Historical Continuity Of Revived Languages

A Preliminary Study of Interrupted Transmission

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Abstract

This paper investigates selected historical-continuity claims about revived linguistic practices after interrupted transmission. Its analytical center is the contribution of earlier linguistic organization to later productive operations, including transformed uses that extend beyond surviving records. A selective review of language revival, reclamation, new speakers and standardization preserves differences between reconstruction, historical evidence, present competence and recognition. Within a preliminary Generative Relational framework, the paper represents histories through relational spacetimes and typed boundary dossiers. It develops compatible-dossier composition, boundary-indexed source-support algebras and finite transfer operators, showing how local evidence or premature source simplification can fail to support a larger attribution. A source-resolved nonlinear field specialization demonstrates that distinct source allocations can share an entire aggregate trajectory; differentiated known dynamics permit a qualified inverse with explicit sensitivity limits. These constructions are conditional representations, not universal identity criteria or calibrated laws of language revival. Documented comparisons and a fully stipulated worked history clarify productive transformation, redundant sources and branching successors. The proposal extends inherited preservation and language-individuation distinctions through a bounded investigation of historical bridges, leaving broader authenticity, authority and whole-language identity questions open.

Keywords: language revival; interrupted transmission; historical continuity; source contributions; nonlinear fields; provenance algebra

Scope Note

This manuscript is a preliminary discussion intended for criticism and further development. Its subject is the warrant for selected historical-continuity attributions across interrupted linguistic transmission. It does not offer a universal classification of revived languages, a measure of authenticity or an empirically calibrated dynamics of revival.

The historical-relational framework is inherited from the author's preservation taxonomy and related manuscripts. The present paper develops a particular application concerning compatible historical links and the contribution of sources to later productive operation. The formal models retain different aspects of that application and are presented as several possible representations.

The prose distinguishes documented reports, philosophical proposals, stipulated examples and conditional mathematical results. Primary literature was consulted selectively; the accompanying source packet records the actual reading scopes and bibliographic checks. A citation does not imply that the complete source was read or that every argument in it is adopted.

The manuscript is organized for sustained discussion. Readers can follow the philosophical inquiry and documented cases without treating the formal sections as an empirical test. The proofs and reproducible calculations make their assumptions available for independent assessment. Their success inside a model does not settle the historical or normative interpretation of an actual community's practice.

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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 investigates selected historical-continuity claims across interrupted transmission. Its formal models are conditional representations; it proposes no universal authenticity test or empirically calibrated language field.

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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.

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1 Historical Continuity Claims

Language revival raises a historical question that present achievement alone cannot answer. A later practice may permit conversation, teaching and the production of unfamiliar expressions. These achievements establish something about that practice. Relating it to an earlier linguistic formation requires an account of how earlier organization enters the later activity. This paper investigates that relation when selected forms of transmission have been interrupted. Its object is a specified continuity attribution, especially one concerning the contribution of earlier linguistic resources to later productive operations. It does not attempt to settle the identity of every revived language or to rank communities by historical authenticity.

The question becomes difficult because both sides of the proposed relation can change. Earlier linguistic organization is encountered through particular records, memories, descriptions and material arrangements. A record preserves something through the selections and limitations of its production. Later interpreters work with additional knowledge, other languages, different social purposes and newly available technologies. A reconstructed practice can therefore be historically dependent and substantially transformative. Calling it either a replica or an invention leaves the relevant dependence unexplained. The inquiry needs to identify what was carried, how it was interpreted, what it helped people do, and which differences remain significant to the continuity claim.

1.1 Interrupted Transmission

An interruption must first be specified. Ordinary intergenerational conversation, a particular teaching practice, ceremonial performance and public recognition need not cease together. A claim that one activity stopped therefore concerns a selected channel and interval. Records or other historically connected arrangements may persist through that interval without themselves instantiating the interrupted capacity. Conversely, retaining a dictionary does not establish the continued existence of fluent conversation. These distinctions permit a reconstruction history to be described without either inventing uninterrupted activity or treating every surviving relation as irrelevant.

The Generative Relational research programme supplies the background vocabulary. It treats the objects relevant to this inquiry as history-bearing relational configurations, with their operative differences distributed across people, practices, artifacts and institutions. A selected object can be represented as a spacetime of events and relations; a labelled 2-complex is one possible representation. Such language does not turn a linguistic formation into a physical field by stipulation. It asks that an account preserve the historical and relational structure on which its inferences depend. The choice of formal carrier remains accountable to the object and question.

The preservation taxonomy already distinguishes historical lineage, retained content, reconstruction and recoverability [9, Section 9]. The earlier study of language individuation already separates profile resemblance, historical continuation and recognition, and permits branching histories [11, Sections 3,5,8]. These are premises of the present investigation, not discoveries made by changing their names. In particular, this paper does not propose that reconstruction after interruption, transformative continuity or nonexclusive descent is possible for the first time.

1.2 Whole-Route Attribution

The present question concerns the assembly of a larger continuity attribution from local links. A historical source may support one reconstruction of an operation. A later teaching practice may demonstrably use another version of the reconstructed material. Both local findings can be sound while the proposed longer chain remains unsupported. The shared name of a book, archive or language does not establish the missing correspondence. The intermediate interpretation, version and conditions of use must be compatible for the selected operation being followed.

A related difficulty concerns source mixtures. Two records can be alternative ways to construct an instructional resource, jointly necessary parts of one reconstruction, or redundant sources actually used

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together. These descriptions make different historical claims. A minimal list of sufficient resources can omit a source that participated in the executed process. A full list of consulted materials can include a source that contributed nothing to the linguistic contrast at issue. Neither list alone explains how an earlier organization helped form a later productive capacity.

The working proposal is consequently modest. A selected continuity attribution gains support when an explicitly reconstructed history connects earlier resources to later productive organization through compatible, independently warranted links. The substantive work concerns the contribution carried by those links. Formalization can make failures of compatibility and losses of source information visible. It cannot manufacture the historical warrant, decide every criterion of language identity, or convert an accepted classification into an unrestricted entitlement to act.

1.3 Research Method

The inquiry combines philosophical distinctions, selective primary-source review, constructed cases and conditional mathematics. The literature review concerns revival, reclamation, new speakers and contested standardization. It retains disagreement between accounts and distinguishes participant testimony from comparative empirical findings. The documented cases illustrate the kinds of reconstruction and authority at stake. They are not a dataset from which the paper estimates a universal revival mechanism.

The formal investigation has two connected parts. Finite dossiers represent historical links with their intermediate states and source requirements. Their composition makes an ordinary but consequential demand precise: the end of one link must supply what the next link actually requires. Source-support algebras distinguish alternative and joint requirements while retaining those states. A transfer-operator representation gives an independently checkable calculation of compatible routes. These mathematical devices are established kinds of construction applied to a selected problem; their general algebraic facts are not claimed as new mathematics.

A nonlinear field specialization then investigates a different loss of information. Current activity can arise through differently sourced channels even when its entire aggregate trajectory agrees. Under declared differentiated dynamics and strong observation assumptions, some channel information can instead become recoverable. The field concerns stipulated realization amplitudes, not quantities of historical identity or degrees of linguistic worth. Its source labels come from the historical interpretation; they are not discovered merely by fitting a differential equation.

1.4 Argument Structure

Sections 2 and 3 establish the relevant debates and positive account of a historical bridge. Section 4 specifies the history-bearing carrier. Sections 5–7 investigate compatible dossiers, source supports and transfer operators. Sections 8 and 9 examine source-resolved fields and the limits of aggregate observation. The documented cases in Section 10 and the philosophical analyses of productive transformation and branching then clarify the interpretation. Section 13 brings the models together in a fully declared hypothetical history. The final sections consider objections, research records and open problems.

This arrangement preserves a difference between the inquiry's conclusion and its instruments. A calculation can reveal that an attribution relies on incompatible intermediate reconstructions. Repairing the attribution then requires historical and philosophical work, which may result in a narrower claim, an additional bridge or the retention of unresolved alternatives. Passing the calculation supplies only the compatibility it tests. The central question remains what earlier linguistic organization contributes to later practice, through which history, and at what level the continuity claim is warranted.

2 Language Revival Research

Language revival research already examines the work connecting historical resources, contemporary learners and renewed practices. Its approaches differ partly because they ask different questions about

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that connection. Historical reconstruction investigates what earlier forms and operations can be recovered; reclamation research examines the purposes and authority of language work; new-speaker research investigates participation and legitimacy; language-planning research follows the organization of continued use. This section compares those questions and their inferential boundaries. The present paper's object is the effective contribution of earlier linguistic organization to later productive practice across a specified interruption. That object requires these established approaches while leaving their wider inquiries open.

2.1 Historical Reconstruction

Amery's account of Kaurna reclamation identifies interpretation of historical materials and the preparation of usable teaching resources as substantial linguistic tasks. These involve knowledge of transcription practices, earlier grammatical terminology and comparative reconstruction, alongside the development of contemporary expressions. The work is described as a collaboration whose participants contribute different forms of knowledge [1, pp. 410–412]. Such an account makes the passage from a retained document to an available practice a process requiring explanation.

For the present analysis, a historical source can contribute in several ways. Its expressions may supply examples, its recorded contrasts may constrain an analysis, and the resulting analysis may support a procedure for forming further expressions. These are analytically distinct contributions. The first concerns particular recorded products; the second concerns relations inferred among them; the third concerns the operative use of an interpretation. An account of continuity becomes more informative when it identifies the relevant contribution instead of treating an archive as a store from which an intact language is simply withdrawn.

Reconstruction also introduces a productive tension. A historical hypothesis needs evidence about the earlier practice. A usable teaching resource needs forms and explanations that present learners can employ. The same proposal may answer both needs, but success at one task does not settle the other. A convenient teaching rule can organize learning while simplifying uncertain historical variation. A defensible historical analysis can remain difficult to learn or insufficient for a desired present activity. A continuity inquiry should follow how the two tasks are connected, including the decisions through which uncertainty is carried into instruction.

Comparative evidence makes the relation more complex. A neighboring language can guide interpretation of an ambiguous historical record without supplying the whole later practice. Alternatively, a form can be borrowed into contemporary use. These descriptions attribute different contributions and require different supporting histories. The fact that another language assisted reconstruction does not determine which description applies. Establishing its role requires examining the operation performed: evidential comparison, direct adoption, analogy, or some combination. These possibilities are an analytical distinction proposed here, rather than a classification imposed on every revival project.

2.2 Reclamation Purposes

Leonard distinguishes reclamation from programmes whose purposes are chiefly expressed through direct language measures. His argument gives community histories, needs and conceptions of language a constitutive role in setting goals and evaluating language work. Practitioner interviews inform the discussion, while the proposal explicitly advances a decolonizing orientation. The definition of the research object is itself at issue when academic and community understandings differ [12, pp. 19–22,31–32].

This challenge bears directly on historical continuity. An investigator might choose a phonological correspondence because it is recoverable from records, while participants might also understand the relevant continuation through relations to land, ancestors or collective practice. The analytical question cannot be resolved by making one description silently stand for all the others. A specified phonological claim remains assessable on its own terms, but its assessment provides only part of a wider account when the inquiry concerns a historically situated language practice. The wider account likewise needs to explain how the different relations enter the selected continuity attribution.

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The present paper therefore treats scope selection as answerable to the people and practices it concerns. This does not entail an inference that any endorsed historical statement is thereby established. It entails a distinction between authority to determine collective purposes and grounds supporting a particular descriptive claim. The distinction permits cooperation: participants can define the uses that matter, investigators can expose the assumptions of their analyses, and both can identify where evidence supports a narrower or different historical relation than originally expected.

There is also a possible failure of the distinction itself. If an investigator selects only dimensions that a preferred method can inspect, the announced narrowness may conceal a substantive exclusion. An account of continuity that systematically removes culturally significant relations could misdescribe its stated object even if each retained comparison is technically competent. Scope discipline therefore requires a reason for the dimensions selected and an account of important relations left unresolved. It should produce a tractable question whose relation to the wider practice remains intelligible.

2.3 Speaker Formation

O'Rourke, Pujolar and Ramallo use new-speaker research to examine people who acquire minority languages through educational programmes, revitalization activity or adult learning. Their conceptual foreword treats the category as socially negotiated and questions inherited assumptions about native-speaker authority. It also asks researchers to examine their own role in producing classifications [13, pp. 1–8,15–16]. These concerns extend beyond cases in which earlier fluent transmission ceased altogether.

A distinction follows between the history of an individual learner and the history attributed to a linguistic formation. A new learner can enter an ongoing practice. A later practice can develop through teaching that depends on records after an interruption. The designation of a participant as new does not decide which process occurred. Conversely, describing a collective lineage as continuing does not imply that its present participants acquired their capacities through the same route as earlier speakers. Acquisition history is part of the explanation, with a scale different from that of the collective attribution.

Costa's Provence fieldwork shows that new-speaker classifications can carry prescriptive force. In one interview, pupils evaluated recorded speech differently after learning about the speaker's acquisition history; they subsequently framed differences in ways that negotiated their own legitimacy. The account concerns a situated encounter partly shaped by the investigator's intervention [4, pp. 136–143]. It should not be converted into a general measure of historical continuity.

The relevance to this paper lies in the force of an attribution. An account of earlier speech can reorganize how present speech is evaluated, making historical knowledge part of the current practice. That feedback is compatible with disagreement about the history's details. The existence of the feedback establishes neither that every historical attribution is accurate nor that classifications are merely optional descriptions. They can organize correction, learning and participation, thereby entering the later history whose continuity is being investigated.

This observation also complicates the demand for an unchanged criterion of success. If later speakers acquire new ways to use and assess inherited resources, their successful participation may transform the practice's organization. A continuity argument then needs to identify what the historical contribution enabled or constrained through that change. Measuring departure from a single earlier output profile would answer only a selected structural question. A generative inquiry additionally asks which inherited distinctions remain effective in producing and interpreting new activity.

2.4 Institutional Coordination

Sayers interprets Cornish standardization through the practical demands of planning, educational provision and public funding. His account emphasizes pressures emerging during implementation and the eventual compromise among rival positions [14]. Davies-Deacon, however, explicitly criticizes narratives that present the standard written form as a neat settlement. Her analysis follows different revival varieties and their naming practices, retaining conflicts that an administrative resolution may obscure [5, pp. 84–87].

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The disagreement is analytically useful because the object called a resolution can differ. Agreement on a working orthography can support a selected institutional activity. Agreement that one reconstruction uniquely expresses the earlier language is a stronger historical claim. Agreement that participants should abandon other forms is a further practical commitment. Treating these as one outcome would make institutional coordination decide questions it may have left open. Equally, continuing disagreement does not erase the work a limited coordination achieved.

These distinctions matter to the mechanism of continuity. Institutions can stabilize a teaching sequence, provide resources and authorize expressions for particular uses. Their contribution may thereby increase the availability of a source-derived practice. Yet an institution can also narrow which historical interpretation becomes widely accessible. The present inquiry consequently examines both the historical contribution carried through a standard and the conditions that select its circulation. These are related explanatory tasks, not competing definitions of authenticity.

An inherited resource may thus acquire a new role through an institutional settlement. A written distinction originally encountered in documents can become a classroom correction rule or a condition of producing official materials. The later rule has its own historical organization. Explaining its relation to the earlier distinction requires the intervening interpretive and practical links. A common label for the rule and source does not eliminate those links, and a changed function does not automatically cancel them.

