

AN INTELLECTUAL AND CULTURAL HISTORY

History of Diagnostics, Observability, and Debugging in Humanities

Humanistic evidence and the examination of interpretations

— *Seven parts and 35 chapters* —

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Historical synthesis with 84 references, chronology, glossary, and evidence taxonomy

Abstract

Humanities investigate artifacts whose meanings depend on their production, transmission, use, and interpretation. A manuscript can preserve a copying error. A chronicle can repeat an earlier report. A painting can contain a later intervention. A searchable collection can hide a document because its words were not recognized. In this history, we examine how scholars made such conditions available for analysis, distinguished competing explanations, and corrected particular errors without removing the evidence of earlier states.

We follow these activities through oral traditions, classical and scriptural scholarship, philology, historiography, philosophy, literary criticism, translation, art history, archaeology, music, performance, archives, and digital humanities. The historical sequence includes the comparison of textual witnesses, the examination of documentary authenticity, the reconstruction of languages and contexts, and the development of computational instruments. Several of these practices have long used the vocabulary of criticism, correction, diagnosis, or restoration. Elsewhere, observability and debugging provide our present-day interpretation of an earlier activity.

The main distinction is between an artifact, the representation through which we inspect it, and the explanation constructed from that representation. These can fail in different ways. A transcription may be inaccurate although its source is authentic. A document may be forged but remain valuable evidence of the circumstances of its fabrication. An interpretation may be well supported without being the only defensible interpretation. We therefore examine the conditions under which a correction is justified and the conditions under which a disagreement should remain visible.

Seven parts and 35 chapters are followed by a selected chronology, glossary, and evidence taxonomy. Connections to our pattern-oriented software diagnostics concern recurring analysis operations and relationships among artifacts. Humanities also provide concepts that have already influenced software narratology and trace analysis. The comparison is therefore reciprocal: we can examine humanistic evidence through diagnostic patterns while learning from humanistic methods how to question the origin, context, and meaning of a recorded trace.

How to read this history

Let us first separate historical vocabulary from the vocabulary of this book. We do not suggest that an Alexandrian editor, a medieval reciter, or a Renaissance philologist practiced software debugging. Their activities belonged to particular institutions and intellectual traditions. We use diagnostics for the investigation of an observed condition and its possible explanation; observability for the arrangements that make relevant evidence inspectable; and debugging for the identification and correction of a specified defect. The last two terms are comparative instruments when applied to earlier humanistic work.

In this usage, observability does not mean that a human life, a culture, or the meaning of a work can be reconstructed uniquely from recorded outputs. Nor does debugging mean that every disagreement is an error. A damaged leaf, a false date, a misleading catalog entry, and a contested interpretation present

different problems. The appropriate investigation depends on which problem we have identified. The chapters repeatedly return to this distinction because it determines what a proposed remedy can establish.

The boundaries of humanities vary among institutions. Here they include the study of languages, texts, histories, arguments, religions, visual and material culture, and performance. Archaeology, oral history, archival studies, conservation, and computational analysis also connect with social and natural sciences. We include them where their methods bear directly on humanistic evidence. The book follows selected developments across several traditions; it does not propose a single origin or an exhaustive inventory of all cultures and disciplines.

The seven parts form a historical and analytical sequence. Part I examines preservation and early criticism. Part II follows the comparison of documents and the reconstruction of their histories. Part III concerns interpretation, argument, and meaning. Part IV considers material objects and performed works. Part V examines authority, silence, and contested evidence. Part VI follows computational instruments. Part VII connects these developments with diagnostic patterns and a worked investigation.

Dates refer to the historical event or first publication when stated. References identify the edition or institutional resource used; a later translation or digital republication does not change the date of the original work. Numbered citations connect claims with sources, while examples introduced as hypothetical or constructed are our own illustrations. The chronology is selective and should be read together with the qualifications in the chapters.

Neighboring practices and their questions

Practice	Primary question	Typical limit
Textual criticism	Which readings and relationships are supported by the witnesses?	Variation may reflect revision or adaptation as well as error.
Diplomatics and paleography	What can form, script, and transmission establish about a document?	A late copy may preserve an earlier act; imitation can reproduce familiar forms.
Historical criticism	What can a source establish about an event or process?	Accurate transmission does not guarantee accurate testimony.
Hermeneutics and criticism	How does an interpretation answer to language, context, and form?	Several interpretations may remain defensible.
Conservation and restoration	What produced the present condition, and what intervention is justified?	Treatment can change or remove evidence.
Computational analysis	What patterns follow from a defined representation and method?	Processing success does not establish historical validity.

An analysis can pass through several of these practices. We may first establish that a letter is a later copy, then identify a mistranscribed place name, and finally reconsider an account of a journey. The first finding concerns the artifact. The second concerns its representation. The third concerns the explanation. Keeping these findings separate allows another reader to accept a correction without being required to accept every conclusion built upon it.

Contents

Seven parts and 35 chapters

SECTION	PAGE
Abstract	2
How to read this history	2
PART I · PRESERVATION AND EARLY CRITICISM	6
1. Vocabulary and historical scope	6
2. Oral traditions and the preservation of difference	7
3. Classical scholarship and the comparison of witnesses	8
4. Scriptural scholarship and traditions of transmission	8
5. Historical reports and the plausibility of explanations	9
PART II · DOCUMENTS AND THE RECONSTRUCTION OF THEIR HISTORIES	11
6. Renaissance philology and the diagnosis of anachronism	11
7. Diplomatics, paleography, and evidential scholarship	12
8. Textual genealogy and the limits of a family tree	12
9. Decipherment and the coordination of constraints	13
10. Archives and the professional criticism of sources	14
PART III · INTERPRETATION, ARGUMENT, AND MEANING	16
11. Hermeneutics and the examination of understanding	16
12. Philosophical arguments and conceptual confusion	17
13. Literary criticism and the diagnosis of reading	17
14. Semiotics, narratology, and the organization of traces	18
15. Translation and multilingual evidence	19
PART IV · MATERIAL OBJECTS AND PERFORMED WORKS	21
16. Attribution and the analysis of visual particulars	21
17. Conservation and the history of interventions	22
18. Archaeological stratigraphy and the reconstruction of sequence	22
19. Musical sources and historically informed performance	23
20. Performance, film, and the preservation of an event	24
PART V · AUTHORITY, SILENCE, AND CONTESTED EVIDENCE	26
21. Archives and the production of silence	26

SECTION	PAGE
22. Oral history and the meaning of discrepancy	27
23. Categories, perspectives, and the authority to interpret	27
24. Forgery, misattribution, and the preservation of corrections	28
25. Microhistory, narrative, and competing reconstructions	29
PART VI · COMPUTATIONAL INSTRUMENTS AND DERIVED EVIDENCE	31
26. Humanities computing and the history of analytical labor	31
27. Digital editions and inspectable editorial decisions	32
28. OCR, search, and the diagnosis of a derived corpus	32
29. Stylometry, distant reading, and comparative validity	33
30. Imaging, virtual reconstruction, and machine suggestions	34
PART VII · DIAGNOSTIC PATTERNS AND THE PRESERVATION OF EXPLANATIONS	36
31. Digital preservation and the provenance of a result	36
32. Visualization and the conditions of observability	37
33. Connections to pattern-oriented software diagnostics	37
34. A worked investigation of an apparent rupture	39
35. Continuing developments and the limits of automation	40
CONCLUSION	42
APPENDIX A SELECTED CHRONOLOGY	43
APPENDIX B GLOSSARY	46
APPENDIX C EVIDENCE TAXONOMY AND BLIND SPOTS	49
REFERENCES	51

PART I**Preservation and early criticism****1. Vocabulary and historical scope**

Let us consider a short sentence in a historical letter: a meeting took place before the messenger arrived. A damaged word, an incorrect transcription, or a mistaken calendar conversion can change the sequence. Even when the sentence is read correctly, the writer may have been misinformed. We therefore have several possible objects of diagnosis before we begin to explain the meeting itself. The material mark, the reading, the report, and the reconstructed event occupy different positions in the investigation.

Humanistic inquiry has developed many ways to examine these positions. Textual criticism compares readings. Diplomatics investigates documentary forms and authenticity. Hermeneutics considers the conditions of understanding. Conservation examines material condition and the consequences of treatment. These practices have different histories and purposes. The critical apparatus of an edition, for example, preserves selected alternatives and editorial decisions so that the printed text can be examined in relation to its witnesses. [1]

In this book, an artifact is something available for investigation: a manuscript, an inscription, a recording, a catalog, a digital image, or a derived dataset. Evidence is relational. The artifact becomes evidence for a particular claim through an argument. A forged charter is poor evidence for the grant it alleges but can be strong evidence for a later attempt to establish rights. The diagnostic question changes, although the physical object remains the same.

An anomaly is also relative to a context. A word may be unusual for an author, ordinary for a translator, and characteristic of an editor. A difference between two witnesses can be a copying mistake, an authorial revision, or an adaptation for a new audience. Calling all differences defects would prejudge the history that we are trying to reconstruct. A diagnostic vocabulary becomes useful only when it preserves these alternatives.

The social life of a text complicates the notion of a single correct state. D. F. McKenzie's bibliographical work connected material forms with the production and reception of meaning. Typography, arrangement, publication, and use can matter to the interpretation of the words themselves. We can therefore investigate an edition as an intervention in transmission rather than merely as a container for an abstract text. [2]

Our scope is a history of these analytical relationships. We examine how observations became available, how claims were tested against them, and how corrections were preserved. This also explains why the book includes limits and unresolved cases. Sometimes the appropriate result is a corrected reading.

Sometimes it is a narrower claim. Sometimes it is a documented set of alternatives that further processing of the same surviving evidence cannot eliminate.

2. Oral traditions and the preservation of difference

The preservation of an oral work does not have a single historical form. Some traditions place great value on the accurate reproduction of a received sequence. Others allow substantial recomposition during performance. If we begin by treating every oral performance as an imperfect copy of a written original, we impose the wrong model before examining the evidence. The first question is what the tradition regards as continuity.