2.5 Analytical Commitments

The literature provides substantial precedents for studying reconstruction, changed acquisition routes, community purposes and contested standards. The present paper inherits the distinction between historical descent, structural resemblance, organizational continuation and recognition already developed in the language-individuation manuscript [11]. It asks a more specific question about the route through which selected earlier organization contributes to later productive practice. The proposed bridge account should be judged by the distinctions and consequences it makes available for that question.

Three commitments guide the inquiry. First, the contribution must concern an actual historical connection whose role can be specified; access to a source by itself supplies an incomplete explanation. Second, transformation remains compatible with an effective contribution: later production can employ a source-derived organization without reproducing an earlier token or context. Third, different contributions can coexist. Documentary interpretation, acquired competence, institutional support and participant recognition may jointly enable continuation while supporting different claims about it.

The resulting formal investigation is a conditional representation of those commitments. Its symbols acquire linguistic content through historical interpretation, and its consequences remain limited by that interpretation. A successful construction would clarify which claims survive a change of carrier, a reconstruction step or a branching route, while keeping unsupported historical inferences visible. It would neither replace the case literature nor supply a general ranking of revived languages. Section 10 returns to the documented settings to examine the practical meaning of these distinctions.

3 Historical Bridges

A historical bridge connects an earlier linguistic organization to a later practice through specified events, carriers and transformations. This section identifies the contribution that such a bridge should establish when recurrent transmission has been interrupted. It first specifies the continuity claim, then examines persisting carriers, effective source use and productive transformation. The objective is a positive account of what a warranted bridge can explain. The finite constructions in Sections 5 and 6 subsequently make selected compatibility requirements explicit.

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3.1 Continuity Targets

A continuity attribution requires an object sufficiently definite to be followed. An inquiry might concern a recorded expression, a contrast governing its use, a word-formation operation, a teaching practice or a historically extended linguistic formation. These objects admit different transformations. A recorded expression can be copied while its interpretation changes; a productive operation can generate new expressions; a teaching practice can migrate between institutions. Specifying the object establishes what the inquiry must explain about the connection between earlier and later activity.

The preceding study of historical language individuation distinguishes resemblance, descent, organizational continuation and recognition [11]. The present analysis inherits that distinction. Its narrower question concerns how an earlier organization contributes to later productive practice across heterogeneous carriers. A resemblance claim compares selected features. A descent claim adds a historically relevant route. A claim of organizational continuation concerns what the route carries through transformation. Recognition concerns how participants or institutions understand and act upon such relations. Evidence relevant to one claim may support another, but the additional inference requires explanation.

Consider a constructed archive containing a set of expressions and a later workshop using a similar set. Matching expressions initially establish a comparison. A dated teaching record connecting the workshop to the archive adds evidence of a route. Participants' use of an archived contrast to correct new expressions adds evidence of a contribution to their productive organization. The third finding gives the archive a more specific role than its presence on a reading list. None of these findings alone determines the boundaries of the entire language. Their combination supports a more informative local historical attribution.

3.2 Interrupted Activities

An interruption is a cessation of selected activity over a specified interval. Recurrent conversation, acquisition within households, public ceremonial use, specialist interpretation and document maintenance can have different temporal profiles. The analysis should name the interrupted activity and the scale at which cessation is claimed. A gap in regular conversation need not be a gap in document preservation; continued document preservation need not mean that the ability to conduct that conversation remained available.

The taxonomy's reconstruction framework already permits retained resources to mediate a historical connection while a selected active pattern is absent [9]. This is a substantive possibility because the organization doing the carrying can change. An earlier exchange becomes an inscription; the inscription enters an archive; a later interpretation enters teaching; teaching supports renewed use. At different stages, different operations maintain what will matter to the selected later practice. An inactive middle carrier need not instantiate the linguistic ability whose interruption motivates the inquiry.

Whether that succession constitutes continuity depends on the target. It can support documentary descent and mediated contribution while leaving uninterrupted interpersonal acquisition false. Retaining these distinct descriptions makes the interruption intelligible. Calling the entire interval either complete survival or complete disappearance would obscure which operations ceased, which resources persisted and which capacities were subsequently formed. The task is to explain those transitions with the historical detail appropriate to the claim.

3.3 Effective Source Contributions

An earlier source contributes to a selected later operation when the historical process connects material taken from that source to the operation's formation, maintenance, interpretation or correction. The contribution may concern an expression, a constraint, a distinction or a procedure. Its content should be identifiable in the account of what participants subsequently do. This proposal applies the taxonomy's inherited requirement of transmission relevance to the present linguistic object [9].

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An effective contribution can be transformative. Participants may reconstruct a pattern from several recorded examples, test its interpretation, and employ it in a situation absent from the record. The resulting operation can depend on earlier usage while adding a new formulation and an expanded range of application. Evidence for that history concerns the sources actually used, the interpretation developed and the role of that interpretation in later practice. A retrospective similarity between the finished practice and an old example would provide less information about the route.

Historical influence has a wider range than the selected linguistic contribution. A document might inspire fundraising, affirm affiliation or motivate a meeting. Those effects can matter greatly to the practice's emergence. They establish a different role from carrying a grammatical contrast into participants' corrections. A careful account can retain both enabling and linguistic contributions without treating either as unreal. The distinction specifies what the evidence explains, rather than ranking the historical importance of the people or resources involved.

3.4 Actual Use

Actual use, available sufficiency and indispensability answer different questions. A source may have participated in the executed historical process even though another available source could have supported a comparable result. Conversely, a source sufficient within a reconstructed possibility may never have been encountered by the participants. A claim about the actual route therefore needs process evidence beyond a demonstration that a successful route was possible.

Suppose two independently retained copies contain the same relevant distinction. A teacher consults both and uses their agreement to settle an interpretation. Either copy might have sufficed under the stipulated teaching conditions. The historical use of both remains part of the executed process. A representation retaining only a smallest sufficient source set has deliberately omitted that redundancy. It cannot then infer that the omitted copy played no historical role.

Consultation itself also requires interpretation. Participants can read a source and reject its proposed analysis; they can cite it ceremonially; they can use it only to locate another record. Whether such an encounter contributes to the selected operation depends on what changes or constraints it supplies. Rejection can sometimes shape a later distinction, but its relevance must be shown. The source-support calculus in Section 6 consequently describes selected sufficient alternatives while preserving actual execution as a separate historical question.

3.5 Productive Correspondence

A bridge into productive practice should explain how earlier material becomes usable beyond its original occurrence. This can involve learning a discrimination, acquiring a correction procedure or organizing a family of expressions. The relevant correspondence is between specified roles or operations. It may tolerate altered pronunciation, revised notation or expanded application when those transformations preserve the declared relation. The acceptable comparison must be argued from the object and evidence, rather than selected solely to make a continuity claim succeed.

The cultural-reconstruction manuscript already treats present learning and historically disciplined reconstruction as achievements whose objects can differ from recovered historical identity [10]. Applied here, a newly articulated grammatical rule can be grounded in earlier examples without establishing that earlier speakers explicitly entertained that rule. The rule's productive present use and the earlier usage's contribution to its construction are assessable claims. An attribution concerning earlier grammatical awareness requires further evidence.

This distinction gives historical continuity an explanatory task. The earlier organization matters when it constrains or helps generate what later participants can do, even though the present operation has its own history and innovations. A warranted account identifies both the inherited relation and the transformation. The formal dossiers that follow represent selected links in that account. Their compatibility preserves the interpreted organization needed at adjoining stages; their existence within a model remains conditional on the historical warrant supplied for those stages.

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4 Historical Spacetimes

This section supplies the representational setting for the formal investigation. Its objective is to retain the history through which a source contributes to later operation while making the selected interfaces finite enough to examine. The construction follows the distinction between historical carriers, local realizations and typed transformations in earlier Generative Relational work [8, Sections 5–6,9]. Its finite boundary records are summaries of specified aspects of that setting. They are not replacements for a community's complete history.

4.1 Historical Relational Structure

Let H denote a selected history-bearing relational spacetime. Here *spacetime* indicates that the object includes temporally and relationally situated occurrences and their organization. No Lorentzian metric, physical dimension or universal clock is assumed. A retained representation can take the form stated in Equation 1.

$$K = (V, E, F, \partial, \lambda_K). \tag{1}$$

In Equation 1, V, E and F are chosen sets of vertices, edges and faces; ∂ records incidence; and λ_K assigns the declared event, relation and interpretation labels. A vertex can represent a retained episode rather than an isolated person. Edges can record transmission, interpretation or coordination relations. Faces can retain a specified relation among paths, such as a documented comparison between a reading and a corrected reading. Different edge types must remain distinguishable. A chronological succession alone does not establish a transmission edge.

The 2-complex does not imply that every closed path has the same interpretation or every comparison is successful. If a face represents agreement between two reconstructed procedures, the claimed agreement requires a comparison criterion and warrant. A face can instead record that the procedures were compared and found to differ. It is the labelling and declared semantics that distinguish these uses. A spin-foam realization would require further representation labels, amplitudes and interpretation rules. The present inquiry supplies none and therefore makes no spin-foam calculation.

The representation may be finite or countable for historical bookkeeping. The continuous real-valued fields introduced later use a different carrier. Assigning a finite number of field channels does not make their amplitude space countable, and a countable archive index does not discretize all possible linguistic practice. Maintaining this distinction prevents a convenient historical index from silently fixing the ontology or mathematics of every later model.

4.2 Operation Descendants

The historical question concerns selected linguistic organization. Let $\mathcal{O}_R$ be a declared family of operations applicable in region R of the represented history. An operation may concern the formation of a specified expression, an interpreted grammatical contrast, a correction practice or a teaching procedure. The family must state its operands and applicability. The ability to copy an inscription, for example, need not imply the ability to extend its pattern to a new communicative task.

An earlier and a later operation can have different domains. A historical comparison therefore requires a declared correspondence, represented schematically by Equation 2.

$$\Delta_{R,R'} : \mathcal{O}_R \rightharpoonup \mathcal{P}(\mathcal{O}_{R'}). \tag{2}$$

Here $\mathcal{P}$ denotes the power set and the partial arrow indicates that some source operations have no justified descendant assignment. Equation 2 follows the earlier field formalism's allowance for changed operation families [8, p. 56]. It does not assign a canonical descendant to every past operation. Several later procedures can be candidates; a mapped family can also be empty. The correspondence records the comparison being defended.

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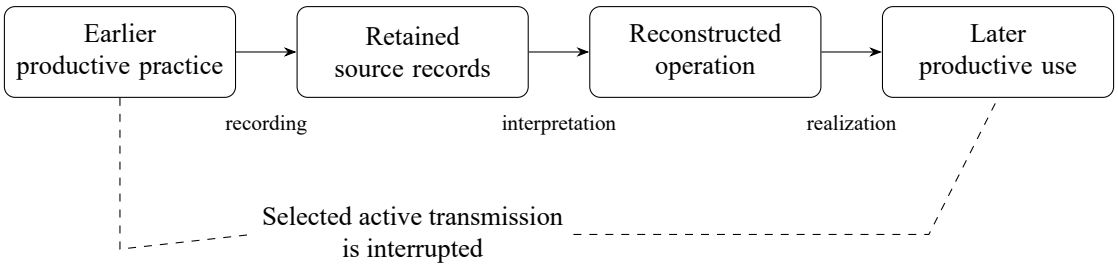

Figure 1: Interrupted Transmission Carriers. A possible record-mediated bridge can persist while the selected active transmission fails. Each solid arrow requires its own historical and operation-specific warrant.

For linguistic application, a descendant claim must identify a relation stronger than a common operation name. The later procedure might reproduce a contrast through different phonetic realizations, extend a reconstructed pattern to new referents, or combine inherited and newly introduced distinctions. Which of these preserves the selected content depends on the declared comparison. Historical source contribution and content correspondence remain separate obligations. An operation can be inspired by a source while replacing the feature whose preservation was claimed.

The correspondence also has a direction. A later instruction can be reconstructed from earlier materials without implying that historical speakers possessed that instruction as an explicit rule. Present grammatical explanation and earlier practical organization occupy different positions in the history. The later explanation may successfully track aspects of the earlier pattern, but the success requires evidence. It cannot be read backward from the existence of a useful modern pedagogy.

4.3 Transmission Carriers

Figure 1 shows a schematic interruption. The active-practice line is discontinuous, whereas the record and interpretation relations provide a different route. The figure is a constructed representation. Its arrows identify questions to investigate rather than evidence that any actual revival followed this exact sequence.

A record-bearing interval need not instantiate the capacity later recovered through it. Its role can be to retain distinctions from which a present reconstruction becomes possible when suitable interpretive and practical resources appear. Those resources belong to the later history. Treating the archive as if it had continuously spoken the language would erase that dependence; treating it as causally inert simply because it did not speak would erase a different dependence. The appropriate description follows the contribution actually at issue.

Historical representation itself can change. A corrected transcription can alter the current account of an earlier utterance without altering the occurrence of that utterance. A community can also change which records it treats as authoritative or which practices make them effective. These are changes in representation and present relational operation. Stronger claims that the past occurrence itself has changed require a separate ontological argument. The earlier field formalism explicitly distinguishes these interpretive levels [8, Section 9.7]; this paper adopts that restraint.

4.4 Boundary Descriptions

The next sections select finite boundary states from this richer setting. At stage i, a member of B_i retains the aspects needed for the next historical comparison: a represented carrier, a relevant version, an interpreted operation and required support conditions. The notation B_i does not designate a complete state space of an entire language. A stage can concern the availability of an archive during an interval in which the selected active practice is absent.

Boundary adequacy is relative to a future question. Two instructional resources can be equivalent

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for displaying one archived word while differing for the productive distinction needed by the next lesson. If that distinction matters to the proposed historical link, a boundary description that retains only the displayed word is too coarse. The error is not necessarily an inaccurate local observation. It can be the use of an accurate observation as a summary for a task it does not support.

The finite model uses exact equality of declared middle states for composition. This is a deliberately strong and transparent specialization. Applications permitting translated or approximately equivalent middle presentations must supply corresponding links and their coherence conditions. Approximate resemblance cannot silently act as equality, because its composition may accumulate error or fail transitivity. The finite construction provides a clear baseline against which such extensions can be investigated.

The historical carrier and the finite boundary therefore perform complementary roles. The carrier retains what the operation and its supports mean within the chosen history. The boundary identifies which parts must agree for a local link to continue into another. A contradiction in the finite model should be interpreted as a diagnosis of that declared comparison. It can lead to a refined state description or revised historical claim. It does not by itself pronounce a language historically discontinuous.

5 Compatible Historical Dossiers

This section studies the assembly of a historical bridge from separately supported links. Its immediate object is a dossier connecting an earlier linguistic organization to a selected later productive practice. An archive can preserve a construction, an interpretation can distinguish its relevant features, and teaching can make the interpreted construction available for new uses. These descriptions support an extended attribution only if their middle terms fit. A document that one investigation establishes as a descendant of earlier activity need not be the document version, interpretation, or supported practice on which a later investigation relies. The following finite representation makes that obligation explicit and supplies a constructive compatibility test.

The general architecture is inherited. The preservation taxonomy distinguishes historical witnesses from comparisons of retained content and already develops reconstructive lineage across interrupted activity [9, Sections 3 and 9]. The earlier language-individuation investigation supplies typed witnesses and conditional composition [11, Section 5]. Here the purpose is to examine an informative failure of local assembly and to prepare a source-sensitive calculation. Neither a new general theory of paths nor a sufficient test of whole-language identity is proposed.

5.1 Boundary States

Let the integers $i = 0, \dots, n$ order selected stages of a historical comparison, where $n \geq 1$. They need not describe equally spaced times or the entire history. At stage i, let B_i be a finite set of candidate boundary states. A state records the features that determine how the next selected operation can proceed: the relevant carrier region, a document or practice version, the interpretation of the target, and the support conditions that affect admissibility. This is a modeling requirement rather than a demand to inventory everything about the situation. If a forgotten difference changes the continuation, the state description must be refined.

A boundary state during the interruption can consist of a documentation arrangement. It need not include anyone who can then perform the later linguistic task. Requiring active linguistic competence at every stage would exclude reconstruction by definition. Conversely, a record's continued material existence does not establish that it supports the selected construction. Its relevant organization must survive in a form for which an interpretation and a subsequent operation can be warranted. The model therefore permits a bridge across an interval of inactive transmission while leaving the content of each link to historical and linguistic investigation.

Let W_i be a finite set of candidate link dossiers. Its source and target maps are

$$s_i : W_i \longrightarrow B_{i-1}, \qquad t_i : W_i \longrightarrow B_i. \tag{3}$$

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The maps in (3) specify the boundary states that a dossier actually connects. A dossier retains a proposed process, the selected comparison, and its evidential grounds. Distinct dossiers can share endpoints: two documented teaching routes might produce the same boundary profile through different participants or sources. Keeping those alternatives distinct matters when the question concerns what happened, even if a later summary treats their operational results alike.

There are two levels of admission. A supported actual dossier asserts an occurrence for which evidence has been supplied. A candidate dossier is a live historical possibility retained for comparison. The same finite calculation can organize either, but it cannot turn the latter into the former. Its output must preserve the status of its inputs.

5.2 Middle Compatibility

In this restricted representation, a full dossier is a tuple of links with exactly matching middle states. For initial state $x \in B_0$ and terminal state $z \in B_n$, put

$$\begin{aligned}\mathcal{P}(z,x) = \{(w_1,\dots,w_n) : w_i \in W_i, \quad s_1(w_1) = x, \quad t_n(w_n) = z,\\ t_i(w_i) = s_{i+1}(w_{i+1}) \quad (1 \le i < n)\}.\end{aligned} \tag{4}$$

Equation (4) compares declared middle states, not archive names. Equality includes the version and interpreted task required for the next link. If a transcription changes a contrast used in later teaching, the original and revised transcription cannot be identified merely because both belong to the same collection.

Exact matching is one possible interface convention. Different descriptions of an adequate middle organization can instead be related by a warranted correspondence. In that case the correspondence, its applicability, and its coherence with the selected operation must be included as additional data or represented by further typed links. The exact convention is useful because it exposes where such an argument is missing; it does not imply that historical continuity requires literal identity of artifacts or tokens.

This distinction gives a positive account of productive transformation. An earlier pattern may contribute to a later ability to form expressions never recorded in the source. The dossier should then explain how the source constrains or enables the later construction, including any inference, correction, or extension. It need not assert token preservation. Cultural reconstruction already distinguishes present reconstruction from recovery of an earlier event and separates targets that can succeed independently [10, pp. 7–8, 20–23]. The boundary state must retain the target actually compared, so that success in contemporary teaching is not silently substituted for an unsupported claim about an earlier speaker's intention.

5.3 Global Reachability

The existence of a full compatible dossier can be checked without first listing every full tuple. Fix an admitted initial set $A_0 \subseteq B_0$. Define the reached sets recursively by

$$A_i = \{t_i(w) : w \in W_i,\ s_i(w) \in A_{i-1}\}, \qquad 1 \le i \le n. \tag{5}$$

The construction in (5) carries the compatible middle states forward. It does not replace them with the weaker statement that some link exists at each stage.

Proposition 5.1 (Global Dossier Compatibility)**.** *For $z \in B_n$, there exists an $x \in A_0$ such that $\mathcal{P}(z,x)$ is nonempty if and only if $z \in A_n$.*

Proof. For one link the assertion is exactly the definition of A_1. Suppose it holds for $i-1$ links. A compatible i-link tuple ends with a link whose source is the endpoint of its preceding compatible tuple. By the induction hypothesis that source belongs to A_{i-1}; its target therefore belongs to A_i. Conversely, if $z \in A_i$, the defining condition supplies a last link w_i with target z and source in A_{i-1}. The induction hypothesis supplies a compatible preceding tuple from some member of A_0 to that source. Appending w_i satisfies every middle equality in (4). Induction proves both directions. □

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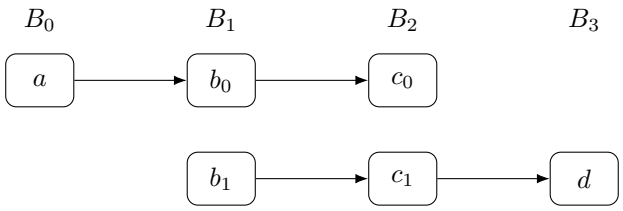

Figure 2: Incompatible Middle Dossiers. Each adjacent pair of link families has a compatible route, but the two routes use different middle states. No full route joins a to d. The missing connection represents an unassembled dossier, not a demonstrated absence of historical relations.

Proposition 5.1 is elementary finite reachability with an interpretive obligation attached to its carrier. Its positive use is constructive: when the result is nonempty, backtracking the selected links produces the candidate bridge that must be assessed. When it is empty, the precise conclusion is that the supplied candidates assemble no such bridge. An inference to the absence of any actual historical route would additionally require a justified completeness claim about the dossiers. Fragmentary archives rarely supply that premise automatically.

5.4 Three-Link Obstruction

Even successful assembly of every adjacent pair need not yield a full dossier. Consider the boundary sets

$$B_0 = \{a\}, \quad B_1 = \{b_0, b_1\}, \quad B_2 = \{c_0, c_1\}, \quad B_3 = \{d\}, \tag{6}$$

with one link from a to b_0, two links from b_0 to c_0 and from b_1 to c_1, and one link from c_1 to d. The carriers in (6) and their links appear in Figure 2.

The first two link families compose through b_0, and the last two compose through c_1. Nevertheless, (5) yields $A_1 = \{b_0\}$, $A_2 = \{c_0\}$, and $A_3 = \varnothing$ when $A_0 = \{a\}$. The final link needs the state that the initial route does not reach.

A stipulated linguistic reading makes the difficulty concrete. An early documentation process supports a first transcription and an interpretation based on that transcription. Later teaching uses a revised transcription with a different treatment of the selected construction. The first local investigation supports the route to the first interpretation; the second supports the route from the revised interpretation to productive teaching. Joining the investigations requires a historically adequate account of the revision and its relevant effects. A shared document title supplies no such account. If evidence of a suitable revision process is found, a further link can repair the dossier. If evidence instead shows that the later interpretation discarded the selected earlier construction, the particular contribution claim must change.

The result identifies a reason to improve the historical description rather than impose an uninterrupted chain of fluent speakers. Both middle stages can consist of records and interpretive arrangements. What matters for this selected attribution is whether earlier linguistic organization reaches the later operation through compatible transformations. Sections 6 and 7 retain this requirement while examining the different information carried by source requirements and transfer calculations.

6 Boundary-Indexed Source Supports

This section asks which combinations of identified sources support a selected later operation along compatible historical dossiers. The distinction between alternatives and joint requirements is central. One construction might be supported by an adequately interpreted source on its own, whereas another route needs both a fragment and a comparative resource. A list of all consulted materials does not express that difference. A minimal-support calculation can express it, provided that the calculation retains the boundary state reached by each combination. The main result shows when this simplification is safe and why apparently redundant sources cannot be discarded across incompatible boundary states.

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The algebraic method has an established precedent. Provenance semirings organize annotations by addition for alternative derivations and multiplication for joint use; different annotation structures retain different information [6, Sections 2–3]. The present construction uses an explicitly defined finite, idempotent support calculus. Its application concerns declared source requirements for selected linguistic operations; it supplies neither an empirical causal measure nor a new general provenance theory.

6.1 Selected Source Requirements

Let S be a finite set of source or resource labels. A label can identify an archival text, a specified retained practice, a speaker's documented contribution, or a comparative resource required by a represented reconstruction or use route. The label's granularity follows the inquiry. Splitting a collection into ten labels does not establish ten times as much continuity. Present supporting resources can also be included when their availability is at issue; resources held fixed can instead be included in the declared boundary conditions.

Resources of the represented process must be distinguished from records used only to warrant our account of that process. A workshop can depend on a transcription, while our evidence that the workshop used it comes from a later interview. The interview belongs to the evidential warrant of the dossier; it is not thereby a requirement of the workshop's linguistic operation. Removing a process resource and losing evidence for its use are different comparisons. They require separate labels if both are modeled, and this section's requirement sets concern the former.

For each dossier $w \in W_i$, specify its requirement set $\sigma(w) \subseteq S$. A compatible path $p = (w_1, \dots, w_n)$ has the combined requirement

$$\sigma(p) = \bigcup_{i=1}^{n} \sigma(w_i). \tag{7}$$

Equation (7) records the joint availability demanded by the selected route. It does not say how much each source contributes, whether it was indispensable to the actual process, or which source deserves authority.

Two assumptions give the calculation its scope. First, the boundary states retain every other condition relevant to the compatibility of the selected links. Second, availability is monotone for a fixed specification: an additional source can be ignored, so its presence does not make an already admitted route inadmissible. This second assumption can fail in an actual revival inquiry. New evidence can require a correction, defeat an admitted reconstruction while leaving the target unchanged, change the target interpretation, or reveal a restriction on access. The admitted dossier family, its adequacy assessment, its boundary description, or its target interpretation may then need revision. Such a change is not merely the addition of an optional source within the fixed model. It can require refined states, an explicit target correspondence when the target changes, or a different nonmonotone model. The formal benefit of the present restriction is that alternative sources and joint requirements can be compared without silently changing their specification.

The empty requirement set means that a route requires no member of the selected label family. It does not mean that linguistic activity is produced without embodied, social, or material conditions. Likewise, a requirement set is not by itself evidence that the proposed route occurred. The actual dossier and its grounds remain necessary.

6.2 Antichain Representation

For a family $\mathcal{F} \subseteq 2^S$, write $\mathrm{Min}(\mathcal{F})$ for its inclusion-minimal members. Because S is finite, every nonempty family has minimal members. A family is an antichain when no distinct members include one another. Write $\mathfrak{A}(S)$ for the set of antichains, including the empty family. Define two operations by

$$\begin{aligned} \mathcal{A} \oplus \mathcal{B} &= \mathrm{Min}(\mathcal{A} \cup \mathcal{B}), \\ \mathcal{A} \otimes \mathcal{B} &= \mathrm{Min}\{a \cup b : a \in \mathcal{A},\ b \in \mathcal{B}\}, \\ \mathbf{0} = \varnothing, &\qquad \mathbf{1} = \{\varnothing\}. \end{aligned} \tag{8}$$

In (8), $\oplus$ combines alternatives and $\otimes$ combines joint requirements. The two special families have different meanings. There is no admitted route in $\mathbf{0}$; $\mathbf{1}$ admits a route without requirements from S.

These operations can be justified directly by availability. For an antichain $\mathcal{A}$, define its upward closure

$$\uparrow \mathcal{A} = \{T \subseteq S : \text{there exists } a \in \mathcal{A} \text{ with } a \subseteq T\}. \tag{9}$$

Thus (9) is the family of available-source sets that satisfy at least one admitted requirement.

Proposition 6.1 (Support Algebra)**.** *The upward-closure representation is injective on* $\mathfrak{A}(S)$ *and satisfies*

$$\uparrow (\mathcal{A} \oplus \mathcal{B}) = (\uparrow \mathcal{A}) \cup (\uparrow \mathcal{B}), \qquad \uparrow (\mathcal{A} \otimes \mathcal{B}) = (\uparrow \mathcal{A}) \cap (\uparrow \mathcal{B}). \tag{10}$$

Consequently (8) *defines a commutative semiring with idempotent addition.*

Proof. Removing a nonminimal member of a finite family does not change its upward closure: that member contains a minimal member of the same family, and every available set containing the former also contains the latter. The first equality in (10) follows because containing a member of a union means containing a member of at least one family. For the second, T contains $a \cup b$ exactly when it contains both a and b. Thus T admits a joint requirement exactly when it belongs to both upward closures.

Every member of an upward-closed family contains one of its minimal members, by finiteness. Those minimal members determine the family uniquely. In particular, the minimal members of $\uparrow \mathcal{A}$ are exactly $\mathcal{A}$, proving injectivity. Union and intersection are associative and commutative, intersection distributes over union, and union is idempotent. Their identities are the empty upward family and the full family 2^S, represented respectively by $\mathbf{0}$ and $\mathbf{1}$. Intersection with the empty family is empty. Injectivity transfers all these equalities to (8), giving the asserted semiring laws. □

Proposition 6.1 derives the calculation from its stated meaning. In this representation, repeated use of a source does not produce a new requirement. A procedure needing two temporally ordered consultations cannot recover that order from its antichain. If multiplicity, timing, or the distinction between consulted and incorporated material matters, the dossier must retain it before this simplification.

6.3 Typed Support Composition

Retain the endpoint maps of (3). For each stage define an antichain-valued matrix with target rows and source columns:

$$\mathsf{A}_i(y, x) = \mathrm{Min}\{\sigma(w) : w \in W_i,\ s_i(w) = x,\ t_i(w) = y\}, \quad (y, x) \in B_i \times B_{i-1}. \tag{11}$$

Equation (11) minimizes requirements only among routes reaching the same declared boundary state from the same source state. For adjacent stages, define

$$(\mathsf{A}_2 \odot \mathsf{A}_1)(z, x) = \bigoplus_{y \in B_1} \mathsf{A}_2(z, y) \otimes \mathsf{A}_1(y, x). \tag{12}$$

The shared index in (12) enforces middle compatibility. An empty sum is $\mathbf{0}$.

Proposition 6.2 (Compatible Support Composition)**.** *For every* $x \in B_0$ *and* $z \in B_n$*, typed multiplication gives*

$$(\mathsf{A}_n \odot \cdots \odot \mathsf{A}_1)(z, x) = \mathrm{Min}\{\sigma(p) : p \in \mathcal{P}(z, x)\}. \tag{13}$$

Its value is independent of parenthesization.

Proof. First consider two links before any minimization. Every compatible pair has a middle state y, a first link ending there, and a second link beginning there. Its requirement is the union of the two link requirements. Conversely every pair counted at a common y is compatible. The unminimized expansion of (12) therefore enumerates exactly the requirement family of compatible pairs.

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Now suppose a requirement a' in one fixed boundary entry is removed because another requirement a in that entry satisfies $a \subseteq a'$. Every next link compatible with the removed route is compatible with the retained route, because their middle boundary state is the same. For its requirement b, the inclusion $a \cup b \subseteq a' \cup b$ holds. Removing a' can therefore remove no minimal composite requirement. The same argument applies on the other side. Minimization within each fixed entry is safe before or after composition.