Vedic chanting provides an example of disciplined transmission in which sound, accent, and recitation practices matter. Safeguarding accounts maintained by India's Sangeet Natak Akademi and UNESCO describe techniques used to preserve pronunciation and textual sequence through instruction and repeated recitation. This is evidence of an organized practice of maintenance. It does not warrant the stronger claim that every surviving form has remained unchanged throughout its entire history. [3, 4]

We can compare such maintenance with a different kind of oral continuity. Milman Parry's recordings of South Slavic epic singers and Albert Lord's subsequent work investigated composition in performance. Lord's *The Singer of Tales*, first published in 1960, explained how formulaic resources and themes support the production of performances that need not be identical to one another. A variation can belong to the operation of the tradition rather than indicate its breakdown. [5]

The two cases expose a diagnostic dependency. Before measuring deviation, we need to identify the relevant norm. A missing syllable can be consequential in a recitation practice organized around exact sound. A changed episode in an epic performance may require an account of audience, occasion, and singer instead of emendation. Neither judgment can be obtained from a difference count alone.

Recording also changes the evidence available to later scholars. A written transcription can preserve verbal content while losing pauses, melody, bodily movement, and interaction. An audio recording retains some of these features but excludes the visual field. A video frame introduces its own boundary. These are not simply decreasing levels of completeness along one scale. Each representation makes some relationships easier to inspect and others less accessible.

From a diagnostic perspective, oral traditions show why preservation and variation must be considered together. We need the history of the recording as well as the history narrated in it. We also need the community's account of what constitutes a faithful performance. Otherwise, a well-intentioned correction can remove precisely the feature that makes an artifact evidence of a living practice. The object of study includes the competence to reproduce, recognize, and assess performances, not only the sequences left in a collection.

3. Classical scholarship and the comparison of witnesses

The textual history of Homer demonstrates that critical comparison is much older than modern computing. Hellenistic scholars at Alexandria, including Zenodotus and Aristarchus, confronted variant readings and questions about verses, language, and authenticity. Their editions and commentaries did not survive as a single complete apparatus. Later manuscripts and scholia preserve evidence of this work through their own histories of transmission. [6, 7]

The critical sign provides a compact example of an observation made persistent. A doubtful verse could be marked for attention instead of silently disappearing from the text. Gregory Nagy's discussion of Homeric terminology explains the use of the obelos in marking suspected verses and distinguishes an editor's base text from the variants recorded around it. A mark can preserve a judgment while leaving the disputed material available to another reader. [7]

This arrangement is structurally different from replacing an artifact with its correction. The reader encounters a text together with evidence that particular places have been questioned. The apparatus creates an additional layer of observability: we can inspect not only a reading but also the history of disagreement about that reading. Its usefulness depends on knowing which witness or scholar supports each entry.

The historical reconstruction remains difficult. A medieval copy can incorporate material that was once marginal. A commentator can quote a reading without adopting it. Several late witnesses may repeat one earlier source. Consequently, the number of surviving agreements is not automatically the number of independent testimonies. Transmission can amplify a decision without adding new evidence for it.

Modern Homeric work also questions whether a single recovered original adequately represents the history of an oral poetic tradition. The Homer Multitext project makes textual multiformity part of the object of inquiry. This does not imply that all readings are equally well supported. It changes what an edition may aim to display: a history of variation can be valuable even where a reconstructed text is also offered. [8]

For our purposes, classical scholarship supplies an early example of evidence accompanied by analysis metadata. The text, the sign, the comment, and the later report of a comment must be distinguished. A diagnostic reader asks whether an apparent defect belongs to the poem, a particular witness, or the transmission of scholarly knowledge about it. This layered investigation anticipates problems that recur in printed editions and digital collections, although the institutions and technical arrangements are very different.

4. Scriptural scholarship and traditions of transmission

Religious texts have generated extensive practices for preserving readings, assessing transmission, and explaining difficult passages. These practices developed within communities with different

understandings of authority and revelation. A history of their analytical methods must respect those differences. We can compare the forms of evidence without treating theological commitments as interchangeable or assuming that modern historical criticism simply replaced earlier scholarship.

Hebrew biblical manuscripts can carry vowel points, accents, and Masoretic notes alongside the consonantal text. The British Library's catalog records these features in particular witnesses, including the manuscript known as the Yonah Pentateuch. Such descriptions make clear that the artifact contains several coordinated forms of textual information, sometimes added or organized in distinct ways. The surrounding annotations are part of the evidence for transmission and reading. [9]

Islamic hadith scholarship developed assessment of reports through their transmitters and contents. The distinction between *isnad*, the chain of transmission, and *matn*, the report's content, is useful here. Scholarship on hadith criticism cautions against reducing the tradition to chains alone: the relationships between transmitted wording, legal reasoning, and critical judgment also require investigation. Different schools and scholars did not apply one uniform procedure. [10]

In both cases, we can observe a separation between a statement and information about its transmission. A chain is not a guarantee of truth, and a marginal note is not an independent copy of the text. Their value lies in the questions they allow a reader to ask. Who transmitted this reading? Which feature was considered unusual? What was preserved as received material, and what was offered as explanation?

Early modern biblical criticism reconfigured these questions. Spinoza's *Theological-Political Treatise* of 1670 argued for investigating scripture through its language and historical circumstances. His account joined interpretation with inquiry into authorship, transmission, and the conditions in which texts were produced. It was also part of a political and religious argument, not a neutral technical manual detached from its setting. [11]

The diagnostic comparison concerns the visibility of dependencies. An interpretation may depend on a particular reading, that reading on a witness, and the witness on an account of its date or authority. If one dependency changes, some conclusions may need revision while others remain unaffected. Preserving these distinctions is more useful than labeling an entire tradition reliable or unreliable. It also prevents a modern analyst from mistaking an internal scholarly debate for the absence of critical thought.

5. Historical reports and the plausibility of explanations

Historical inquiry encounters a problem that no amount of precise transcription can remove: a correctly transmitted report can still be mistaken. The historian must consider what a source could have known, what it intended to communicate, and whether its claims fit other evidence. These questions were already explicit in ancient accounts of historical method.

In the first book of his *History of the Peloponnesian War*, Thucydides distinguishes his handling of speeches from his investigation of events. He describes the difficulty of recovering exact wording and the disagreement of eyewitnesses according to memory and attachment. His account therefore exposes limitations in the making of his own narrative. The speeches cannot simply be treated as verbatim recordings. [12]

The distinction matters because a narrative can be convincing at the level of composition while remaining uneven at the level of evidence. A sequence of speeches may explain a political situation, but the evidence supporting their precise wording differs from the evidence supporting the occurrence of a battle. We need to inspect the claim at the appropriate resolution rather than transfer confidence from the whole narrative to each sentence.

Ibn Khaldun's *Muqaddimah*, initially composed in 1377 and subsequently revised, made criticism of historical reports part of a wider inquiry into human social organization. Reports were to be considered in relation to the conditions that made events possible. A prestigious chain of reporting could not by itself establish an implausible account. His project combined assessment of testimony with explanation of historical processes. [13]

This introduces a second source of diagnostic difficulty. Background knowledge can reveal an impossible or highly doubtful report, but an overly rigid model can also reject an unfamiliar event. The investigator must distinguish a contradiction with well-supported constraints from a contradiction with habit or expectation. Historical plausibility is an argument to be examined, not a substitute for examining evidence.

We can illustrate the difference with a hypothetical military chronicle. A large reported force may be inconsistent with the available transport and supplies. That inconsistency invites an investigation of numerals, rhetorical conventions, and the source's dependence on earlier texts. It does not license silently replacing the number with a preferred estimate. The useful result records the discrepancy, the reasons for doubt, and the alternatives that remain possible. Historical criticism makes progress by exposing the structure of uncertainty as well as by eliminating particular errors.

PART II

Documents and the reconstruction of their histories

6. Renaissance philology and the diagnosis of anachronism

Renaissance philology joined the recovery of ancient texts with close attention to linguistic usage. A word or construction could become evidence about the period in which a document was produced. The question was not merely whether the text made grammatical sense. It was whether its language and institutions belonged to the time and speaker it claimed.

Lorenzo Valla's attack on the Donation of Constantine, written in 1440, is a prominent example. The Donation purported to record an imperial grant of authority and possessions to the papacy. Valla examined its Latin and historical assertions and argued that it could not be the authentic act it presented itself as being. His argument also employed rhetoric and political reasoning. It should not be reduced to a modern automated test for vocabulary. [14]

The case illustrates a diagnostic use of anachronism. A feature that becomes ordinary in one period can be suspicious in a document attributed to another. Several kinds of discrepancy may reinforce one another: terminology, institutional arrangements, documentary conventions, and the surrounding narrative. Their force depends on an established comparison set and on the possibility of later copying, translation, or interpolation.

We therefore need to distinguish the date of a physical witness from the date of its contents. A late manuscript can preserve an early work. A modernized spelling can reflect a copyist rather than the author. An anachronistic passage may concern one layer of a document instead of the entire composition. Dating the visible marks is one investigation; reconstructing the text's earlier states is another.

The broader humanist setting also matters. The Library of Congress exhibition on Renaissance humanism describes both philological work and the institutional pressures affecting its reception. An evidential argument could be accepted privately and suppressed or qualified in publication. The history of correction therefore includes the history of what scholars were able or willing to make public. [15]

For pattern-oriented analysis, anachronism is a context mismatch that requires explanation. The pattern identifies a promising region of investigation; it does not determine the mechanism. Fabrication, interpolation, modernization, mistaken attribution, and a faulty chronology can produce superficially similar symptoms. The strength of the analysis comes from following those alternatives through the artifact's transmission. A correction becomes historical knowledge when its supporting evidence and scope remain available for inspection.

7. Diplomatics, paleography, and evidential scholarship

An authentic document can have an unfamiliar form, while a forgery can imitate a familiar one. The analysis of authenticity therefore requires knowledge of variation as well as knowledge of rules. Seals, scripts, formulas, materials, and institutional procedures acquire evidential value through comparison with documents whose histories can be established.