Induction extends this reasoning to all stages and proves (13). Expanding either parenthesization enumerates the same compatible tuples with the same union of requirements. Equivalently, distributivity from Proposition 6.1 permits all finite expansions, while set union is associative. Final minimization of the same family gives the same result. □

The adequacy of a boundary state is substantive. Proposition 6.2 assumes that histories represented by the same intermediate state can be continued by the same admitted links for this selected task. If a later interpretation depends on a version difference omitted from that state, the computational equality remains valid for the coarse model, but its proposed historical application fails. This is a local condition on the interface, not a claim that a finite state exhausts a historical spacetime.

6.4 Premature Minimization

Consider two first-stage routes from x: one reaches m_0 with requirements $\{a\}$, and the other reaches m_1 with requirements $\{a, b\}$. A second-stage route reaches z only from m_1, with requirements $\{c\}$. Their nonzero entries are

$$\begin{aligned} &\mathsf{A}_1(m_0, x) = \{\{a\}\}, \qquad &&\mathsf{A}_1(m_1, x) = \{\{a, b\}\}, \\ &\mathsf{A}_2(z, m_1) = \{\{c\}\}, \qquad &&(\mathsf{A}_2 \odot \mathsf{A}_1)(z, x) = \{\{a, b, c\}\}. \end{aligned} \tag{14}$$

Equation (14) follows because the m_0 term has no compatible second link. If the two middle states are first merged into one coarse summary, minimization changes $\{\{a\}, \{a, b\}\}$ into $\{\{a\}\}$. The retained support then describes the wrong middle organization. Simply appending $\{c\}$ would falsely certify $\{a, c\}$; retaining the original admissibility condition would reveal that the needed route has been discarded.

A stipulated example concerns a construction interpreted from an archival source a. Source a alone supplies an unresolved version m_0. Comparing it with b yields a corrected interpretation m_1, which a later teaching arrangement c can use to form new examples. The second source is apparently redundant only under the inadequate summary that merges the unresolved and corrected states. Within the adequate entry for m_1, it can already be part of the minimal requirement. The error lies in simplifying before deciding what must be carried forward.

This obstruction helps distinguish preservation of a useful source from preservation of its contribution to productive practice. Having a somewhere in the archive does not by itself retain the interpretive organization that later users need. Conversely, using b to revise the interpretation does not automatically sever the historical contribution of a. The dossier must specify which earlier organization is retained, corrected, or abandoned in reaching m_1.

6.5 Actual Routes

Minimal supports answer a possibility question over admitted alternatives. Suppose two routes with the same endpoints use $\{a\}$ and $\{a, b\}$. Their antichain is $\{\{a\}\}$, even if the documented executed route is the second. Removing b from the minimal summary does not show that it was absent from the historical process. The summary has intentionally forgotten some routes.

The converse error is also possible. A source can appear in a consulted-materials list without supplying the selected linguistic discrimination. The process account must say what was taken up, checked, transformed, or made available through that source. The metamodel's distinction between historical tracking and a warranted efficacy comparison already prevents a generic observed effect from deciding

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a particular historical contribution [7, pp. 30–31]. Neither minimal sufficiency nor documentary presence can replace that account.

For example, $\{\{a\},\{b,c\}\}$ says that a provides one admitted route and the pair b,c another. No source is required by every route. The flat list $\{a,b,c\}$ loses both the alternative and the joint requirement. For an available set $T \subseteq S$, define

$$F_{\mathcal{A}}(T) = \begin{cases} 1, & \text{some } a \in \mathcal{A} \text{ satisfies } a \subseteq T, \\ 0, & \text{otherwise.} \end{cases} \tag{15}$$

By (10), the evaluation in (15) sends $\oplus$ to Boolean disjunction and $\otimes$ to conjunction. If $F_{\mathcal{A}}(T) = 1$ and $R \subseteq T$, excluding R defeats admitted route feasibility exactly when every support $a \in \mathcal{A}$ contained in T meets R. Indeed a support remains available precisely when it is contained in T and disjoint from R.

The comparison must specify the stages at which availability is varied; labels can include those stages where needed. If the original route used an archive during learning, its later destruction does not retrospectively undo that contribution or establish loss of the acquired operation. A present continuation inquiry begins from a boundary state retaining acquired capacities and substitutes, and examines its onward requirements. The whole-history calculation instead compares availability for the represented route across its stages.

This criterion can identify vulnerabilities of the declared support arrangement under that fixed availability comparison. It is conditional on the alternative routes being adequate and on the exclusion changing no unrepresented conditions. It measures neither authenticity nor actual historical causation. Its constructive role is to reveal which archival, interpretive, and teaching resources would keep the specified route to later productive practice available, while the executed dossier preserves what actually occurred.

7 Historical Transfer Operators

This section represents compatible dossiers by operators and specifies what the calculation preserves. It also introduces diagonal middle-state operators that locate the compatibility requirement inside a composition. The purpose is an additional view of the preceding historical problem: several locally supported routes can fail to connect earlier linguistic organization to later productive use when their middle states differ. The construction retains this obstruction while allowing an independent calculation of source availability.

The operators are finite representations of declared interfaces. They do not replace the history-bearing object with a point, nor do they establish that every historically important distinction has entered the interface. The prior field-power manuscript treats typed algebra maps, regional compatibility, and historical anchor preservation as distinct obligations [8, pp. 40–43, 46–48]. The present matrices satisfy their own explicitly stated conditions; they are not asserted to be algebra homomorphisms or instances of every earlier field construction.

7.1 Finite Transfer Kernels

For each finite boundary carrier B_i, let $\mathcal{H}_i = \ell^2(B_i;\mathbb{C})$, with orthonormal basis $\{e_x : x \in B_i\}$. Assign a strictly positive real formal weight $\omega(w)$ to every admitted dossier w. Define

$$\begin{aligned} K_i(y,x) &= \sum_{\substack{w \in W_i \\ s_i(w)=x,\ t_i(w)=y}} \omega(w), \\ (K_i v)(y) &= \sum_{x \in B_{i-1}} K_i(y,x)\,v(x), \qquad K_i : \mathcal{H}_{i-1} \longrightarrow \mathcal{H}_i. \end{aligned} \tag{16}$$

Empty sums in (16) are zero. All spaces are finite-dimensional, so these linear maps are bounded. The entries are nonnegative and are strictly positive exactly where at least one link is admitted. This use of

positivity concerns matrix entries. A rectangular matrix is not a positive element of a C^*-algebra, and even a square nonnegative-entry matrix need not be self-adjoint or positive semidefinite.

The weights have no automatic probabilistic meaning. Choosing all of them equal to one counts admitted dossiers, including distinct dossiers with identical endpoints. It does not count independent confirmations: two dossiers could rely on the same record. Different positive weights can express stipulated bookkeeping conventions without becoming source-importance measures. The existence result below is insensitive to those numerical choices because it uses only strict positivity on admitted links.

Proposition 7.1 (Compatible Path Expansion)**.** *For $x \in B_0$ and $z \in B_n$,*

$$(K_n \cdots K_1)(z,x) = \sum_{p=(w_1,\ldots,w_n)\in\mathcal{P}(z,x)} \prod_{i=1}^{n} \omega(w_i). \tag{17}$$

Consequently the entry is positive if and only if a compatible full dossier exists.

Proof. For one stage, (17) is the definition of the kernel. For two stages, matrix multiplication sums $K_2(z,y)K_1(y,x)$ over $y \in B_1$. Expanding the two finite sums in each product gives one term for every pair of links whose shared state is y, and no term for a pair with different middle states. Each term is the product of its link weights. Suppose the formula holds through stage $i-1$. Multiplication by K_i appends a last link at the endpoint of each preceding tuple, giving exactly every compatible i-link tuple once with its product weight. Induction proves the expansion. Every term is strictly positive, so a nonempty path family gives a positive sum; an empty family gives zero. □

Proposition 7.1 represents compatible assembly, not an inference that an admitted path happened. If zero weights are allowed on admitted links, the representation can delete those links. If signed or complex weights are used, different paths can cancel. For example, two paths of weights 1 and -1 have zero sum despite existing as paths. Such choices require another interpretation and lose the stated existence certificate. Likewise, the adjoint of K_i is a mathematically defined reverse-direction map; it does not supply an executable reversal of documentation, interpretation, or teaching.

7.2 Coarse Middle States

The obstruction in Figure 2, with unit link weights and the displayed ordering of the boundary states, gives

$$K_1 = \begin{pmatrix} 1 \\ 0 \end{pmatrix}, \qquad K_2 = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}, \qquad K_3 = \begin{pmatrix} 0 & 1 \end{pmatrix}, \qquad K_3K_2K_1 = 0. \tag{18}$$

Both adjacent products in (18) are nonzero. The full product vanishes because their successful middle states differ. If the two states of each middle carrier are collapsed merely because they concern the same named archive, summing the entries of each kernel gives scalar values 1, 2, and 1. Their product is 2, falsely representing complete routes. The problem is the loss of matching information before multiplication.

This is not an objection to coarse representations in general. A justified coarser state must preserve the particular compositions being used. Here a first transcription and a revised interpretation have different onward possibilities; the coarse archive name does not retain those possibilities. The historical inquiry must either establish the relevant correspondence or preserve the distinction. The matrix result makes the cost of omission visible without deciding which description a real case warrants.

7.3 Middle-State Observables

For a finite carrier B_i, every function $f : B_i \to \mathbb{C}$ defines a diagonal operator M_f on $\mathcal{H}_i$ by $(M_f v)(y) = f(y)v(y)$. These operators form the commutative algebra

$$\mathcal{D}_i = \{M_f : f : B_i \to \mathbb{C}\}, \qquad M_f M_g = M_{fg}, \quad M_f^* = M_{\overline{f}}, \quad P_y = M_{\mathbf{1}_{\{y\}}}, \quad \sum_{y\in B_i} P_y = I_i. \tag{19}$$

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Here I_i is the identity operator on $\mathcal{H}_i$, and $\mathbf{1}_{\{y\}}$ is the indicator of the singleton state. The finite algebra in (19) is closed in operator norm and therefore is a finite-dimensional C^*-algebra. This statement concerns the diagonal endomorphisms, not the rectangular transfer kernels.

For two stages, insertion of a middle observable yields

$$(K_2 M_f K_1)(z,x) = \sum_{y \in B_1} K_2(z,y) f(y) K_1(y,x), \qquad K_2 K_1 = \sum_{y \in B_1} K_2 P_y K_1. \tag{20}$$

Equation (20) follows by applying the diagonal matrix between the two kernels. It decomposes the full calculation by the declared intermediate state. Choosing f as the indicator of corrected interpretations selects exactly the modeled routes that pass through such an interpretation. The label is meaningful only if the historical analysis has justified that state classification. Possession of the full diagonal algebra in a representation does not imply that an investigator can observe or correctly interpret every state distinction.

The location of a selection matters. In the simplest square illustration, let J exchange two boundary states and let P select the first:

$$J = \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}, \quad P = \begin{pmatrix} 1 & 0 \\ 0 & 0 \end{pmatrix}, \quad JP = \begin{pmatrix} 0 & 0 \\ 1 & 0 \end{pmatrix}, \quad PJ = \begin{pmatrix} 0 & 1 \\ 0 & 0 \end{pmatrix}. \tag{21}$$

The unequal products in (21) distinguish selecting a state before a transformation from selecting it afterward. J is a stipulated interface transformation, not a historical reversibility claim. In the historical interpretation, restricting to a source version before revision need not select the same dossiers as restricting to the resulting version afterward. The operator notation records this difference; it does not convert selection of records into an intervention in the past.

7.4 Source-Availability Agreement

For an available source set $T \subseteq S$, form K_i^T by retaining in (16) only dossiers whose requirement sets are contained in T. The same strictly positive weights are retained. Proposition 7.1 and the support representation then give

$$(K_n^T \cdots K_1^T)(z,x) > 0 \quad \Longleftrightarrow \quad F_{(\mathsf{A}_n \odot \cdots \odot \mathsf{A}_1)(z,x)}(T) = 1. \tag{22}$$

To derive (22), a surviving compatible path must have every link requirement contained in T, which is equivalent to its union (7) being contained in T. Proposition 6.2 gives exactly the minimal such unions, and passing to minimal members does not change feasibility. The equivalence follows in both directions.

The agreement supplies a reproducible cross-check using two different calculations: explicit compatible paths and boundary-indexed support composition. It does not make the two representations informationally identical. The antichain forgets nonminimal routes, order, and multiplicity. A positive kernel sum retains selected weighted multiplicity but can still identify several distinct historical explanations. The full dossier retains the interpreted route and its evidence. Accordingly, a claim that an earlier linguistic organization contributed to present productive practice should cite the supported transformation process; the algebra can expose a missing compatibility condition or a falsely discarded support, but cannot substitute a positive number for that process.

8 Source-Resolved Fields

The finite dossier models retain the interpretation and composability of historical contributions. This section asks how those distinctions can enter a model of current activity. Its objective is narrower than a theory of language reactivation: it investigates a declared mechanism through which differently sourced realization channels can produce the same aggregate behavior. The construction is one possible nonlinear field specialization. It neither reduces the preceding history to amplitudes nor assigns a quantity of identity to a language.

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8.1 Realization Channels

Choose a finite undirected graph G with site set $I = \{1, \dots, N\}$ and symmetric weights $w_{ij} = w_{ji} \geq 0$, with $w_{ii} = 0$. Sites represent selected realization channels at retained places or settings. They need not represent whole speakers. The graph Laplacian is defined in Equation 23.

$$(L_G v)_i = \sum_{j \in I} w_{ij}(v_i - v_j), \qquad v \in \mathbb{R}^N. \tag{23}$$

The sign convention in Equation 23 makes L_G positive semidefinite. The symmetry assumption supplies conservative exchange for each tag; directed or asymmetric relations require a different law. The graph is a selected spatial or relational discretization for the current field. It is not identified with the full historical 2-complex of Section 4.

Let $\alpha \in \{1, \dots, k\}$ label a finite family of historically interpreted source channels. At each site, $x_i^\alpha \geq 0$ is the model amplitude assigned to that channel. Its interpretation must specify which realization process is being represented and how observations could support that assignment. The aggregate amplitude is given in Equation 24.

$$a_i = \sum_{\alpha=1}^{k} x_i^\alpha, \qquad \Pi : \mathbb{R}_{\geq 0}^{Nk} \longrightarrow \mathbb{R}_{\geq 0}^{N}, \quad \Pi(x) = a. \tag{24}$$

Equation 24 is an additive specialization. A channel label can designate a jointly supported route, provided that interpretation is stated. The equation does not decompose linguistic organization into independently additive historical ingredients. If the selected phenomenon requires synergy that cannot be represented by the chosen channels, the realization map or the field carrier must change.

The earlier field formalism distinguishes a local field datum, its realization and its dynamical action [8, pp. 27–28,33–35]. That distinction applies here. A historical dossier can warrant a source tag, while a separate realization protocol connects the tagged amplitude to a selected current process. Agreement with an aggregate activity record alone cannot establish either step. Without such a protocol, the following law is a mathematical exploration whose linguistic application remains hypothetical.

8.2 Nonlinear Source Dynamics

Assume symmetric transport with coefficient $D \geq 0$, source-specific coefficients $r_\alpha \in \mathbb{R}$, a shared saturation coefficient $\lambda > 0$, and nonnegative actual inputs $s_i^\alpha(t)$. The selected law is Equation 25.

$$\dot{x}_i^\alpha = -D(L_G x^\alpha)_i + \big(r_\alpha - \lambda a_i^2\big) x_i^\alpha + s_i^\alpha(t). \tag{25}$$

Equation 25 combines three separately stipulated mechanisms. Transport exchanges the same tagged channel across connected sites. The local reaction amplifies or attenuates that channel while depending nonlinearly on total local activity. The input represents an actual contribution to the represented process. Merely having a source available in an archive does not establish a positive input. This is why the source-support algebra and the field input cannot be identified.