Jean Mabillon's *De re diplomatica*, published in 1681, organized the examination of documentary features in a work that became foundational for diplomatics. Surviving copies and modern institutional projects preserve its comparative illustrations of scripts and documents. The book helped make authenticity a question that could be argued through inspectable features rather than settled solely by the prestige of the institution holding a charter. [16, 17, 18]

Paleography and diplomatics overlap but ask different questions. A script can help locate a manuscript within a range of dates and practices. A document's formula can help explain how an act was recorded and authorized. Neither feature is an infallible clock. Conservative writing, imitation, later copies, and changes within an institution complicate the comparison. An isolated discrepancy is an invitation to examine dependencies, not a complete verdict.

The emphasis on evidential comparison has histories outside European diplomatics. Benjamin Elman's study of late imperial China describes the development of evidential scholarship, commonly called *kaozheng*, through philological, historical, and institutional changes in the seventeenth and eighteenth centuries. The examination of classical language and transmitted texts became central to important scholarly debates. This was not simply a delayed repetition of European humanism. [19]

The comparison helps us avoid a single invention story. Different traditions developed practices for testing claims about inherited texts, but their objects, authorities, and aims differed. A useful history asks which evidence was admitted, how comparison was organized, and what consequences followed from a correction. It also asks who could participate in producing and evaluating that evidence.

Consider a hypothetical charter with a familiar seal and an unfamiliar dating clause. One explanation is forgery. Another is that the document is a later authorized copy. A third is an unusual local practice. We would inspect comparable acts, the physical attachment of the seal, the script, and the history of custody. The diagnostic gain comes from combining features whose relationships are understood. Simply accumulating suspicious details can create an appearance of proof without establishing that the details are independent or incompatible with an authentic document.

8. Textual genealogy and the limits of a family tree

When several manuscripts transmit the same work, a majority reading can be misleading. Ten copies may descend from one defective exemplar, while a single witness preserves a reading from another

branch. Genealogical textual criticism attempts to reconstruct these relationships so that numerical repetition is not mistaken for independent support.

Nineteenth-century scholarship associated with Karl Lachmann helped establish systematic genealogical methods, although their development involved several predecessors and contemporaries. Paul Maas's *Textkritik*, first published in 1927 and translated into English as *Textual Criticism* in 1958, offered an influential concise account. Shared errors and separative evidence can help infer relationships among witnesses, provided that the relevant assumptions about transmission are justified. [20, 21]

A stemma is a model of descent, not a recovered photograph of the copying process. Some intermediate witnesses have disappeared. A scribe may consult more than one exemplar, producing contamination in the technical sense of mixed transmission. Similar errors can also arise independently. These conditions can make a simple branching tree inadequate or leave several reconstructions compatible with the surviving readings. The modern *Handbook of Stemmatology* treats such difficulties alongside digital approaches. [21]

The Critical Edition of the Mahabharata at the Bhandarkar Oriental Research Institute provides a major example of sustained editorial comparison in an Indian textual tradition. The eighteen parvans were completed in 1966, producing a constituted text together with a substantial critical apparatus; the Harivamsha supplement followed. Its editorial product must be distinguished from a claim to recover every historical performance, regional recension, or authorial beginning of the epic. [22]

We can see the distinction in a small constructed example. Witnesses A and B omit the same line, while C retains it. If A and B derive from one ancestor, their agreement adds less independent support than a count of two against one suggests. But the line in C might also be an addition. We need evidence about the kinds of omission and expansion that occur in this transmission, not merely a tree-drawing procedure.

The diagnostic lesson is to preserve the model's assumptions with its result. A reconstructed reading should remain connected to the witnesses and arguments that support it. A newly discovered manuscript may alter the genealogy without rendering all previous observations worthless. The apparatus preserves reusable evidence; the stemma organizes a revisable explanation. Confusing the two turns a useful reconstruction into an authority that can no longer be examined.

9. Decipherment and the coordination of constraints

An undeciphered inscription is observable in one sense: its marks can be seen and copied. Yet the relationships needed to read it may remain unavailable. Decipherment changes the analytical situation by connecting signs with a writing system and language. It is therefore a useful case for distinguishing visibility from interpretability.

The Rosetta Stone carries versions of a decree in hieroglyphic, demotic, and Greek writing. Its comparative evidence contributed to the work of Thomas Young and Jean-François Champollion.

Champollion's announcement in September 1822 was a major milestone in deciphering Egyptian hieroglyphs, but it belonged to a longer history of investigation involving other inscriptions and knowledge of Coptic. A simple substitution table derived from one object does not describe the achievement adequately. [23]

Linear B presents another history of constraints being assembled. Alice Kober's analysis of recurring sign patterns and inflection provided important foundations. Michael Ventris achieved the decipherment in 1952, and collaboration with John Chadwick helped establish the linguistic interpretation. Accounts from the Cambridge Mycenaean Epigraphy Group and Gonville and Caius College distinguish the breakthrough from the earlier work on which it depended. [24, 25, 26]

A proposed reading becomes stronger when it explains material beyond the examples used to construct it. The system should work across different inscriptions and plausible linguistic forms. If every difficulty requires a new exception, apparent success may reflect the flexibility of the explanation rather than the adequacy of the decipherment. Independent material can expose this weakness.

The diagnostic analogy is reconstruction under multiple constraints. Sign frequencies, positions, repeated groups, names, grammatical patterns, and archaeological context do not carry equal weight in every case. Their relationships matter. A frequency pattern can support several languages; a contextual guess can help but also bias the assignment of values. Progress often involves revising a once-plausible assumption while retaining the observations that first motivated it.

Decipherment also depends on the accuracy and availability of copies. A mistaken sign drawing can create a nonexistent anomaly. A damaged surface can make two signs appear identical. We therefore need to preserve images or other records of the original marks alongside the transcription and interpretation. A readable final text should not erase the boundary between observed signs, uncertain readings, and supplied restorations. Otherwise, later scholars inherit a fluent narrative while losing the means to diagnose its construction.

10. Archives and the professional criticism of sources

The increasing organization of historical scholarship around archives made the acquisition and criticism of sources an explicit part of professional method. Documents had to be located, described, compared, and interpreted before they could support a historical account. This development did not eliminate older erudition, nor did it make written administrative records a complete representation of the past.

Charles-Victor Langlois and Charles Seignobos's *Introduction aux études historiques*, published in 1898, organized historical work around the search for documents and their critical examination. Their distinctions among operations of criticism helped separate questions about a source's origin from questions about the assertions it contained. The manual also shows how a method can reflect the documentary priorities of its period. [27]

Marc Bloch's posthumous *Apologie pour l'histoire*, first published in 1949 and translated as *The Historian's Craft* in 1953, broadened the discussion of observation, testimony, and questioning. The historian does not merely wait for a source to deliver its meaning. Questions make features of evidence significant, including features that an original producer did not intend to communicate. [18]

This distinction is central to diagnostics. An account book may be deliberately informative about payments while unintentionally informative about institutional routines or changing categories. The analyst needs to know which claim is being made. Trust in the book's arithmetic does not automatically establish the completeness of its social representation, and distrust of its declared purpose does not remove every evidential use.

Archival arrangement supplies another layer. A document's position within a series can reveal dependencies that disappear in an isolated image. A catalog description can make a record discoverable while also framing how it will be understood. Reordering a collection for convenience may preserve every item but obscure relationships that were once visible through the original arrangement.

A historical investigation therefore includes the history of access. Which series survived? Which were transferred, selected, or restricted? Which documents were described in sufficient detail to be found? These questions concern the construction of the available evidence, not simply shortcomings to be repaired by a larger search. The historian's working collection is a derived artifact with its own boundaries. Making those boundaries explicit improves the explanation even when the missing material can never be recovered.

PART III**Interpretation, argument, and meaning****11. Hermeneutics and the examination of understanding**

Finding the correct words does not complete an interpretation. We still need to consider what those words could mean in their language, genre, and situation. Hermeneutics makes this dependency an object of inquiry. It also directs attention to the interpreter, whose expectations can determine which features appear ordinary and which require explanation.

Friedrich Schleiermacher's writings on hermeneutics and criticism developed interpretation through the relation between linguistic understanding and the particular act of expression. His work, preserved through lectures and manuscripts and available in modern edited collections, connected the understanding of a passage with the larger whole in which it occurs. The relation is reciprocal: a provisional understanding of the whole guides reading, while a difficult part can require revision of that whole. [28]

Hans-Georg Gadamer's *Truth and Method*, first published in German in 1960, placed historically situated understanding at the center of philosophical hermeneutics. Interpretation does not begin from a position outside every tradition. The encounter with a text can expose and revise assumptions brought by the reader. This is not a procedure for mechanically extracting a single message from an otherwise passive object. [29]

The diagnostic relevance lies in the examination of a mismatch. A sentence may seem inconsistent because the author changed position, because the text is corrupt, because a term changed meaning, or because our initial account of the argument was inadequate. The investigation should preserve these alternatives long enough to test them. Emending the sentence too early can protect a mistaken interpretation from contrary evidence.

This also explains why interpretation can be iterative without becoming arbitrary. A proposed understanding must answer to features of the text and its context. Repeatedly adjusting a hypothesis is useful when the adjustments improve its ability to explain difficult material. It becomes circular in a damaging sense when every discrepancy is dismissed solely because it conflicts with the preferred whole.

Let us take a hypothetical letter in which a courteous phrase appears in an otherwise hostile exchange. The phrase could be sincere, conventional, ironic, or added by a later copyist. Its isolated wording does not select among these possibilities. Comparison with other letters, attention to genre, and inspection of the witness may change the interpretation. Hermeneutic diagnosis concerns the relation between those observations and our account of the act of writing. The final explanation should indicate which dependencies are secure and which still depend on a contested reading of the situation.

12. Philosophical arguments and conceptual confusion

Philosophy offers several forms of error examination. We can test whether a conclusion follows from its premises, whether a distinction is coherent, or whether a question depends on an unnoticed change in the use of a word. These are related but different activities. A valid argument may contain a false premise, while an apparently profound disagreement may involve two uses of the same expression.

Charles S. Peirce's 1878 essay *How to Make Our Ideas Clear* connected conceptual clarification with conceivable practical consequences. For our purposes, the relevant movement is from familiarity with a term toward an account of what difference its application would make. A verbal definition alone may leave the operative distinction unresolved. [30]

Ludwig Wittgenstein's *Philosophical Investigations*, published posthumously in 1953, examined how philosophical difficulties arise through the treatment of language. His attention to use, examples, and the variety of language-games provides a way to question an apparently uniform concept. The word can remain the same while the activity in which it functions changes. [31]

We can apply this observation to the vocabulary of this book. An error in a catalog date, an error in an argument, and an error in interpreting a performance do not necessarily admit the same kind of demonstration or repair. If we use debugging for all three, we need to state the relevant criterion of success. Otherwise, the analogy becomes a source of confusion rather than an instrument of analysis.

Interpretive reasoning also appears in legal philosophy. Ronald Dworkin's *Law's Empire*, published in 1986, developed an account of legal interpretation in which fit with institutional history and justification both matter. Legal disagreement cannot always be resolved by finding a missing factual item. This is a useful boundary case for a diagnostic history: a shared archive can support disagreement about the principles through which it should be understood. [32]

The practical consequence is to identify the kind of claim under examination. A historical claim concerns what occurred or was said. A conceptual claim concerns how a distinction works. A normative claim concerns what should be accepted or done. Evidence can connect these claims, but it does not make them identical. A reconstructed chain of reasoning is most useful when its premises, changes of meaning, and evaluative commitments are visible. We can then locate a disagreement without pretending that every philosophical problem is a damaged mechanism awaiting one replacement part.

13. Literary criticism and the diagnosis of reading

Literary criticism can investigate the reader's response as well as the literary work. A poem may be misread because a familiar association dominates an unfamiliar use of language. A reader may mistake a speaker for the author or assume that a recognizable theme determines every detail. Such problems concern the activity of interpretation even when the printed text contains no error.

I. A. Richards's *Practical Criticism*, published in 1929, examined readers' interpretations of poems presented without the usual information about authorship and reputation. The resulting comments made habits of judgment available for analysis. The exercise could expose difficulties that remained hidden when a reader relied on a recognized name or an accepted critical description. It also created an artificial reading situation whose limits need to be acknowledged. [33]

W. K. Wimsatt and Monroe C. Beardsley's 1946 essay *The Intentional Fallacy* challenged the use of an author's intended meaning as a controlling standard of literary judgment. Their argument became an influential part of New Critical debate. It did not remove every historical question about composition. It questioned a particular inference from evidence of intention to the meaning or value of the completed work. [34]

This history is not a sequence in which one school corrected all previous schools. Different approaches changed the object of attention. Close reading examined relations among words, images, and structures. Historical approaches examined situations of production and reception. Reader-oriented approaches examined the conditions under which meaning was actualized. A disagreement may concern what should be explained rather than an overlooked fact.

Editorial history can make this especially concrete. The early quarto and folio texts of *King Lear* differ in substantial ways. The Folger Shakespeare Library's textual introduction explains the problems posed by these witnesses and the decisions involved in presenting a reading text. An interpretation based on an edition that combines readings inherits those editorial decisions, whether or not the critic explicitly discusses them. [35]

A diagnostic reading therefore asks which textual object is being interpreted. The answer may be a particular early witness, a modern edition, a performance, or a translation. We can then distinguish a mistaken quotation from a disputable interpretation and an editorial intervention from an authorial feature. This does not reduce literature to proofreading. It supplies the conditions under which an argument about ambiguity, irony, or narrative form can be inspected and challenged by another reader.

14. Semiotics, narratology, and the organization of traces

Humanistic analysis often proceeds by separating relationships that ordinary reading combines. A sign is distinguished from what it signifies. The order of events is distinguished from the order in which a narrative presents them. The speaker of a statement is distinguished from the person who wrote the work. These separations do not remove meaning; they help explain how it is produced.

Umberto Eco's *A Theory of Semiotics*, published in 1976, considered signification and communication through the organization of codes and signs. A visible feature becomes informative through a system of distinctions and conventions. The analyst must therefore examine the interpretive conditions under which it is taken to signify something. The same mark can function differently in another setting. [36]

Gérard Genette's *Narrative Discourse*, drawn from work published in French in 1972 and translated into English in 1980, supplied distinctions concerning narrative order, duration, frequency, mood, and voice. These distinctions make it possible to analyze how a narrative distributes information instead of treating the text as a transparent chronological record. [37]

For example, one event may be narrated several times, while a long period may be compressed into one sentence. A later narrator may know more than a participant knew at the time. If we read the order of narration as the order of occurrence, or repeated narration as repeated occurrence, we construct a false history from correctly read sentences. The error arises in the mapping between representations.

These concerns connect directly with our software narratology. In *Theoretical Software Diagnostics*, we consider traces and logs as narratives of computation and apply distinctions developed in literary study to their analysis. This is an explicit conceptual transfer in our work, not a claim that literary narratology was originally a branch of computing. A trace message has a production context and presents selected information about activity. [38]

The comparison remains bounded. Software messages may include timestamps and machine identifiers, while human narratives may intentionally rearrange time and perspective. Neither is automatically a complete account of its subject. A useful analysis preserves the relation between the recorded sequence and the reconstructed sequence, together with the rules used to connect them. Narratology helps us recognize that an apparent discontinuity can belong to presentation, knowledge, or selection rather than to the underlying activity. It also reminds us that the act of telling becomes evidence in its own right.

15. Translation and multilingual evidence

Translation creates another artifact through which evidence becomes accessible. It can preserve an argument while changing the range of associations available in particular words. It can clarify an ambiguity for one audience by choosing among alternatives that remain open in the source. These are not necessarily defects, but they become diagnostically important when the translation is used as evidence for a precise historical claim.

Roman Jakobson's 1959 essay *On Linguistic Aspects of Translation* distinguished rewording within a language, translation between languages, and interpretation between sign systems. The distinction helps us see that transformation is not confined to bilingual dictionaries. A prose account of an image and a normalized version of an older text also reorganize the representation available to a reader. [39]

Historical translation requires attention to categories whose boundaries do not coincide. A term for office, kinship, ritual, or obligation may have no single equivalent that works in every context. Replacing it consistently with a modern administrative term can create a misleading appearance of institutional continuity. Conversely, leaving every term untranslated can hide relationships that comparative explanation needs.

The Florentine Codex offers a particularly rich case of multilingual and visual evidence. Produced in sixteenth-century New Spain through the work of Bernardino de Sahagún and Nahua collaborators, it combines Nahuatl, Spanish, and images. Getty's Digital Florentine Codex makes these components and modern transcriptions and translations available together. The parallel columns should not be assumed to be interchangeable accounts with identical content and perspective. [40, 41]

The diagnostic opportunity comes from inspecting differences. A passage present in one language and abbreviated in another may reveal translation choices, audience assumptions, or the organization of colonial knowledge. A picture can add information that neither column states in the same way. Each component needs its own provenance and interpretive context before the components are combined.

We can generalize this as a requirement to preserve transformation history. A quotation should identify the language and edition from which it was taken. A decisive interpretation should return to the relevant source wording where possible. If it depends on one translator's choice, that dependence belongs in the explanation. Translation makes humanistic evidence more observable to wider audiences, but the resulting accessibility should not be confused with the disappearance of linguistic difference. Often the difference is itself the most informative part of the investigation.

PART IV

Material objects and performed works

16. Attribution and the analysis of visual particulars

Art attribution asks how a work can be connected with an artist, workshop, place, or period. A signature is evidence, but it is not a self-validating answer. An unsigned work may preserve distinctive habits, while a signed work may be a copy or later intervention. Attribution consequently depends on relationships among visual features, materials, documentary records, and comparative objects.

Giovanni Morelli's nineteenth-century connoisseurship drew attention to recurrent particulars such as the representation of ears and hands. Details that seemed secondary to the subject of a painting could become evidence of habitual practice. Carlo Ginzburg later examined Morelli within a wider history of inference from clues, connecting apparently marginal traces with the reconstruction of an otherwise inaccessible activity. [42, 43]

This approach has an obvious diagnostic attraction. A conspicuous feature may be deliberately imitated, while a less noticed habit can persist across works. But a recurring feature is not automatically unique to one artist. Workshop instruction, collaboration, restoration, and copying can distribute similar particulars across several hands. The value of a clue depends on the history of its production and on the comparison set.

Erwin Panofsky's *Studies in Iconology*, published in 1939, addressed another level of analysis: the interpretation of subjects and cultural meanings. Identifying a represented figure, explaining a conventional motif, and interpreting a work's broader significance are different operations. Agreement about a depicted attribute does not require agreement about every cultural conclusion drawn from it. [44]

We can illustrate this with a hypothetical painting whose visible emblem appears inconsistent with its traditional date. The emblem might be a later addition. It might have been misidentified. The accepted chronology of the motif might be incomplete. Or the painting's attribution may need revision. A useful investigation combines surface examination, technical imaging, documentary history, and comparison instead of choosing the explanation that best preserves the existing label.

Attribution is therefore a changing evidential judgment, not merely the discovery of a name hidden in an object. The wording of a catalog entry can make the degree of commitment visible: by an artist, from a workshop, a copy after a work, or attributed to an artist. These categories should not be flattened when records are imported into databases. Their distinctions preserve the diagnostic history of the object and help prevent a tentative judgment from becoming an apparently settled fact through repeated citation.

17. Conservation and the history of interventions

Conservation makes the condition of an artifact an explicit object of investigation. Cracking, discoloration, fading, corrosion, or structural weakness can have several causes. Some changes arise from materials and environment; others from earlier treatment or use. Before acting, the conservator needs to distinguish the present symptom from the processes that produced it.

Technical examination has enlarged the range of inspectable evidence. Infrared reflectography can reveal certain underdrawings beneath paint, while other imaging and analytical methods answer questions about layers and materials. Getty's technical studies combine noninvasive examination with microscopic sampling where appropriate. The techniques are complementary, and their usefulness depends on the materials and the question. An image does not simply reveal an undifferentiated truth beneath the surface. [45, 46]

The historical importance of this development lies partly in the visibility of change. A painting can contain an artist's revision, later overpaint, and modern treatment. Removing everything that differs from an imagined first state could destroy evidence of those histories. We therefore need an account of the state being preserved or presented and of the reasons for choosing it.