The shared cubic saturation is a tractable hypothesis about the selected realization process. It is not a psycholinguistic law, a resource equation established by the case studies, or a theorem of Generative Relational theory. Model time and amplitudes are dimensionless in the numerical illustrations. Physical or social calibration would require a justified scale and measurement procedure. The law earns its present role by allowing exact questions about source information, nonlinear aggregate behavior and regional boundaries.

The source coefficients do not measure the worth, age or authenticity of a source. They distinguish declared channel responses. Likewise, a vanishing amplitude does not establish that the associated historical records disappeared. Inactive channels can coexist with retained archives outside this field's active carrier. A later reconstruction would require an interpreted input or a changed model domain; it does not follow automatically from the differential equation.

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8.3 Admissible Evolution

Suppose the inputs are piecewise continuous and bounded on each finite time interval. The vector field in Equation 25 is locally Lipschitz in the amplitudes between input discontinuities. Solutions are absolutely continuous and differentiable between input jumps, with the law holding almost everywhere. The following conditional result ensures that the model does not leave its declared nonnegative carrier or diverge in finite time.

Proposition 8.1 (Nonnegative Bounded Evolution)**.** *For nonnegative initial data and the assumptions above, Equation 25 has a unique forward solution. On a finite time interval where* $\sum_\alpha s_i^\alpha(t) \le S$*, choose* B *at least as large as every initial* a_i *and large enough that*

$$r_{\max} B - \lambda B^3 + S \le 0, \qquad r_{\max} = \max_\alpha r_\alpha. \tag{26}$$

Then $0 \le x_i^\alpha(t) \le a_i(t) \le B$ *throughout that interval.*

Proof. At a face $x_i^\alpha = 0$ of the nonnegative cone, the reaction term vanishes, the transport term equals $D\sum_j w_{ij} x_j^\alpha \ge 0$, and the input is nonnegative. Thus a solution cannot first cross that face outward. Summing Equation 25 over tags gives Equation 27.

$$\dot{a}_i = -D(L_G a)_i + \sum_\alpha r_\alpha x_i^\alpha - \lambda a_i^3 + \sum_\alpha s_i^\alpha(t). \tag{27}$$

At a site attaining a maximal total $a_i = B$, with all other totals at most B, the transport term is nonpositive. Nonnegativity gives $\sum_\alpha r_\alpha x_i^\alpha \le r_{\max} B$. The outward derivative is therefore at most the left side of Equation 26. The maximum cannot cross the bound. Such a B exists because $\lambda > 0$ and the cubic term dominates for large B. Local uniqueness and continuation on this bounded carrier yield a solution on the finite interval. Repeating the argument on each finite interval gives global forward existence. □

Proposition 8.1 is a mathematical admissibility result. It does not establish that every bounded nonnegative solution corresponds to a possible linguistic history. It also does not authorize interpreting a signed corrective action as a negative source without revising the cone argument. A process that changes the operation family, source interpretation or carrier belongs to an extension of the model rather than to a hidden change of meaning in x.

8.4 Aggregate Potential

When every r_α equals a common r, Equation 27 closes on the total. Put $s_i = \sum_\alpha s_i^\alpha$. The closed law and a corresponding potential are stated in Equations 28 and 29.

$$\dot{a} = -DL_G a + ra - \lambda a^{\circ 3} + s(t). \tag{28}$$

$$\mathcal{E}_G(a) = \frac{D}{2} \sum_{\{i,j\} \in E_G} w_{ij}(a_i - a_j)^2 - \frac{r}{2}\sum_i a_i^2 + \frac{\lambda}{4}\sum_i a_i^4. \tag{29}$$

Here $a^{\circ 3}$ denotes the coordinatewise cube and E_G contains each unordered edge once. Differentiating Equation 29 gives $\nabla \mathcal{E}_G = DL_G a - ra + \lambda a^{\circ 3}$. Thus Equation 28 equals $-\nabla \mathcal{E}_G + s$. In the unforced case its potential decreases according to Equation 30.

$$\frac{d}{dt}\mathcal{E}_G(a(t)) = -\|\nabla \mathcal{E}_G(a(t))\|_2^2 \le 0. \tag{30}$$

The potential in Equation 30 belongs to the aggregate specialization. It is not claimed to generate the full tagged field by an ordinary Euclidean gradient. It also has no established interpretation as cultural value, historical fidelity or available social resources. Its role is to characterize the selected nonlinear amplitude dynamics and to demonstrate how a mathematically structured total can still omit historical distinctions.

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8.5 Regional Boundaries

For a subset $R \subseteq I$, let L_R retain only graph edges with both endpoints in R. Restricting the full trajectory gives the regional law in Equation 31.

$$\dot{x}_i^\alpha = -D(L_R x_R^\alpha)_i + (r_\alpha - \lambda a_i^2)x_i^\alpha + s_i^\alpha + b_{R,i}^\alpha, \quad b_{R,i}^\alpha = D\sum_{j\notin R} w_{ij}(x_j^\alpha - x_i^\alpha). \tag{31}$$

Equation 31 preserves the actual crossing traces. The regional restriction is generally not an autonomous system with a closed boundary. Omitting b_R^α changes the problem: a source contribution arriving through a neighboring setting can disappear from the local description even though it operated in the full model. This is a precise instance of the need for compatible local realizations in the earlier field formalism.

The boundary state in the dossier model can retain the relevant field traces together with their source interpretation and support arrangement. A finite B_i can list finitely many specified trace dossiers or explicitly justified summaries; it cannot silently represent the continuum of all possible boundary trajectories. Equal total boundary fluxes need not imply equal tagged fluxes. If a later continuity claim concerns a particular source contribution, the aggregate interface may therefore be insufficient. Conversely, retaining every amplitude is unnecessary for a question that genuinely depends only on the total. The required resolution follows the selected historical claim.

9 Aggregate Observation

This section derives the informational consequences of the field specialization. The first result concerns an entire aggregate history, not merely a matching endpoint. A second calculation separates nonlinear aggregate growth from the exact transport of source proportions. A final inverse result shows how differentiated dynamics can make model channels identifiable under stronger assumptions. Together they establish conditional limits and positive possibilities without treating an amplitude decomposition as proof of genealogy.

9.1 Full-History Ambiguity

Proposition 9.1 (Aggregate History Equivalence)**.** *Suppose the tag coefficients in Equation 25 all equal r. Two nonnegative initial states with equal totals, driven by inputs with equal total at every site and time, generate identical aggregate trajectories.*

Proof. Summation gives Equation 28 for both trajectories, with the same initial value and the same input $s(t)$. The local Lipschitz property and the bounds in Proposition 8.1 give uniqueness. Hence the total solutions agree at every subsequent time for which they are compared. □

Proposition 9.1 is stronger than a statement that two endpoints look alike. Even exact observation of the complete total field fails to distinguish some tagged histories under the common-rate law. More frequent measurement of that same total cannot remove a distinction the observable discards at every time. Source-sensitive observations, an independently warranted dossier or additional differentiated dynamics are needed.

This result does not show that every real linguistic source contribution is forever inaccessible. It identifies a model regime in which a chosen observation cannot perform that task. Nor does it imply that identical totals always mean identical outputs or experiences: the realization protocol may retain further differences beyond the amplitude. The aggregate record is precisely the record specified by the model, not a complete description of language.

9.2 Source Mixing Dynamics

Retain the common coefficient $r_\alpha = r$, set the inputs to zero, take $r > 0$, and suppose all sites have the same strictly positive initial total a_0. By uniqueness, the total remains spatially uniform, because the

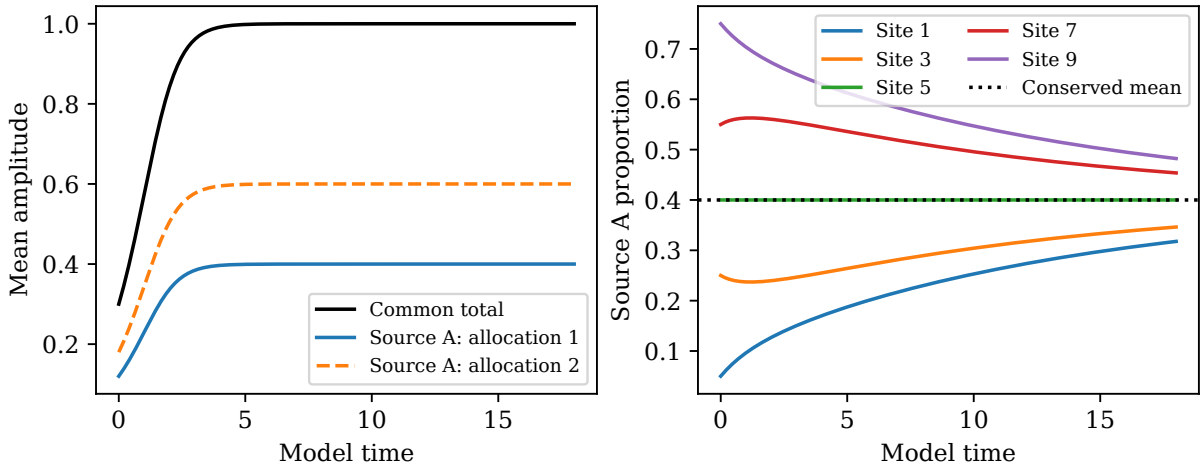

Figure 3: Illustrative Source-Resolved Field Evolution. Two source allocations have identical nonlinear total trajectories but different tagged means. The second panel shows spatial mixing for one allocation. Values are uncalibrated model amplitudes and proportions, not measured linguistic competence or historical identity.

Laplacian of a constant field vanishes. It solves $\dot{a} = ra - \lambda a^3$. Writing $u = a^2$ gives $\dot{u} = 2ru - 2\lambda u^2$; separation and the initial condition yield Equation 32.

$$a(t) = a_0 \left(\frac{r}{\lambda a_0^2 + (r - \lambda a_0^2) e^{-2rt}} \right)^{1/2}. \tag{32}$$

The denominator in Equation 32 is positive for every finite $t \geq 0$, and $a(t)$ tends to $\sqrt{r/\lambda}$. This is a derived nonlinear solution within the stipulated law. The limiting amplitude is not a threshold of language survival or a measure of achieved fluency.

Define the source proportions only in this positive uniform-total regime. Their exact evolution follows from the quotient rule as shown in Equation 33.

$$q_i^\alpha = \frac{x_i^\alpha}{a(t)}, \qquad \dot{q}^\alpha = \frac{-DL_G x^\alpha + (r - \lambda a^2) x^\alpha}{a} - \frac{x^\alpha (ra - \lambda a^3)}{a^2} = -DL_G q^\alpha. \tag{33}$$

The linear transport sector in Equation 33 has been derived from the nonlinear field under explicit symmetry and initialization assumptions. It is not proposed as a universal linear dynamics of language. A nonuniform total, an input or unequal tag coefficients changes the quotient equation.

Because every row and column of L_G sums to zero, each mean $\bar{q}^\alpha = N^{-1} \sum_i q_i^\alpha$ is constant. If G is connected and $N \geq 2$, its ordered eigenvalues satisfy $0 = \mu_1 < \mu_2 \leq \cdots$, and for $D > 0$ the spectral decomposition gives Equation 34.

$$\| q^\alpha(t) - \bar{q}^\alpha \mathbf{1} \|_2 \leq e^{-D\mu_2 t} \, \| q^\alpha(0) - \bar{q}^\alpha \mathbf{1} \|_2 \, . \tag{34}$$

To derive Equation 34, expand the mean-zero initial vector in the orthonormal Laplacian eigenbasis. Each coefficient is multiplied by $e^{-D\mu_j t}$ with $j \geq 2$; summing their squares gives the bound. For $N = 1$, the spatial deviation is identically zero and no second eigenvalue is needed. A disconnected graph retains one mean per connected component, and $D = 0$ gives no spatial mixing. These qualifications are necessary to the inference.

Figure 3 displays this specialization. Distinct tag allocations have the same nonlinear total at all times. Within either allocation, exchange smooths spatial differences while preserving its global mean proportion. The model therefore permits changing local mixtures and stable aggregate activity without making the source decomposition observationally unique.

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The conservation of $\bar{q}^\alpha$ is a property of this transport law. It does not imply that source-specific linguistic operations are conserved. A provenance label may be retained across a separately represented operation change, but the fixed field does not itself model that change. Such an extension requires a warranted interface between operation families, field interpretations and their carriers. Establishing continuity across it requires the correspondence and historical interpretation introduced earlier. A conserved model label cannot substitute for that work.

9.3 Observable Algebras

The same distinction can be expressed algebraically without quantizing language. Consider the unforced field and choose $B > 0$ such that $\lambda B^2 \geq \max(0, r)$. The compact invariant carrier is stated in Equation 35.

$$\Omega_B = \{x \in \mathbb{R}^{Nk}_{\geq 0} : \textstyle\sum_\alpha x_i^\alpha \leq B \text{ for all } i\}. \tag{35}$$

Proposition 8.1 proves invariance of Equation 35. Let Φ_t be its tagged flow and ψ_t the aggregate flow on $[0, B]^N$. Their continuous complex-valued observable algebras are $C(\Omega_B)$ and $C([0, B]^N)$, with pointwise operations, complex conjugation and the supremum norm. The aggregate pullback $Jf = f \circ \Pi$ is an injective unital $*$-homomorphism, since Π is a continuous surjection.

Define the flow pullbacks by $T_t F = F \circ \Phi_t$ and $U_t f = f \circ \psi_t$. The common-rate result implies the intertwining relation in Equation 36.

$$\Pi \circ \Phi_t = \psi_t \circ \Pi, \qquad T_t J = J U_t. \tag{36}$$

Equation 36 follows by applying both sides to any observable f and using the trajectory identity. Thus the aggregate observable subalgebra is invariant under the tagged dynamics. Its stability does not make it informationally complete. For $k \geq 2$, the coordinate observable x_i^1 is not in its image: two nonnegative states can have the same total at every site and different x_i^1.

This algebraic statement identifies what the aggregate dynamics can carry forward without retaining every source distinction. The commutative function algebra is appropriate to the chosen classical field carrier. The finite transfer operators of Section 7 address a different object: ordered dossier transitions. Their representation and this observable algebra should not be conflated merely because both use algebraic language.

9.4 Differentiated Dynamics

Now retain exactly two tags A, B and suppose $r_A \neq r_B$. Summing the two field equations gives Equation 37.

$$\dot{a} = -DL_G a + r_B a - \lambda a^{\circ 3} + (r_A - r_B) x^A + s. \tag{37}$$

The aggregate is generally no longer autonomous. Two states with equal positive total and opposite tag allocations have total derivatives differing by $(r_A - r_B)a$. This supplies a direct failure of closure: the total value alone does not determine its subsequent derivative.