The Nara Document on Authenticity, adopted in 1994, emphasized the need to consider cultural context when assessing heritage values and authenticity. It provides a useful corrective to the assumption that one material criterion settles every preservation question. The significance of continuity, use, workmanship, location, or replacement can differ among heritage practices. [47]

Treatment documentation becomes part of future observability. A note that a coating was removed or a support was reinforced helps a later investigator explain what is visible. Without it, an intervention can be mistaken for an original feature or a naturally occurring change. Photographs, material descriptions, sampled locations, and records of decisions allow the object's present state to be related to its prior states.

A diagnostic history of conservation therefore concerns both investigation and intervention. The analysis may improve because a new instrument exposes a layer, but the act of treatment can alter the evidence available to later analysis. The appropriate response is not to avoid all intervention. It is to preserve a reasoned account of what was observed, what was inferred, what was changed, and what uncertainty remains. Repair becomes more accountable when its own traces are retained.

18. Archaeological stratigraphy and the reconstruction of sequence

Archaeological evidence includes relationships that can be lost during the process of examining it. Excavation removes deposits and exposes surfaces, making some features available while changing the site itself. Recording is therefore not an administrative supplement. It preserves relationships on which later interpretation may depend.

Edward Harris's work made stratigraphic sequence explicit through the Harris Matrix. The method was published in 1975, and *Principles of Archaeological Stratigraphy* followed in 1979, with a second edition in 1989. Its diagrams represent relationships among units of stratification rather than simply arranging all finds by depth. A cut, a fill, and an interface can have different roles in the sequence. [48, 49]

The matrix helps distinguish physical relationships from historical interpretation. A deposit may be later than a surface it overlies, but that relation alone does not identify the people involved or the purpose of the activity. Some units have no directly established ordering relative to one another. A diagram should preserve that partial knowledge instead of supplying a complete narrative merely because a complete sequence is visually convenient.

Dating techniques add other constraints. Radiocarbon measurements, for example, require calibration when converted into calendar estimates; the IntCal20 calibration work documents a major modern reference curve. A date estimate concerns a sampled material and a model of its history. The relation between the material and the archaeological event still requires argument. [50]

Residual material, later disturbance, and the reuse of objects can complicate the inference. An old object in a later deposit does not necessarily date the deposit's formation. A later intrusion can introduce younger material into an earlier context. These are mechanisms to investigate, not exceptions that should be invoked solely to protect a preferred chronology.

The diagnostic comparison with trace analysis is especially useful at the level of ordering. We reconstruct a sequence from surviving relations, but we must not confuse the sequence of discovery with the sequence of deposition. We also need to retain the records that support each relation. If two observations appear incompatible, the next step may be to revisit the recording, the interpretation of an interface, or the assumed association of a sample. A well-documented unresolved relationship is more informative than an elegant diagram whose certainty was introduced by the drawing process.

19. Musical sources and historically informed performance

A musical work can survive through scores, parts, sketches, instruments, treatises, and recordings. These artifacts answer different questions. A printed score may identify pitches while leaving aspects of articulation or realization to performers. A recording documents one performance, with the additional choices introduced by the recording process. Neither artifact alone is equivalent to the complete history of a work.

The Répertoire International des Sources Musicales, founded in 1952, developed international documentation of surviving musical sources. Its records make manuscripts, printed editions, theoretical writings, and related materials discoverable across dispersed collections. The cataloging infrastructure changes what comparisons are practicable: a researcher can locate several witnesses of a work instead of relying on the most accessible edition. [51]

Historical performance scholarship examines the relations among notated instructions, instruments, conventions, and artistic decisions. Colin Lawson and Robin Stowell's *The Historical Performance of Music*, published in 1999, presents this as a field in which historical evidence informs choices without mechanically producing a unique performance. The distinction is important when authenticity is used as if it named one recoverable sound. [52]

Textual variants can have immediate practical effects. Two sets of parts may disagree about a note or dynamic. One might contain an error, but the difference could also reflect revision, adaptation, or a particular performance. A critical edition should make the basis of its choices inspectable. Silently selecting the most familiar reading can erase evidence of how the work circulated.

We can consider a hypothetical discrepancy between a conductor's score and a surviving instrumental part. The first diagnostic task is to establish their dates and relationship. If the part was copied from an earlier state, disagreement may reveal revision. If it was copied from the same state, a local copying error becomes more plausible. Neither explanation follows simply from which artifact looks more authoritative.

Performance also exposes a limit of document-centered reconstruction. A notation can be accurate while the competence needed to interpret it has changed. Reconstructing that competence requires comparison with other evidence and, sometimes, practical experimentation. The result is a historically informed realization with stated dependencies. Calling it debugging would be appropriate only for a specified defect, such as a mistaken note introduced during copying. It would be misleading if it implied that expressive decisions can be reduced to the repair of a damaged score.

20. Performance, film, and the preservation of an event

Theater, dance, ritual, and film complicate the relation between a work and its surviving record. A script is not the same artifact as a performance. A filmed performance is not the same event experienced from every position in the room. The diagnostic question concerns what a particular record can establish about the activity it represents.

Diana Taylor's *The Archive and the Repertoire*, published in 2003, examined embodied practices as carriers of cultural memory alongside archival materials. Gesture, movement, song, and performance can transmit knowledge through participation and repetition. Their relation to written records cannot be understood by treating them simply as documents that have not yet been transcribed. [53]

This distinction affects preservation. A detailed transcript may omit the features through which participants recognize a performance as competent or meaningful. Conversely, a recording may preserve visible movement without explaining its conventions. The analyst needs information about the occasion, participants, recording position, and subsequent editing. More pixels do not supply all of this context.

Film restoration introduces another history of transformation. Giovanna Fossati's *From Grain to Pixel*, first published in 2009 and revised in later editions, examines how the move between photochemical and digital media affects archival preservation and presentation. Decisions about versions, color, projection, and restoration depend on what is taken to constitute the film being preserved. Technical improvement can change an artifact's historical appearance if its goals are not clearly specified. [54]

Consider a hypothetical digital restoration assembled from two incomplete prints. The completed sequence may contain shots with different histories and qualities. A viewing copy can be coherent while the restoration record remains complex. The useful documentation identifies the source of each intervention and distinguishes recovered material from reconstruction. This makes the restoration available for later reassessment rather than presenting it as a newly discovered original.

The wider lesson is that humanistic observability can concern an event that cannot be replayed under its original conditions. Reenactment and reconstruction can test possibilities, but they also produce new events. Their evidential value depends on the question and the controls imposed. A record of how a reconstruction was made is therefore part of the result. It lets us distinguish what the surviving evidence requires from what contemporary performers, archivists, or viewers supplied in order to make the event intelligible again.

PART V

Authority, silence, and contested evidence

21. Archives and the production of silence

An archive is not a neutral recording of everything that happened. Records were created for particular purposes, kept under particular conditions, and described through particular categories. Some activities generated abundant documentation because institutions sought to regulate them. Others remained poorly recorded even when they were important to the people involved. The amount of surviving text cannot be read directly as the amount of historical activity.

Michel-Rolph Trouillot's *Silencing the Past*, first published in 1995, examined how power enters the production of historical facts and narratives. Silence can arise at several stages, including the making of sources, their assembly, and their subsequent use. This redirects inquiry from a simple search for missing documents toward the processes that determined what could become evidence. [55]

The distinction is diagnostically useful. A gap may reflect destruction, non-recording, restricted access, or a cataloging practice that makes relevant material difficult to find. These mechanisms have different implications. If a record was never made, improved image recognition will not recover it. If it survives under another category, a changed search strategy may expose it. Treating every absence as the same problem conceals the required investigation.

Archival silence also interacts with institutional abundance. A person can appear in many records while having little opportunity to speak in them. Administrative visibility is not equivalent to self-representation. A database containing thousands of entries may reproduce this asymmetry more efficiently unless the categories and original purposes of those entries are examined.

Saidiya Hartman's 2008 essay *Venus in Two Acts* confronts the limits of recovering lives from the archive of Atlantic slavery. It examines both the violence of the surviving records and the risks involved in narrating beyond them. The methodological problem is not solved by making a fluent story fill every gap. The conditions that prevent recovery remain part of what must be explained. [56]

For our diagnostic comparison, a missing trace must be related to an observation opportunity. We need to ask what would normally have been recorded, by whom, and under which conditions. Even then, absence supports only a claim of appropriate scope. The failure to find a voice can expose the structure of an archive without establishing what that person would have said. Preserving this boundary is an analytical achievement, especially when a complete narrative would be easier to read.

22. Oral history and the meaning of discrepancy

Oral history brings recorded recollection into a deliberate relationship with historical inquiry. The interview is both a source about earlier events and an event produced through questions, memory, interaction, and the circumstances of recording. A transcript that removes these conditions can make the evidence appear more immediate than it is.

Alessandro Portelli's work, collected in *The Death of Luigi Trastulli and Other Stories* in 1991, examined differences between remembered chronology and other evidence. His approach treated oral accounts as evidence of meaning as well as information about events. A discrepancy could reveal how a community organized experience and connected an individual death with a wider history. It did not require abandoning the attempt to establish when the death occurred. [57]

This produces two legitimate but distinct investigations. We can ask whether a reported event happened at the stated time. We can also ask why it was remembered at another time. Correcting the date answers the first question while potentially creating the evidence for the second. Deleting the discrepancy from the archival record would make the corrected account less informative about memory.

The interview relation also matters. A question can introduce a category that the narrator would not otherwise have used. A familiar interviewer and an unfamiliar interviewer may elicit different accounts. Editing can change how hesitation, irony, or emphasis is perceived. These observations do not invalidate interviews; they identify the circumstances under which the evidence was produced.

The Oral History Association's principles and practices make the responsibilities of interviewing, consent, preservation, and access explicit. Their importance to this history is methodological as well as ethical. Agreements about use influence what can be recorded, how it may be shared, and whether future readers can inspect the conditions of its production. [58]

We can therefore treat discrepancies as diagnostic branches rather than automatic disqualifications. One branch investigates event chronology. Another examines narrative structure. A third examines interview conditions or editorial transformation. The branches may converge, but they should not be collapsed at the outset. An account can be inaccurate about a date and still be valuable evidence about expectation, identity, or later interpretation. A careful history states which evidential use is being made and avoids transferring credibility or doubt indiscriminately between them.

23. Categories, perspectives, and the authority to interpret

Humanistic evidence is organized through categories that have histories of their own. Labels for peoples, genres, identities, and periods can make comparison possible while also importing assumptions. An investigator may accurately count the contents of a category without examining how membership was assigned. The result can be technically correct and historically misleading.

Joan W. Scott's 1986 article *Gender: A Useful Category of Historical Analysis* argued for examining gender as a constitutive element of social relationships and a way of signifying power. Its diagnostic significance here lies in making the analytical category itself questionable. Adding neglected people to an existing account may be necessary, but the organizing concepts of the account may also require revision. [59]

Edward Said's *Orientalism*, published in 1978, examined relationships between scholarly representation and imperial power. Its argument prompted extensive debate about how bodies of knowledge characterize their objects and establish authority. We need not treat every description as interchangeable or every disagreement as resolved to recognize the analytical question: what institutional and conceptual conditions made this representation persuasive? [60]

Linda Tuhiwai Smith's *Decolonizing Methodologies*, first published in 1999 and developed in later editions, addresses research from Indigenous perspectives and challenges assumptions about discovery, extraction, and ownership. A collection can be accessible to a researcher while its use remains inappropriate to the community whose knowledge it contains. Availability is only one condition of responsible investigation. [61]

The CARE Principles for Indigenous Data Governance, released in 2019 and set out in a 2020 paper, identify Collective Benefit, Authority to Control, Responsibility, and Ethics. They complement technical concerns about data management by asking whose purposes and authority govern the work. This changes the design of observability: making material universally searchable is not always the appropriate objective. [62]

A diagnostic account should therefore include the history of its own categories and access decisions. For a hypothetical catalog of ritual objects, correcting dimensions does not resolve an inaccurate cultural classification. Replacing that classification does not by itself establish permission to reproduce restricted imagery. These are connected tasks with different standards of justification. The history of humanities expands when the people represented in an archive can also contest its descriptions and participate in determining how their evidence is interpreted and used.

24. Forgery, misattribution, and the preservation of corrections

A forgery creates an artifact designed to be accepted under a false account of its origin or authority. Its success can depend on more than technical skill. Desire for a discovery, trust in an intermediary, a familiar narrative, or restricted opportunities for examination may support acceptance. Diagnosis must therefore investigate the evidential chain as well as the object.

The purported Hitler diaries published in 1983 provide a modern documentary case. The German Federal Archives' historical account records the announcement on 6 May 1983 that the diaries were forged, following examination involving several federal institutions. The case shows the importance of coordinated scrutiny when a sensational historical claim is presented through a persuasive story of discovery. [63]

The analytical structure differs from merely finding an inaccurate statement. A genuine diary can contain errors, and a forged diary can reproduce correct information from published sources. The question of authenticity concerns the artifact's asserted production and history. Agreement with known facts may be necessary in some circumstances, but it is not sufficient to establish that history.

Dependence can also undermine apparent corroboration. Several supporting reports may all derive from one source. A comparison sample may itself have uncertain provenance. When evidence circulates through trusted intermediaries, each repetition can appear to add authority without adding an independent observation. The investigator needs a map of those relationships before assessing their combined force.

Misattribution is a broader category than deliberate forgery. A cataloger can assign the wrong author in good faith. An anonymous work can acquire a famous name through repeated citation. A later edition can present an adaptation as an original text. The correction should identify the mechanism where the evidence permits it and should not infer fraudulent intent merely from a false attribution.

After a forgery is identified, its evidential life changes rather than ends. It becomes evidence for the history of deception, collecting, publication, and reception. The later transfer of the forged diaries to the Federal Archives makes this change particularly concrete. Preservation can support the study of how a false claim was manufactured and accepted. [64]

The diagnostic result should therefore preserve both the rejected claim and the reasons for rejection. A database that silently removes a false attribution may leave earlier scholarship difficult to interpret. A documented correction allows readers to understand why a once-accepted source disappeared from an argument and which conclusions depended on it.

25. Microhistory, narrative, and competing reconstructions

Historical explanation does more than arrange verified statements in date order. It selects a scale, identifies relationships, and constructs a narrative through which events become intelligible. Those operations can be examined without abandoning the distinction between supported and unsupported claims.

Carlo Ginzburg's *The Cheese and the Worms*, first published in Italian in 1976 and in English in 1980, reconstructed the intellectual world of the sixteenth-century miller Menocchio through inquisitorial records and other evidence. The work became a prominent example of microhistory. Its small scale made detailed relationships visible while also confronting the mediation of testimony through an institution with its own purposes. [65]

Microhistory is not simply a larger narrative reduced to fewer people. Close examination can reveal connections and exceptions obscured by aggregate categories. Yet a richly documented case does not automatically represent a whole population. The analyst must distinguish evidence that a possibility existed from evidence about how common it was.

Hayden White's *Metahistory*, published in 1973, examined literary and rhetorical organization in historical writing. The book made the form of explanation itself an object of analysis. Recognizing narrative construction does not compel the conclusion that evidence is irrelevant. It invites examination of how selected facts are made to support a particular kind of story. [66]

Quentin Skinner's 1969 essay on meaning and understanding in the history of ideas raised another problem of reconstruction: attributing to past writers doctrines or intentions that belong to a later conceptual agenda. A text needs to be considered within the linguistic and argumentative situations in which an author could have acted. Similar words across periods do not necessarily perform the same intellectual work. [67]

These developments help us distinguish several kinds of disagreement. Two histories may disagree about a date, about a causal connection, about the scale of explanation, or about the significance assigned to an event. Resolving one disagreement may leave the others intact. The diagnostic task is to locate the point at which the accounts diverge and identify the evidence or commitments on which that divergence depends.

We can then preserve competing reconstructions without declaring them equally strong. One may explain more evidence with fewer unsupported assumptions. Another may remain possible but depend on a missing source. A third may be incompatible with an established chronology. Making these relations explicit produces a more useful historical result than either premature certainty or an undifferentiated statement that every interpretation is subjective.

PART VI

Computational instruments and derived evidence

26. Humanities computing and the history of analytical labor

Humanities computing did not begin with a machine discovering meanings that scholars had overlooked. Early projects required the definition of textual units, the preparation of input, and the checking of large quantities of transformed material. Their history includes intellectual design and sustained editorial labor as well as computers.

Roberto Busa's Index Thomisticus became an influential example. In his 1980 account of the project, Busa described the development of computational work on the language of Thomas Aquinas, including the importance of indexing and linguistic organization. The project's collaboration with IBM began in 1949. Its purpose required more than counting visible character strings: the relation among word forms, lemmas, and contexts mattered to the scholarly question. [68]

A concordance changes observability by making dispersed occurrences inspectable together. A reader can compare contexts that would be difficult to hold in memory during sequential reading. But a concordance also introduces a representation. The chosen text, rules of segmentation, treatment of variants, and indexing decisions determine what the reader can find.

This creates a historical continuity with earlier scholarly instruments. Tables, indexes, catalogs, and critical apparatuses already reorganized evidence for comparison. Computation changed their scale and speed and enabled new transformations. It also introduced new places where an error could enter: character encoding, data conversion, search logic, and the software used to display results.

The labor behind these instruments should remain visible. A clean searchable text can conceal transcription, correction, classification, and adjudication. If the record of those activities disappears, later users may attribute consistency to the source that was actually introduced by the project. The final dataset can then become misleading evidence about historical spelling, punctuation, or variation.

We can illustrate this with a hypothetical concordance of an author's works. A repeated expression appears to occur only in early publications. Before interpreting it as intellectual development, we should inspect whether later texts were normalized differently, whether supplements were excluded, and whether the same form was indexed under another lemma. The apparent historical pattern may be real, but its explanation depends on the instrument's construction. Humanities computing expands the range of questions we can ask while making the history of data preparation part of the evidence needed to answer them.

27. Digital editions and inspectable editorial decisions

A digital edition can present a reading text, images of witnesses, transcriptions, annotations, and alternative versions within one environment. This makes possible forms of comparison that a printed page can only approximate. The additional capacity does not remove editorial judgment. It makes the representation of that judgment a central design problem.

The Text Encoding Initiative began in 1987, and its first official Guidelines, P3, appeared in 1994. The project developed methods for representing textual and related humanistic information independently of particular software or hardware. Its history reflects collaboration around the need to preserve scholarly distinctions while allowing texts to move between systems. [69]

The TEI critical apparatus module distinguishes witnesses and readings and provides ways to record editorial responsibility and certainty. Its documentation explicitly recognizes that different editorial methodologies require different choices. Encoding does not select the best textual method for an editor; it supplies structures in which a chosen method can be made explicit. [1]

Digital access also changes the practical geography of scholarship. The International Dunhuang Project, now known as the International Dunhuang Programme, was established in 1994 to support cooperation around dispersed collections, their conservation, and their documentation. Its later digital resources allow objects held in different institutions to be brought into comparative view. Such access can support new relationships among fragments while leaving questions about acquisition, ownership, and the history of dispersal open. [70]

Interoperability introduces another useful layer. The IIIF Presentation API describes how compound digital objects and annotations can be presented, and its version 3.0 extended the model to time-based media. Common interfaces can make images and recordings easier to compare across collections. They do not establish that a manifest is complete, that its ordering is historically correct, or that every annotation is equally well supported. [71]

A diagnostic digital edition should therefore preserve the difference between an image, a transcription, an editorial reading, and a generated display. A missing line on screen can arise from an absent source, incomplete encoding, a transformation rule, or a viewer problem. The same visible symptom has several possible origins. When the edition retains identifiers and transformation records, these alternatives can be investigated without rebuilding the entire project from its public appearance.