If $D, L_G, \lambda, r_A, r_B$ and the actual total input s are known, and both a and its time derivative are observed exactly, Equation 37 can be solved wherever that derivative exists. At input jumps, matching one-sided data are required instead. The reconstruction is Equation 38.

$$x^A = \frac{\dot{a} + DL_G a + \lambda a^{\circ 3} - r_B a - s}{r_A - r_B}, \qquad x^B = a - x^A. \tag{38}$$

Equation 38 is a positive identifiability result for the stipulated model. It requires a nonzero coefficient gap, independently known coefficients and input, a sufficiently resolved derivative, and compatibility with nonnegative reconstructed channels. Unknown parameters, unrecorded inputs or changing tag meanings create different inverse problems. The calculation does not establish that an inferred channel really originated in the historical source named by its tag.

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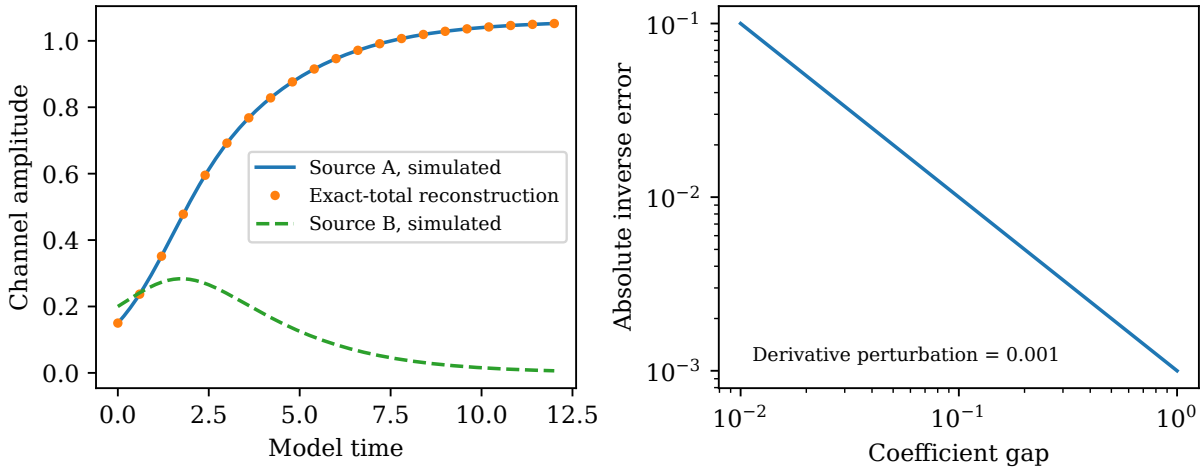

Figure 4: Illustrative Source Reconstruction. The left panel compares the known tagged trajectory with its reconstruction from exact model total and derivative. The right panel shows the exact error from a fixed derivative perturbation as the coefficient gap changes. No empirical source attribution is inferred.

The inverse also becomes poorly conditioned as the rate gap decreases. Suppose measured and true total coordinates lie in $[0, B]$, the coefficients are exact, and errors in total, derivative and input are $e_a, e_{\dot{a}}, e_s$. The cubic map is Lipschitz there with constant $3B^2$. Subtraction in Equation 38 and the triangle inequality yield Equation 39.

$$\|\widehat{x}^A - x^A\|_2 \leq \frac{\|e_{\dot{a}}\|_2 + (D\|L_G\|_2 + 3\lambda B^2 + |r_B|)\|e_a\|_2 + \|e_s\|_2}{|r_A - r_B|}. \tag{39}$$

Equation 39 states its own limitations: it does not include parameter error, and derivative estimation can amplify observation noise. Exact identifiability and practically reliable inference are therefore distinct. Figure 4 illustrates both the algebraic reconstruction and sensitivity to a fixed perturbation of the total derivative.

The field investigation consequently offers two different lessons for continuity inquiry. An aggregate manifestation can conceal a source difference even over a complete observed trajectory. A richer dynamical specification can sometimes expose that difference, but only relative to an independently justified realization and source interpretation. Historical dossiers and field observations can support one another through an explicit interface. Neither can absorb the other's evidential task.

10 Documented Revival Routes

Documented revival routes give historical content to the bridge distinctions developed in this paper. This section examines selected Kaurna, Wôpanâak and Cornish accounts, concentrating on the operations connecting historical materials to present formation. The sources describe different periods, purposes and kinds of intervention; they provide no common dataset for measuring continuity. The philosophical comparisons below are therefore interpretations of bounded reports. They examine how source-derived organization can remain effective through new teaching resources, comparative reconstruction and differentiated successor practices.

10.1 Kaurna Teaching Resources

Amery's 2016 book principally retains an investigation of the 1990–1997 revival period, supplemented by later material. Its historical-source account must therefore be read with that temporal scope [2, pp. x–xi,128–129].

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The 2014 article describes a learner's guide combining practical expressions, grammatical explanation and assistance interpreting historical materials. Its development involved Kaurna participants, including dialogue shaped by a grandparent's classroom visit and an alternative expression for towel proposed by a Kaurna collaborator. Amery also reports that community decisions about the revised orthography sometimes differed from his linguistic advice, which he accepted within the collaborative arrangement [1, pp. 411,417].

The case permits a specific philosophical comparison between copying a record and carrying an organized contribution into use. A learner's resource can preserve access to a historical source while also reorganizing how its material becomes learnable. Reorganization may include selecting an order of presentation, connecting forms to a current activity, and making an uncertain distinction usable within stated limits. These are analytical possibilities concerning the role of teaching resources. The reported collaboration makes such a role pertinent; deciding the history of an individual construction would require following its own evidence.

The continuity claim is strengthened when the account can specify what the earlier organization contributes. Suppose, as a constructed comparison, two lessons contain the same inherited expression. One presents it as a memorized answer; the other teaches a relation that learners can apply when the participants or objects change. Both lessons can have documentary descent, while the second supplies additional grounds for investigating productive inheritance. Even there, success on the taught examples is only the beginning of the inquiry. Evidence of appropriate extension would help establish that the interpreted relation became operative.

This comparison leaves room for transformation at each stage. A productive relation can be taught through an explanation that differs from the explanations earlier speakers used, if they gave explicit explanations at all. Earlier practice need not have contained the later analyst's grammatical terminology. The continuity attribution concerns an operative historical contribution at the chosen level, whose relation to the teaching analysis must be argued. Identifying a reconstructed pattern with earlier conscious grammatical awareness would expand the claim beyond that level.

The authority arrangement adds a second dimension. A collective decision can determine which writing convention a programme adopts while a specialist's analysis remains relevant to particular historical claims. The two activities can support each other without having identical criteria. A disagreement over a convention therefore needs to be described at the level where it occurs. It might concern practical legibility, historical interpretation, public presentation or a combination. Treating the decision merely as acceptance or rejection of expertise would suppress its object.

For a Generative Relational description, the explanatory unit is the history connecting sources, interpreters, teaching relations and later activities. A textbook is one participant in that history. Its preserved marks become significant to productive continuity through the uses and constraints they enter. The history-bearing account adds value only where it helps explain those connections; calling the surrounding arrangement relational does not itself establish them.

10.2 Wôpanâak Reconstruction Routes

In her 2018 Senate testimony, Jessie Little Doe Baird describes learning from historical Wampanoag documents, drawing on correspondences with related Algonquian languages, and subsequently teaching other Wampanoag citizens. She connects this work to the development of a dictionary, educational materials and teaching programmes. The testimony also explains the importance of tribal authority for schooling [3, pp. 4–5]. This is a dated participant account of a reconstruction and teaching route, rather than an independent estimate of its effects.

The combination of evidence sources illustrates a central problem of attribution. A historical document and a related language need not contribute the same thing. The document may retain an expression whose interpretation is uncertain; comparative work may constrain the interpretation; teaching may turn that result into an available procedure. A defensible description distinguishes these contributions while investigating how they operate together. It would be premature to describe comparative assistance either as recovery of every missing feature or as wholesale replacement by a neighboring language.

The difference can be made precise through an analytical contrast. In one possible route, comparison helps resolve two readings of an attested form. In another, it supplies a proposed new expression for a contemporary purpose. The former supports a reconstruction claim conditional on the comparative inference. The latter supports a history of new formation whose relation to the earlier practice needs its own explanation. Both can occur within one project, and neither description makes the project's other activities irrelevant. What changes is the particular historical contribution being attributed.

An interruption of habitual speech also changes the arrangement through which interpretation can be corrected. Historical records can constrain a proposal, related-language evidence can challenge it, and present use can expose difficulties in teaching or application. These forms of correction answer different questions. A proposal's usefulness in present use cannot settle its historical accuracy, while uncertainty about one reconstructed feature need not make the whole present practice unusable. Continuity can be investigated through a differentiated account of such judgments.

The testimony establishes a reported route connecting written resources, linguistic work and teaching. It does not establish the earlier origin of every item later taught. A more fine-grained inquiry would follow particular forms or operations through the available records and accounts of their reconstruction. That narrower inquiry could deepen the general attribution without making the community wait for a complete genealogy before undertaking further language work. The explanatory task and the practical activity can develop together, subject to different standards of completion.

10.3 Cornish Successor Differentiation

Davies-Deacon describes revived Cornish varieties whose reconstruction draws differently on historical sources: Unified Cornish and Kernewek Kemmyn are oriented toward Middle Cornish, while Modern Cornish draws on seventeenth- and eighteenth-century attestations. The differences involve interpretations of linguistic form and the ways varieties are named and legitimated [5, pp. 84–87]. The account supplies grounds for studying differentiated routes without converting source selection into a hierarchy of authentic communities.

A common earlier history can consequently enter several later organizations. The continuity claim should retain the selected historical period, the material interpreted and the route by which an interpretation becomes available. A claim about a particular earlier layer can have a clearer evidential basis than an unrestricted claim about the language's complete history. Greater precision need not reduce the practical value of the later practice. It enables participants and investigators to identify what the attribution establishes and which additional relations remain to be examined.

Sayers traces the planning process that encouraged agreement on a standard written form, emphasizing educational and administrative practicalities. His account records an eventual compromise and acknowledges that publications in other versions continued. Davies-Deacon's later criticism is that accounts of the settlement can understate persistent ideological and practical plurality [14][5, p. 84]. Their difference concerns how the achievement is interpreted, including what a description of resolution leaves visible.

The present framework can preserve the institutional achievement and the continuing historical question simultaneously. A shared convention may support a specified teaching or administrative operation. Its adoption does not thereby establish that all users understand its history identically or that other source-derived operations have ceased. Conversely, disagreement about its historical adequacy does not entail that it failed to support the activity for which agreement was reached. These are distinguishable criteria of success.

Branching should also be separated from complete isolation. Two successor practices can share documents, researchers, learners or later resources while maintaining different commitments about forms. Each shared element has a possible role that requires examination. Shared personnel, for instance, can transmit a procedure between branches, but their presence alone does not show that every distinction is mutually available. A formal representation that collapses the branches whenever one such connection exists would lose the specificity of the documented differentiation.

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Continuity Claim	Relevant Historical Work	Additional Assessment
Reconstructed Operation	Trace the sources and interpretive steps supporting the operation	Examine alternatives and the grounds distinguishing them
Productive Inheritance	Follow the interpreted operation into learning and further use	Examine whether the selected organization remains operative
Institutional Continuation	Identify arrangements carrying resources and coordinating activity	Specify which practices the arrangement supports and which differences persist

Table 1: Revival Route Questions. These analytical tasks distinguish forms of historical contribution; they are not empirical ratings or sufficient tests of a community's legitimacy.

The case therefore favors a plural historical representation. Different later practices can have supported contributions from a common earlier formation, and a later coordination can connect selected operations across them. Such a representation preserves the direction and content of the connections without deciding the numerical identity of the successor languages. The latter question requires the declared individuation criteria developed in the earlier manuscript, together with the relevant historical argument [11].

10.4 Comparative Evidential Boundaries

The comparison yields several distinct tasks for a continuity inquiry. Table 1 states these tasks at the level of the proposed analysis. Its rows are possible claims, rather than scores assigned to the three communities.

The account should remain open to uneven results. A study might establish a documentary route and a teaching route while leaving the historical interpretation of one construction disputed. It might also establish a productive inheritance without recovering every intermediate event. Such results call for a differentiated attribution with explicit grounds and uncertainties. Describing the whole practice as either completely continuous or wholly disconnected would discard the information the investigation has achieved.

The cases also identify a limit on formalization. A bridge representation can require compatible contributions and preserve distinctions between sources, interpretation and uptake. Historical inquiry must still determine what occupies those roles. An algebraic path is not a recovered event, and a modeled coupling is not evidence that a teacher or source made the corresponding contribution. The representational benefit is to make the required connections explicit and to expose conclusions that depend on links not yet established.

These limits leave a substantive positive object. Earlier linguistic organization may enter later production through interpretable traces, trained capacities and deliberately arranged practices. The route can include new expressions, changed institutions and several successors. The explanatory task is to specify the inherited contribution and how it remains effective through those transformations. The selected cases support that task's relevance; its general adequacy remains open to further historical and philosophical investigation.

11 Productive Transformation

Productive transformation concerns the formation of usable linguistic operations from inherited materials, auxiliary resources and present activity. Its importance for continuity lies in the possibility that earlier organization contributes to expressions and practices that it never directly contained. This section examines interpretive reconstruction, joint source roles, correction and target revision. It develops the linguistic meaning of the source distinctions formalized earlier, while treating the illustrated operations as limited cases rather than a complete account of language.

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11.1 Reconstructed Operations

A retained set of examples can support several analyses. Participants who develop a productive operation must decide which similarities matter, which differences constrain use and which apparent regularities depend on the circumstances of recording. Their interpretation can draw upon neighboring examples, comparison materials, practical testing and further testimony. The result is an organized way of proceeding that may be more explicit than the source material itself. A source-based operation therefore has a formation history in addition to the history of its recorded examples.

The distinction matters when later success supports an overly strong retrospective claim. A reconstructed rule can generate acceptable present expressions while remaining one of several plausible analyses of the earlier usage. Present success supplies evidence about the operation now taught. Historical evidence determines how closely that operation corresponds to an earlier productive organization. The earlier speakers' ability to use a distinction also differs from their ability or disposition to formulate the particular rule that later instruction supplies.

The inherited reconstruction account permits real present learning without treating the constructed arrangement as a recovered past event [10]. Here that separation supports a positive historical description: participants have developed a present operation partly constrained by earlier material. The operation's new articulation is not itself an objection to descent. The account becomes stronger when it shows which alternatives the source excludes, which choices remain open and how participants resolved those choices. A bare declaration that a rule came from the archive would leave the decisive interpretive work unexplained.

11.2 Joint Resource Roles

Mixed resources can participate in one operation through different roles. In a constructed teaching example, one source preserves expressions contrasting paths of movement, another clarifies the recording conventions used in the first, and a present instructor develops exercises that make the contrast learnable. The first source supplies linguistic material; the second supports interpretation; the exercises support acquisition. An adequate account identifies the conjunction through which the selected operation becomes usable. Treating each source as an independent quantity of inherited language would obscure that organization.

Some contributions concern interpretation of another source. Their importance can therefore exceed the number of new expressions they supply. A short note resolving a transcription convention may alter the analysis of many recorded examples. Conversely, a large collection of parallel expressions may provide redundancy without adding a new productive distinction. Source volume and source count answer documentary questions; they acquire linguistic significance only through an account of the operations they support.

The boundary-indexed construction in Section 6 expresses one part of this dependency. A smaller support set can reach an interpretation that is adequate for one purpose, while a larger set reaches the interpretation required for the later teaching operation. Their apparent redundancy disappears once the endpoint organization is retained. This is a reason to preserve what resources jointly produce. It is not an instruction to retain every available source regardless of relevance, access conditions or evidential quality.

Joint formation also creates an attribution limit. Where a later operation depends on a combination of historical material and present invention, the whole result need not be assigned exclusively to either. The account can specify source-conditioned features, interpretive choices and new teaching arrangements. Such differentiated attribution allows real novelty within a historically connected practice. A single purity percentage would require a common unit that these heterogeneous roles do not supply.

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11.3 Generative Extension

Productivity becomes visible when participants use an operation beyond memorized instances. In the movement example, learners might apply the inherited contrast to a route omitted from the surviving corpus. That extension provides a limited test of whether the distinction organizes present production. Extending it to a metaphorical route introduces a further question: whether the new use preserves the selected relation, changes its application conditions or begins a differently organized operation. The answer depends on how participants understand and correct the extension.

A later application can retain a relation while changing its surrounding practice. The continuity claim should then identify the retained organization at a suitable scale. If the relevant contrast remains available in correction, it can have a history that crosses the new application. If participants systematically reorganize the contrast, the account should describe that transformation. Naming the earlier source remains historically informative even when an unchanged-operation claim becomes untenable.

The relevant evidence includes failed extensions. A learner's unsuccessful use can expose which distinction guides correction; disagreement among competent participants can reveal a changing application boundary. These episodes can help establish the operation's organization more precisely than a list of accepted outputs alone. Their historical interpretation still requires a bridge to the earlier source. Present correction demonstrates what regulates the current practice; it does not automatically show that the same regulation operated earlier.

Generative extension thus supports a graduated description without requiring a continuity scale. An inquiry can establish that a source-based interpretation supports new expressions, identify the relation those expressions retain, and leave the full history of that relation unresolved. The resulting claim has positive content even when it falls short of whole-language identity or unchanged historical competence.

11.4 Correction Histories

Corrections can participate in the historical bridge in several ways. They can restore a distinction lost through copying, resolve an uncertain analysis or introduce a present convention for previously unsettled use. Those operations have different relations to the earlier practice. A manuscript correction backed by an earlier recording carries a different warrant from a contemporary decision to standardize two surviving variants. Both may support effective teaching, but their contribution to historical attribution differs.

Consider two editions of the constructed teaching material. The first teaches a movement contrast using a provisional interpretation. The second revises it after comparison with additional sources. Learners taught from the second edition can acquire a productive operation unavailable from the first edition alone. A route through the first edition and a later route from the second need the intervening revision history to compose. The formal middle-state requirement therefore expresses a substantive issue about what was interpreted and taught.

The revision can itself be a continuity-bearing event. It renews the role of earlier material by making it relevant to present correction. Historical connection here includes responsive change, rather than requiring that the first reconstruction remain authoritative indefinitely. At the same time, a correction justified entirely by a new practical convention should be described as that kind of change. Its present usefulness does not supply missing evidence of earlier use.

11.5 Changing Targets

The support model presupposes a selected target and conditions under which an additional available resource can be left unused. Some linguistic inquiries violate those assumptions. A newly recovered source can defeat an admitted reconstruction while the linguistic target remains fixed; new testimony can alter its evidential or authorization conditions. These changes require revision of the dossier or its assessment, without necessarily changing the operation sought. A revised purpose can instead favor a different operation, in which case the target itself changes. The record should distinguish these forms of revision.

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A target revision requires an explicit comparison between the old and new operations. Participants may retain some outputs while changing the reasons for accepting them, or preserve a distinction while expanding its application. The appropriate historical account records both relations. Section 7 supplies a restricted representation of compatible routes; it cannot decide which interpretive revision the sources warrant. The source-resolved field in Section 8 likewise represents declared channels whose linguistic interpretation precedes their amplitudes.

The prospective dimension remains open. A productive operation demonstrated today may support later teaching, further revision or new genres, but those continuations require their own evidence when claimed. Historical contribution and future generativity are connected through present organization without becoming interchangeable. A careful account can therefore explain how inherited resources have entered a living productive practice while preserving uncertainty about its eventual scope, durability and successor formations.

12 Successor Attribution

Successor attribution concerns the historical relations assigned to later practices that draw upon earlier linguistic organization. Several such practices can develop from overlapping materials while differing in interpretation, teaching and use. This section examines what shared ancestry supports, how recognition enters the history, and which forms of authority remain separate from a descriptive bridge. Its method combines inherited branching distinctions with constructed cases of divergent uptake and contested attribution.

12.1 Branching Histories

The earlier individuation study and preservation taxonomy already permit several historically connected successors without imposing one present equivalence class [11, 9]. The current investigation adds a particular compositional concern: each proposed successor route must retain its own relevant carriers, interpretations and transformations. Sharing an archive supplies a common possible resource. Actual uptake and compatible later links establish which historical connection each practice has realized.

Suppose two teaching groups draw upon a common collection. One develops a contrast through a conservative transcription; the other revises its analysis after integrating further records. Both can maintain a documented relation to the earlier material. Their resulting productive operations may overlap without being interchangeable. A comparison can preserve the common source, the different interpretive routes and the distinct present organization. Declaring one group the sole descendant would require an additional criterion that the shared source alone does not provide.

Branching may also occur within a practice. Different genres, teaching settings or cohorts can sustain partially different correction norms. Whether these count as branches of one formation or separate successors belongs to the broader boundary inquiry. The local bridge analysis can establish particular connections before that question is settled. Its value is partly to prevent a decision about the encompassing unit from replacing the histories that the decision is supposed to organize.

12.2 Historical Evidence

Participants' identification with an earlier practice can supply evidence as well as express affiliation. Testimony can identify a teacher, explain a source choice or preserve an account of a correction. Its evidential force depends on what the speaker is positioned to know and what the testimony asserts. A statement of collective belonging is different from a recollection that a particular edition was used in a particular lesson. Both can matter, but they support different historical claims.

The same differentiation applies to institutional records. A certificate can establish that a body recognized a course or a participant under its procedures. Its authority within that system does not automatically demonstrate which archived distinctions entered the course. A teaching notebook may provide

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stronger evidence about those operations while having little authority to decide recognized membership. The analysis therefore evaluates evidence in relation to its object, rather than organizing all sources into a single hierarchy of credibility.

Disagreement deserves a similarly specific description. Two participants can agree about the route by which a productive operation developed while disagreeing about whether it should be called a continuation of the earlier language. Alternatively, they can share the label while disputing the actual teaching history. The former disagreement concerns the encompassing classification or its significance; the latter concerns a factual component of the bridge. Treating both as undifferentiated authenticity disputes would make their possible resolution less clear.

12.3 Recognition Effects

Recognition can alter the history that a continuity account later describes. An institution's decision may enable teaching, support publication or establish an accepted correction procedure. A community's declaration may bring participants together and orient their study of earlier sources. These effects can create new historically consequential organization. The resulting practice is part of the later history even if the recognition did not settle every earlier connection.

The temporal distinction is decisive. Recognition can help form a future continuation without retrospectively supplying an undocumented past link. If a newly recognized curriculum brings together previously separate materials, its success may establish a later integrated practice. It does not follow that the same integration characterized the earlier source community. The inherited individuation argument already identifies this risk of reading classificatory feedback backward into the history it helped change [11].

Recognition can also preserve an account of past connection that other records overlook. Excluding participant identification because it has practical effects would therefore be equally mistaken. The appropriate inquiry examines its different roles: evidence concerning earlier events, interpretation of a historical relation, and intervention in future organization. A single act can perform several roles. Its consequences neither automatically verify nor automatically invalidate its historical content.

12.4 Differentiated Authority

Historical expertise, custodial responsibility, teaching competence and collective decision authority need not coincide in one person or institution. An archivist may establish a document's provenance; a teacher may explain its current use; participants may determine acceptable conditions of access; a historical investigator may challenge a proposed chronology. Those roles become relevant through particular claims and decisions. The bridge analysis does not supply a court empowered to replace them with one universal judgment.

This differentiation has a normative consequence within the present proposal. Evidence that a source contributed to a practice is insufficient by itself to authorize publishing the source, teaching restricted material or representing a community. A descriptive relation does not contain the premises needed for those permissions. Conversely, a restriction on access does not demonstrate that a historical relation is absent. The cultural-reconstruction framework's separation of preservation operations and their warrants provides an inherited basis for keeping those questions distinct [10].

The distinction should not make affected participants peripheral to inquiry. Their interpretations may be indispensable to understanding the operation, and the inquiry can alter the conditions under which they practice. Recognizing those facts gives reasons to examine participation, accountability and control within the particular project. It does not establish that one speaker represents every member or that disagreement within a community can be erased through a single consultation.

The argument remains limited. It identifies why historical proof and legitimate authority require connected but distinguishable reasons. It does not derive a complete procedure for resolving contested representation, legal entitlement or collective membership. Those questions may affect whether a research route is permissible even when its descriptive objective is clear.

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12.5 Qualified Successor Claims

A qualified successor claim can retain positive historical content while acknowledging divergent present organization. In the two-group example, the account can identify both routes from the common collection, specify their different interpretations, and describe the current operation each supports. It can leave open whether a shared umbrella language label remains useful or accepted. Such a report supplies grounds for a boundary discussion without claiming to settle that discussion by source counting.

Qualification also permits asymmetry. One group's relevant route may be well documented while another's remains partly inaccessible or unresolved. The evidential difference should be reported at the level supported. A less publicly documented route is not thereby a less valuable practice, and a more complete archive does not automatically confer exclusive succession. Historical confidence, practical achievement and legitimate recognition are different evaluative questions.

The positive aim is an attribution that participants and investigators can examine without collapsing their distinct concerns. It should make clear which earlier organization entered which later operation, what transformation occurred, and what broader conclusions remain contested. Branching then becomes a describable historical configuration rather than a defect requiring an exclusive winner. Whether particular branches should subsequently converge, remain differentiated or develop new relationships is a further practical question.

13 A Constructed Revival History

This section combines the preceding distinctions in one hypothetical history. Its purpose is to show how they change a substantive continuity attribution. Every person, record and operation in the constructed example is stipulated. The documented comparison introduced at the end is separately identified and supplies no empirical validation of the formal model.

13.1 Productive Contrast Attribution

Suppose an earlier practice distinguishes two ways of forming names for tools. Record A contains examples but leaves one relevant contrast ambiguous. Record B supplies contexts that resolve the ambiguity. Ordinary transmission of the selected productive practice has stopped before a reconstruction group works with these records. A contemporary teaching arrangement C then uses the reconstructed contrast to form and explain new names. The claim being investigated is that the later productive operation derives part of its organization from the earlier contrast through this reconstruction.

This is narrower than saying that every feature of the revived language is inherited, that the new terms were formerly spoken, or that the present group is the only legitimate successor. It is stronger than saying that the group owns an old document. To support the selected attribution, the history must connect the earlier examples, their interpretation and the operation through which learners form new cases. Contemporary usefulness is relevant to the last step but cannot establish the earlier steps by itself.

Let the intermediate state m_0 retain an unresolved instructional version derived from A. Let m_1 retain a corrected version produced through A and B. The task is fixed: productive use of the selected distinction, rather than mere reproduction of either record's tokens. Teaching arrangement C requires the resolved interpretation in m_1. These stipulations give the source-support entries of Equation 14.

13.2 Attribution Profiles

Table 2 distinguishes three accounts of this history. Their differences affect the warranted claim, not merely the format of the research record.

The flat list in Table 2 can be entirely accurate while failing to support the proposed continuity. It registers association with the project, which might include reading, rejecting, teaching or displaying a source. The untyped minimum contains a different error: it treats sufficiency for one intermediate

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Account	Retained Information	Consequence For The Selected Claim
Flat source list	A, B, C are associated with the project.	Does not show which interpretation teaching used or how the earlier contrast entered it.
Untyped minimum	A is enough for some intermediate product; B is removed.	Confuses unresolved m_0 with corrected m_1 and can falsely attribute productive adequacy to A, C.
Compatible dossier	A, B yield m_1; C uses that version; later examples exercise the selected contrast.	Supports the declared source-to-operation route, subject to independent warrant for each stipulated link.

Table 2: Constructed Attribution Profiles. The richer dossier supports a narrower, explicit contribution claim. It supplies no universal verdict about language identity.

product as sufficiency for the product needed by the next stage. The compatible dossier preserves the difference and makes the role of B visible.

The positive result is not that more sources always create stronger continuity. A newly found source might undermine the interpretation of the earlier contrast, in which case the dossier needs revision. It might support an unrelated contrast useful for another task, leaving the present attribution unchanged. Or it might independently confirm the existing reconstruction, providing redundancy. These possibilities cannot be ordered by the number of sources alone.

13.3 Executed Source Contributions

Now suppose a further resource D offers an independently warranted route to the same interpreted boundary state m_1. In the restricted availability model, there are two sufficient routes to the later operation: A, B, C and D, C. The executed historical route remains A, B, C. Introducing the alternative D, C does not rewrite that history, and it does not establish that D influenced the learners.

If the question concerns maintaining access to a reconstruction route, the alternative matters. If A becomes unavailable before a future reconstruction begins, D, C may remain usable under the stipulated conditions. If the question concerns the origin of an already learned operation, the actual route remains essential. The present disappearance of A does not remove its past contribution. Likewise, an archive used only by today's historian to establish the route has a different role from a source used by the original reconstruction group.

Suppose instead that the group actually used both A, B and D, while either route would have sufficed under the model. The minimal support summary retains the alternatives A, B, C and D, C while omitting the larger executed union A, B, C, D. A history of execution must retain that combined use and specify each contribution. Redundancy is compatible with actual contribution. It prevents indispensability from serving as a universal definition of historical efficacy.

13.4 Divergent Productive Successors

Consider two later teaching communities. The first retains the reconstructed contrast while changing pronunciation and creating new terms. The second retains the source vocabulary but replaces the selected contrast with a different productive pattern. Both may have historical relations to the earlier materials. The selected continuity attribution applies differently: the first is a candidate continuation of the contrasted operation; the second may preserve other content while discontinuing this particular organization.

This difference need not decide whether either community speaks the language bearing the inherited name. That broader judgment can involve other historical relations, practices of affiliation and criteria of

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individuation. The construction shows why local positive claims are useful: it permits one to say what continues without forcing every dispute into a single all-or-nothing classification.

The branches also create future histories. New teaching practices can stabilize one interpretation and make alternative reconstructions harder to access. A later observer may then encounter similar aggregate performance across the branches while lacking the source-resolved history. The field model illustrates a possible mechanism for such observational loss. It does not establish that these hypothetical communities literally obey its law, or that equal amplitude implies equal linguistic achievement.

13.5 A Documented Productive Extension

Amery describes a June 1990 Kaurna workshop in which participants examined relationships among recorded forms and used a reconstructed word-formation pattern to devise terms for a car and an aeroplane. The car term was then used in a story. His account distinguishes this contemporary extension from the archival forms on which the workshop worked [2, p. 161]. This is a dated participant account, not a claim about every later use of those terms.

The case supplies a concrete reason to attend to productive organization: the historical materials can contribute through a pattern used beyond the recorded examples. Whether that pattern exactly captures earlier practical organization, how participants assessed it, and how later use developed remain questions for the relevant evidence. The present paper does not infer historical speakers' explicit grammatical analysis from a modern workshop explanation.