28. OCR, search, and the diagnosis of a derived corpus

Digitization creates a succession of artifacts. A physical page becomes an image; an image becomes recognized text; recognized text becomes a normalized and indexed corpus. Each transformation can improve access while introducing changes. A researcher who begins at the search box enters this sequence near its end.

Optical character recognition makes printed collections searchable, but errors can depend on typeface, layout, damage, language, and image quality. Mark J. Hill and Simon Hengchen's 2019 study examined the effects of imperfect OCR on historical text analysis using Eighteenth Century Collections Online. The consequences were task-dependent: an error rate by itself does not tell us whether a particular historical conclusion is robust. [72]

A search for a name is especially sensitive to the form under which that name has been indexed. A thematic analysis may tolerate some scattered recognition errors while being distorted by systematic errors concentrated in a period or publication type. Aggregation can reduce some local noise, but it can also make patterned missingness appear to be a historical trend.

Consider a constructed corpus in which a phrase seems to disappear after a change in typeface. If the recognition system confuses the same letter group in the later material, the frequency plot may describe recognition performance rather than language use. The relevant comparison includes page images, alternative spellings, search rules, and a sample of manually checked passages. Merely repeating the query on the same index does not provide independent confirmation.

The diagnosis must also separate source damage from processing failure. A blank in a transcription can indicate a torn page, illegible print, a skipped image, or a rule that excluded marginal text. These mechanisms lead to different remedies. We may need another physical witness, a better image, corrected OCR, or a change in the project's inclusion policy.

The history of digital collections therefore extends the older history of critical apparatus. Users need to know where readings came from and what transformations produced them. A corrected search index should retain its relationship to earlier versions when published analyses depend on them. Otherwise, a later researcher may be unable to reproduce an earlier result and mistake a silent technical repair for a disagreement about the past. The corpus itself requires a history.

29. Stylometry, distant reading, and comparative validity

Quantitative literary analysis changes the scale at which patterns become visible. Frequent words, grammatical features, genre labels, and publication dates can be compared across more texts than a reader could examine closely in one investigation. The resulting regularities are evidence about the chosen representation of the corpus. Their connection with authorship, genre, or historical change requires further argument.

Frederick Mosteller and David Wallace's *Inference and Disputed Authorship*, published in 1964, used statistical analysis in the attribution of disputed Federalist papers. The case became influential because it joined a concrete historical problem with explicit probabilistic reasoning and comparative textual evidence. It did not establish that every authorship problem can be solved by the same features or assumptions. [73]

John Burrows's 2002 article on Delta proposed a measure of stylistic difference and a guide to likely authorship. Its wording is instructive: a distance among representations is not itself a historical identity certificate. The reference texts, chosen features, sample lengths, and possible confounders affect what the comparison can support. [74]

Ted Underwood's *Distant Horizons*, published in 2019, explored large-scale literary change through computational evidence. Such work makes comparisons available at scales that differ from the individual work or passage. The result need not replace close reading. It can identify patterns whose historical explanation requires returning to texts, categories, and the composition of the collection. [75]

A model trained to distinguish authors may instead exploit genre, period, publisher, or editorial convention if these coincide with the author labels in its examples. A translation can carry the translator's habits. A collected edition can introduce common spelling and punctuation. The diagnosis therefore asks whether the apparent author signal survives comparisons that separate these alternatives.

The same principle applies to absence. A corpus can show a decline in a topic because different books were digitized in later periods. A classifier can appear successful because closely related editions occur on both sides of an evaluation split. These are ordinary evidential questions about dependence and coverage expressed through new technical arrangements.

Computational comparison becomes historically useful when the representation, sampling, and evaluation decisions remain inspectable. A numerical score should be connected to a claim of appropriate scope and to the conditions under which that claim could fail. The result is an additional line of evidence whose strengths and limitations can be compared with bibliography, archival history, and textual criticism.

30. Imaging, virtual reconstruction, and machine suggestions

Imaging technologies can expose features that ordinary viewing cannot distinguish. Multispectral examination can separate traces of writing from other marks, and tomographic methods can support the reconstruction of inaccessible surfaces. These techniques create new representations of an artifact. Their historical value depends on maintaining the relation between measured signals, processing decisions, and the readings proposed from them.

The Archimedes Palimpsest is a prominent example. The surviving prayer book reused parchment from several earlier manuscripts, including a tenth-century copy containing works by Archimedes. Its conservation and imaging project made erased writings available for renewed scholarly reading. The artifact preserves several textual histories; the modern name highlights only one of them. [76, 77]

Virtual unwrapping offers another kind of access. The 2016 study of the En-Gedi scroll described a computational process for extracting and flattening a writing surface from volumetric scans so that its

text could be read. The resulting readable image was produced through a chain of geometric and imaging operations, not by physically opening the damaged scroll. [78]

These cases require a distinction between revealing surviving marks and proposing missing text. A processing method can increase the visibility of material evidence. A language model can also suggest a plausible continuation where material evidence is absent. Both may assist inquiry, but their outputs have different evidential status. A convincing suggestion is not a newly observed stroke.

The 2022 Nature paper on Ithaca presented a neural system for restoring and attributing ancient Greek inscriptions. Its authors described proposed restorations as suggestions and evaluated the system in relation to historical tasks. The model's output depends on training material and task design. It should enter an argument as a candidate to examine, not as an independent witness to the ancient event. [79]

We can therefore organize the diagnostic sequence around provenance. Which pixels or scan values support the reading? Which transformations were applied? Which letters are observed, uncertain, or supplied? Can the proposed restoration be tested against language, space, formula, chronology, and other witnesses? Recording these distinctions prevents a useful computational aid from converting uncertainty into apparently recovered evidence. It also preserves the possibility that a later reader will reject the suggested text while accepting the underlying imaging result.

PART VII

Diagnostic patterns and the preservation of explanations

31. Digital preservation and the provenance of a result

Digital preservation concerns more than retaining a readable file. A file may survive while its relation to a collection, application, or earlier version becomes obscure. A text may remain legible after conversion while losing annotations or distinctions that mattered to an argument. Preservation must therefore consider the information needed to interpret the surviving object.

The PREMIS Data Dictionary for Preservation Metadata, version 3.0 published in 2015, organizes preservation information through Objects, Events, Rights, and Agents. These distinctions support records of what was preserved, what happened to it, who or what acted, and which permissions apply. A conversion can then be represented as an event in the object's history rather than mistaken for an unchanged continuation. [80]

The W3C PROV family, documented in 2013, provides models for representing provenance through entities, activities, and agents. In a humanistic project, this can help connect a transcription to its image, an annotation to its author, or a published dataset to the transformations that produced it. A provenance description is still a claim about history; its presence does not independently guarantee the claim's accuracy. [81]

The FAIR Guiding Principles, published in 2016, emphasize findability, accessibility, interoperability, and reusability. These goals address conditions under which data can support further work. Reusability also depends on whether a later scholar can understand the definitions and decisions that produced the data. A table with excellent identifiers may remain misleading if its historical categories are unexplained. [82]

Fixity checks answer a narrower question. A matching checksum can support the claim that a sequence of bytes has not changed since a reference value was established. It does not establish that the original scan was complete, the catalog date correct, or the object appropriately described. Integrity at one representational level must not be transferred automatically to another.

The diagnostic benefit of preservation metadata is that it makes failures localizable. If a diacritic disappears, we can examine the conversion in which it was lost. If a result changes, we can compare input versions and processing decisions. If a document is unavailable, we can distinguish a technical failure from an access restriction. Without such records, every new investigation must infer the history of the instrument from the instrument's final output. Preserving that history allows correction to accumulate as knowledge instead of repeatedly disappearing into replacement files.

32. Visualization and the conditions of observability

A timeline, map, or network can make a relationship easier to inspect than a long narrative. It can also introduce an appearance of precision that the evidence does not support. A point on a timeline requires a coordinate even when the historical date is a range. A line between two people can conceal uncertainty about whether they met, corresponded, or merely appeared in the same source.

Johanna Drucker's 2011 article *Humanities Approaches to Graphical Display* argued for representations that acknowledge interpretation and the constructed character of humanistic data. Its distinction between data treated as given and *capta* understood as taken directs attention to selection and modeling. A display should not make interpretive commitments disappear behind apparently self-evident graphical forms. [83]

This is a specific contribution of humanities to the wider history of observability. More visible output is not necessarily better evidence. A dense network can contain uncertain identity matches, inferred edges, and duplicated sources. If those distinctions are omitted, the display may be less analytically useful than a smaller set of carefully documented relations.

We can consider a hypothetical map of an author's journey. One location is established by a dated letter, another inferred from a later memoir, and a third only proposed by a biographer. Plotting three identical markers gives these claims the same appearance. Different symbols or an accompanying evidence table can preserve their status without preventing comparison.

The same issue occurs with time. The date of an event, the date of its recording, the date of a surviving copy, and the date of digitization are different attributes. A database that has only one date field encourages substitutions that can distort an analysis. An apparent cluster may concern accession or publication rather than the events under study.

Observability in this history therefore includes the visibility of uncertainty, dependence, and transformation. It is not equivalent to the formal control-theoretic property of reconstructing a state from outputs. The useful question is whether the available arrangements let us inspect the evidence relevant to a particular claim. A visualization succeeds when it helps the reader ask better questions and return to the supporting artifacts, including the places where the record remains incomplete.

33. Connections to pattern-oriented software diagnostics

Our pattern-oriented software diagnostics organizes recurring problems of analysis through patterns that connect observed features with further investigative actions. The trace and log analysis repertoire has already expanded toward texts, narratives, and data. Its use in humanities is most productive when the mapping remains explicit and the historical object is allowed to constrain the analogy. [84]

Message Context directs attention to related material around a selected message. In humanistic inquiry, a quotation can be considered together with its paragraph, genre, occasion, and transmission. The

relevant context is not always a fixed number of neighboring sentences. It may include a reply preserved in another collection or an editorial convention explained elsewhere.