The constructed history and the documented comparison thus support different parts of the inquiry. The former exposes exact consequences of declared assumptions. The latter demonstrates why a source-to-new-operation question can matter in an actual revival account. Their combination motivates a research problem while preserving the distinction between an illustrative model and an evidenced historical explanation.

14 Continuity Objections

The proposed account makes continuity attribution depend on a specified historical contribution and compatible links through changed carriers. Its adequacy therefore turns on more than the internal correctness of the formal constructions. This section examines five objections concerning the continuity criterion, retrospective interpretation, explanatory importance, mathematical representation and unequal evidential access. Each objection tests whether the account explains a substantive linguistic relation or merely makes a preferred attribution easier to state.

14.1 Acquisition Continuity

A strong objection reserves linguistic continuity for uninterrupted acquisition from competent practitioners. A document can retain expressions, but it cannot itself participate as a speaker in the practices that gave them significance. Once the relevant acquisition chain ends, later learning develops a reconstructed practice. Calling that practice continuous with the earlier language might seem to obscure a consequential loss.

The objection correctly identifies an important target. A mediated route does not restore the truth of an uninterrupted-acquisition claim. The present account should preserve the cessation and investigate what the later reconstruction adds. Its further question concerns whether earlier linguistic organization effectively contributes to the reconstructed practice. Documents, remembered fragments and interpretive work can carry different aspects of that connection even when none individually sustains the interrupted competence.

The resulting historical relation can be significant without settling the terminology of language identity. Suppose an archived contrast constrains later teaching and productive correction. A description treating the later practice as wholly independent would omit that explanation. A description treating it as

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unchanged acquisition would omit the interruption and reconstruction. The bridge account retains both facts and identifies the transformations that connect them.

The reply is consequently conditional. If an inquiry defines continuity solely as uninterrupted acquisition, the bridge may fail that target while supporting a different, explicitly named relation. The paper does not establish that every descriptive purpose should prefer its broader historical question. It argues that mediated contribution deserves investigation because it can explain later linguistic organization that acquisition chronology alone leaves incompletely described.

14.2 Retrospective Projection

A second objection concerns circular interpretation. Investigators might choose an earlier pattern because it resembles the desired present operation, select source passages supporting that pattern, and then cite the resulting reconstruction as evidence of continuity. A compatible dossier would merely formalize the circular choice. The problem is especially acute when surviving material is sparse and the modern operation is well organized.

The account requires constraints on interpretation that are additional to the success of the desired attribution. Relevant constraints can include the range of recorded uses, incompatible examples, source provenance, independently documented teaching choices and evidence about which alternatives participants considered. Their force depends on the case. A reconstructed operation should expose what would count against its asserted historical correspondence, rather than define correspondence by the fact that reconstruction succeeded.

A distinction between historical dependence and historical accuracy is also necessary. A teacher can develop an operation from a mistaken interpretation of an old text. The text then contributes to the actual history of the operation, but that contribution does not establish preservation of the originally claimed distinction. Correcting the interpretation can narrow the retained relation to source-mediated formation while revising the stronger claim about earlier linguistic organization.

Formal compatibility helps only after these interpretive choices have been justified or retained as explicit alternatives. Two links can compose perfectly while sharing a false historical premise. Conversely, unresolved interpretation can leave several candidate dossiers open. The mathematical result establishes what follows within each supplied account. Historical criticism determines whether the supplied account has appropriate grounds.

14.3 Explanatory Importance

A third objection challenges the substantive weight of the selected contribution. Almost any revived practice has numerous historical influences. If a single copied expression or distant inspiration suffices, historical continuity becomes too permissive to distinguish an enduring linguistic relation from a minor contact. Restricting the target until some connection can be shown could manufacture success through excessive narrowing.

The response requires proportion between contribution and claim. A copied expression can support a claim about that expression's route. It cannot carry the explanatory burden of continuity for an entire productive organization. A broader attribution needs evidence that the selected connections organize a correspondingly broader range of practice. Their importance can involve recurrent correction, productive generalization, interpretation or transmission to later participants. No fixed source count establishes that importance.

The earlier individuation inquiry already warns that an analyst's chosen purpose cannot make an unsupported historical connection true [11]. The present account extends that discipline to explanatory scope. The target should be justified by the phenomenon requiring explanation, not chosen solely because its survival is easy to demonstrate. If a local result leaves the motivating whole-language question unanswered, the report should say so and identify what additional relations would need investigation.

This requirement also limits the paper's own contribution. Generic lineage, reconstruction and branching are inherited from the preservation taxonomy [9]. The present argument earns a separate

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treatment only insofar as compatible whole-route attribution and source-role distinctions clarify the linguistic problem in a way that the inherited summary does not. Its model-relative results do not establish a new universal theory of language continuity.

14.4 Representation Adequacy

A fourth objection grants the distinctions while questioning the mathematical work. A historian can already notice that two studies concern different editions of a document. Encoding those editions as boundary states and multiplying transfer operators may appear to reproduce an elementary observation with additional notation. The field model may seem still further removed from the actual interpretive process.

The strongest justification is a specific inferential task. The three-link example in Section 5 shows that successful composition of each adjacent pair can coexist with failure of a complete route. Section 6 shows how a seemingly economical support summary can discard the only middle organization required by a later link. The positive constructions specify which retained information makes the corresponding inferences valid. Their value lies in exposing and repairing those failures within an explicit class of descriptions.

That justification remains representational. A finite boundary state is adequate only if the distinctions omitted from it do not matter to the composition being attempted. Source labels require historically defensible granularity; splitting one archive into several labels cannot create additional continuity. The operator calculation preserves declared compatibility, and the field calculation examines declared source channels. Neither discovers its own historical interpretation.

Section 9 accordingly addresses an identification problem within a stipulated nonlinear law. Equal aggregate histories can leave source decomposition unresolved under its assumptions. This mathematical fact supports a diagnostic warning about that representation. Its application to a real practice needs grounds for the channel structure, observables and dynamics. Ordinary historical analysis remains sufficient where the formal construction adds no useful discrimination.

14.5 Evidential Asymmetry

A final objection concerns whose histories the method can recognize. An emphasis on articulated dossiers might favor well-funded archives, widely legible records and institutions able to document their procedures. Practices sustained through restricted knowledge, dispersed recollection or inaccessible materials could appear less continuous simply because their routes are less publicly inspectable.

The objection identifies a limit on the available attribution, not evidence that the underlying historical relation is absent. A dossier is an account supported for a stated inquiry; it is not the whole history. Its failure to contain a route can reflect missing evidence, restricted access, inadequate description or an actual absence. Distinguishing those possibilities is part of the interpretation of an empty formal result.

The proposed response separates public warrant from unrestricted disclosure. An account can identify the claim that remains publicly assessable, the evidential basis available to authorized participants and the questions left unresolved for other readers. This arrangement does not make inaccessible claims automatically correct. It preserves the difference between a reason for qualified confidence and a demand to expose material whose use requires further justification.

Historical investigation can therefore remain critical while admitting differentiated access and incomplete reconstruction. Its conclusions should track the grounds actually available and the scope those grounds support. The method is strongest when it makes a particular contribution clearer, a hidden incompatibility visible or a proposed route more carefully warranted. Its limits are reached when the available descriptions cannot answer the selected question, even though the practice itself continues to generate meaningful activity.

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15 Historical Inquiry Records

The preceding analysis suggests a way to organize a limited historical inquiry. This section develops its practical implications without proposing a universal certification system. The record should make the proposed source contribution inspectable, preserve its alternatives and show what new evidence would change. Its appropriate detail depends on the claim and the conditions under which participants permit the inquiry.

15.1 Claim Specification

A useful starting statement identifies an earlier formation, a later practice, the selected organization being followed and the transmission channel whose interruption is asserted. It also distinguishes the interval of alleged interruption from the interval actually supported by evidence. A gap in public records may justify uncertainty about an activity without establishing that it ceased. Different forms of transmission should not be collapsed simply to produce a clean break.

The selected contribution must be intelligible before it receives a formal label. A claim about productive extension should state what would count as a new application of the relevant pattern. A claim about an interpreted contrast should identify the distinctions it retains. A claim about affiliation requires different evidence. Formal precision begins with these choices; increasing the number of symbols cannot compensate for leaving them unresolved.

Scope specification also identifies what the inquiry holds fixed. The target operation may stay fixed while evidence about its reconstruction changes. Alternatively, participants may revise the target itself. Those situations produce different comparisons. A record should preserve the earlier question and describe the revision, rather than presenting a newly successful test as if it answered the original one unchanged.

15.2 Source Roles

For each materially relevant source, distinguish its role in the represented practice from its role in our evidence. A reconstruction group can use a record to infer a pattern; a researcher can later use a different record to show that this happened. Losing the second record damages the research warrant without necessarily altering the practice's historical contribution. Losing the first before the reconstruction occurs can instead affect the process being modeled.

Within the represented practice, relevant roles can include exemplification, contrast resolution, correction, instruction and later productive uptake. These roles can overlap. Their specification does not require attributing a precise numerical share of a linguistic achievement to each source. It requires identifying what the source helped constitute or transform for the selected operation, and which grounds support that claim.

A consultation record alone is inadequate when the claim concerns uptake. A researcher should look for the intermediate interpretation, the version used, the operation taught and evidence of its exercise. The appropriate evidence can differ by setting; no single artifact type is privileged in advance. Where the required materials are unavailable or appropriately restricted, the public conclusion should remain limited rather than treating disclosure as a condition of historical legitimacy.

15.3 Compatibility Review

Adjacent links should be examined for the actual information crossing their boundary. A shared title or community name may identify a useful search location but not the relevant middle state. The review asks whether the first link reaches the interpretation and support arrangement required by the second. Where a translation or revision connects them, that connecting process belongs in the account.

The finite reachability construction can make a proposed dossier easier to inspect. It is especially useful when several plausible reconstructions have been discussed as though they formed one sequence.

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If the calculation fails, its intermediate reached sets locate the break in the assembled account. Historical research can then seek the missing relation or narrow the claim. The result should not be reported as proof that no unrecorded relation existed.

A successful path also requires interpretation. An assembled chain of document custody can establish material provenance while leaving the productive operation untracked. A chain of effective teaching episodes can establish present competence while leaving the source attribution unresolved. The typed state should carry the feature necessary to the claim, and the prose should explain why that feature matters.

15.4 Unresolved Historical Alternatives

Alternative dossiers should remain available when evidence does not distinguish them. A minimal-support summary can describe which selected resources suffice across those possibilities. It should be accompanied by the actual or candidate execution record because the summary deliberately forgets order and some redundant use. The two artifacts answer different questions and should not overwrite one another.

Negative findings require equally careful scope. Failure to find a source contribution can result from a missing record, a model that omits a relevant channel, an incompatible interpretation or evidence that the selected feature was actually abandoned. These explanations have different implications. Reporting their difference helps future inquiry instead of turning present ignorance into a permanent boundary judgment.

Field observations can be added when their realization is independently defensible. Before fitting a source-resolved law, the inquiry must identify the measured process, the meaning of each channel and the observation protocol. The aggregate-closure example shows why a good fit to total activity does not validate the source decomposition. The differentiated inverse shows what additional assumptions could help and why practical uncertainty remains.

15.5 Revisable Historical Assessment

A public discussion draft should preserve enough provenance for a critic to identify which step is contested. The objection may concern a source reading, an intermediate operation, a formal assumption or the legitimacy of the inquiry's target. Treating all objections as failures to understand the model would prevent the model from learning from its application.

Revision can consequently occur at several levels. A newly available record can change which dossiers are admitted. A participant correction can alter the interpreted target. A boundary refinement can repair a formal composition without resolving a historical disagreement. A rejection of the selected continuity criterion can leave every calculation intact while limiting its relevance. Recording these changes separately makes the inquiry cumulative.

This practice is compatible with incomplete knowledge. A carefully bounded claim about one reconstructed operation can contribute to understanding while broader identity questions remain open. The value of the record lies in its ability to preserve what is supported, reveal what remains uncertain and enable subsequent criticism. It does not depend on producing a final classification of a community or its language.

16 Research Boundaries

The primary object of this paper has been a selected historical-continuity attribution across interrupted transmission. Its strongest positive proposal concerns earlier linguistic organization contributing to later productive practice through an explicitly interpreted history. The account permits transformation, mixed sources and branching while requiring the contribution at issue to be identified. It does not infer continuous activity from a surviving record or whole-language identity from one successful reconstruction.

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16.1 Conditional Results

The dossier construction establishes how compatible local links can be assembled and why separately successful adjacent comparisons may fail to supply a full bridge. The support construction establishes when minimal source requirements can be composed safely: minimization must retain the relevant intermediate boundary state. Its counterexample shows how an apparently redundant source can be essential to the corrected state required by later practice. The transfer representation gives a consistent calculation of compatible routes while distinguishing route existence from actual execution.

These are conditional mathematical results with an applied interpretive purpose. The general mathematics of paths, semirings and matrix multiplication is inherited. The historical-continuity vocabulary and allowance for reconstruction are also inherited from the earlier Generative Relational manuscripts. The present work contributes a more developed investigation of their consequences for selected revival attributions. Its value depends on whether those distinctions improve an actual explanation; the constructed history shows one way they can alter the attribution rather than merely redescribe its files.

The source-resolved field provides a second investigation. Under common coefficients, different tagged histories can produce an identical aggregate trajectory throughout time. Under more differentiated known dynamics, exact aggregate data can identify the represented channels, with a quantified conditioning problem as the coefficient gap shrinks. These results distinguish observational adequacy from historical warrant. They propose no empirically established field law of language revival.

16.2 Application Limits

Several substantive issues remain unresolved. A real application must justify the interpretation of the earlier organization, the descendant correspondence and the admission of each historical link. The formal model does not supply those judgments. It also cannot establish archival completeness or erase the effects of unequal documentation. A missing public dossier need not imply absent continuity.

The finite boundary model assumes that retained states contain the information needed for the selected continuation. Some historical questions may resist that compression. Source availability is monotone only within a fixed specification that permits unused resources to be ignored. New evidence, changed responsibilities or revised adequacy criteria can require a different dossier family. The fixed graph and additive amplitudes of the field are further restrictions, not general properties of relational spacetime.

Normative questions likewise remain differentiated. Evidence about a historical contribution does not automatically authorize an outsider to define membership, publish restricted materials or monopolize interpretation. Recognition can affect future practice while remaining distinct from the evidence for an earlier link. This paper clarifies the junction between these questions but does not provide a complete account of their resolution.

16.3 Open Research Problems

A useful next application would follow one productive operation across source interpretation, instructional development and later use, retaining actual revisions and competing reconstructions. Such a study could test whether the proposed boundary descriptions preserve the differences that participants and historical evidence make consequential. It could also show where finite support summaries fail and require richer relational descriptions.

Further mathematical work could investigate partial correspondences, nonmonotone source conditions and changing operation carriers. Those extensions should be driven by a case in which the present assumptions fail. Adding a more elaborate algebra without such a need would not deepen the continuity argument. Similarly, empirical field work would require an independently defensible realization protocol before parameter estimation or claims about observed language dynamics.

The resulting position remains deliberately open. A revived practice can have a supported historical relation through reconstructed productive organization even when selected active transmission was

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interrupted. The adequacy of that claim rests on the particular contribution, its compatible history and the comparison being defended. Preserving these distinctions makes both positive claims and principled disagreement more precise.

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