Adjoint Thread of Activity groups records by a chosen attribute rather than only by their original computational thread. For a correspondence collection, an analogous operation can follow a person, place, topic, or shared document across several sources. The grouping rule must be preserved because it determines which apparent continuity the resulting sequence displays. The analogy does not imply that historical persons are operating-system threads. [84]

Message Invariant separates recurring structure from changing values. Documentary formulas, repeated headings, and conventional openings can supply comparable structures. Discontinuity and No Activity direct attention to gaps, but their transfer requires particular care: no surviving letter does not establish that no communication occurred. The conditions of recording and survival remain part of the hypothesis.

Meta Trace concerns the evolution of traces and their forms. An analogous history can follow how a catalog, edition, or transcription changes across versions. A newly visible pattern may result from a changed representation rather than a changed account of the underlying historical activity. This distinction is especially useful when computational analyses are repeated on updated collections. [84]

Pattern or concept	Humanistic comparison	Boundary to retain
Message Context	Read a quotation through related passages, genre, occasion, and transmission.	Relevant context can extend beyond neighboring text.
Adjoint Thread of Activity	Follow a person, place, topic, or document across dispersed records.	The selection rule creates the sequence being inspected.
Message Invariant	Compare recurring documentary formulas and their variable portions.	A shared formula does not establish independent corroboration.
Discontinuity	Investigate a gap in correspondence, performance records, or catalog coverage.	A recorded gap need not be a gap in historical activity.
No Activity	Ask whether an expected class of records is wholly absent.	The expectation requires evidence about recording and survival.
Meta Trace	Compare the evolution of editions, catalogs, transcriptions, or datasets.	A changed representation need not indicate changed historical evidence.
Software narratology	Separate the order of recording from the reconstructed order of events.	The purpose and conventions of each narrative remain relevant.

These connections do not establish a new historical origin for the patterns or make humanities a subset of software analysis. They organize questions about evidence. The strongest transfer is often an investigative habit: retain context, examine dependencies, compare representations, and distinguish an observed discrepancy from its possible causes. Humanities add another requirement: ask how the categories, purposes, and authority of the observer shaped what became a trace in the first place.

34. A worked investigation of an apparent rupture

Let us consider a constructed example. It is not a report of an actual archival discovery. A researcher studies correspondence associated with a small theater company. A searchable collection shows an abrupt end to exchanges between a director and a translator in October of a particular year. A later memoir describes a disagreement. The researcher proposes that the collaboration ended because of that disagreement.

The first observation is narrower: the current search returns no matching correspondence after October. We have not yet established that letters were not written, that the collection is complete, or that the search identifies every relevant record. The memoir supplies a possible explanation, but its relation to the observed gap remains to be tested.

We first record the query, collection version, date field, and identity rule. Inspection shows that the index uses the date of the letter when available but sometimes substitutes an estimated catalog date. Several records use the translator's initials. A married surname appears in later descriptions. We now have reasons to widen the identity search and separate secure dates from estimates.

Next we compare the derived text with images. One later letter contains the director's name, but the name was misrecognized by OCR. Another relevant letter survives only as an enclosure and lacks its own catalog record. These findings explain part of the apparent rupture. They do not yet establish that the collaboration continued in the same form.

We then inspect provenance. A later inventory reveals that one box was acquired separately and was not included in the digitization. The search interface gave no visible indication of this boundary. The gap therefore combines several mechanisms: identity variation, recognition failure, incomplete item description, and collection coverage. Repairing only the OCR would have left most of the problem unresolved.

The memoir is now reconsidered alongside the recovered correspondence. The disagreement may still have occurred, but the surviving letters do not support the claim that it immediately ended all communication. The narrower conclusion is that the initial search could not establish the proposed rupture. Whether the disagreement changed the artistic relationship remains a historical question requiring other evidence.

Observed condition	Check in the constructed case	Result and remaining limit
No later search hits	Compare names, initials, and later surname forms.	The identity rule excluded some relevant records.
Mixed dates	Separate explicit letter dates from catalog estimates.	Chronology becomes less tidy but more accurate.
Missing name in text	Compare OCR with the page image.	A recognition error explains one missed letter.
Uncataloged enclosure	Inspect the surrounding archival unit.	Item-level discovery missed related material.
Undigitized box	Compare the digital collection with the acquisition inventory.	Digital coverage was incomplete.
Memoir reports conflict	Reconsider the claim alongside later correspondence.	Conflict remains possible; immediate cessation is unsupported.
Published causal account	Preserve queries, corrections, and reasoning.	The claim is narrowed; artistic consequences remain open.

The diagnostic result includes corrections to the representations and a revision of the historical claim. We retain the original query result, the checks, and the reasons for the change. This allows another reader to reproduce the path from an apparent pattern to a more limited explanation. It also preserves a useful negative result: the available evidence does not support the causal account first proposed.

35. Continuing developments and the limits of automation

The history surveyed here suggests several directions for further work. Collections can preserve more of their editorial and processing history. Interfaces can distinguish absent evidence from unavailable evidence. Computational systems can help compare witnesses, locate recurring features, and identify passages that need human attention. These developments extend longstanding practices of criticism through new instruments.

Generative systems also create a new route by which an interpretation can become detached from its evidence. A fluent answer can combine accurate information, unmarked conjecture, and invented detail in one continuous account. For historical work, the crucial requirement is not fluency alone but the ability to connect a claim with an identifiable source and an inspectable chain of transformation.

The distinction between retrieval and restoration becomes especially important. Returning a passage from a known edition is different from proposing words for a damaged inscription. Summarizing an interview is different from constructing a plausible answer that the interviewee never gave. The visible form of the output can conceal these differences unless the system and the publication preserve them explicitly.

Automated evaluation also needs historical care. A model can reproduce the labels of an existing catalog while reproducing its errors. It can score well on material closely related to its training examples and fail on a different language, period, or document type. The appropriate investigation connects performance

with the composition of the examples and the intended scholarly use. It also asks which forms of uncertainty the evaluation has excluded.

Humanities provide a long record of warnings against treating agreement as independence, legibility as authenticity, and coherence as proof. These warnings remain useful when software produces the intermediate artifacts. Their application does not require rejecting computational assistance. It requires preserving the distinction between a tool's operation and the historical claim for which its output is used.

Future progress will also depend on the institutions and communities that preserve evidence. Access, language expertise, conservation, cataloging, and sustained maintenance determine what can be investigated. An advanced model cannot compensate for the loss of a collection or the exclusion of the people who understand its practices. The continuing task is to make evidence and reasoning more available for examination while preserving the limits, responsibilities, and differences through which that evidence acquires meaning.

Conclusion

Diagnostics, observability, and debugging provide a useful comparative vocabulary for a long history of humanistic inquiry. The practices themselves arose in different settings and under different names. Reciters maintained received sequences. Editors compared witnesses. Philologists examined anachronisms. Historians criticized reports. Conservators investigated layers and interventions. Digital scholars made transformations and collections available at new scales.

Across these histories, we repeatedly encounter the separation of an artifact from its representation and of a representation from the explanation built upon it. A correction can concern one of these levels without settling the others. Establishing a manuscript's date does not resolve every question about its text. Correcting OCR does not make a collection complete. Recovering a sentence does not determine the only possible interpretation of the work.

The contribution of humanities also runs in the opposite direction. It teaches diagnostics to examine the origin of categories, the mediation of testimony, the organization of narratives, and the authority through which evidence is preserved. These are useful questions whenever we reconstruct activity from traces, including traces produced by software systems and by the instruments used to study them.

We can therefore regard a good diagnostic result as more than a repaired artifact or a persuasive answer. It is an explanation whose supporting observations, transformations, and remaining alternatives can be inspected. Some investigations end with a corrected reading. Others end with a narrower conclusion or a documented uncertainty. In each case, preserving the path from evidence to claim allows the next investigation to begin with accumulated knowledge.

Appendix A Selected chronology

This chronology identifies selected developments discussed in the chapters. A publication date marks an available artifact, not the first occurrence of every idea associated with it. Earlier traditions continued alongside later methods. The table should therefore be read as a set of reference points rather than a single line of progress.

Period or date	Development	Diagnostic significance
Continuing traditions	Oral transmission and disciplined recitation	Preservation can concern precise sound or competent recomposition, depending on the tradition. [3, 5]
Fifth century BCE	Thucydides on speeches and events	The historian states different evidential conditions for different parts of a narrative. [12]
Hellenistic period	Alexandrian Homeric scholarship	Comparison, commentary, and critical signs make questioned readings visible. [6, 7]
Medieval traditions	Scriptural transmission and annotation	Texts circulate with information about readings, transmission, and interpretation. [9, 10]
1377	Initial composition of the Muqaddimah	Historical reports are examined in relation to the conditions of human society. [13]
1440	Valla writes against the Donation	Linguistic and historical discrepancies support an argument against authenticity. [14]
1670	Spinoza's Theological-Political Treatise	Language and historical circumstances become explicit instruments of scriptural inquiry. [11]
1681	Mabillon's De re diplomatica	Comparative documentary analysis becomes more systematically inspectable. [16]
Seventeenth–eighteenth centuries	Evidential scholarship in late imperial China	Philological and historical comparison reshape inherited scholarly questions. [19]
1822	Champollion's decipherment announcement	Multiple constraints connect visible Egyptian signs with a readable system. [23]
Nineteenth century	Genealogical textual criticism	Witness dependence challenges simple majority counts of readings. [20, 21]
Later nineteenth century	Morelli's connoisseurship	Recurrent visual particulars become evidence in attribution. [42, 43]
1878	Peirce on conceptual clarity	Conceivable consequences help distinguish operative meanings. [30]
1898	Langlois and Seignobos's manual	The search for documents and the operations of source criticism are organized explicitly. [27]
1927	Maas's Textkritik	A concise account systematizes important problems of textual reconstruction. [20]
1929	Richards's Practical Criticism	Readers' recorded responses become material for investigating interpretation. [33]
1939	Panofsky's Studies in Iconology	Visual identification and broader interpretation are distinguished. [44]

Period or date	Development	Diagnostic significance
1946	The Intentional Fallacy	The relation between evidence of intention and literary judgment is challenged. [34]
1949	Bloch's posthumous French work; Busa's IBM collaboration begins	Historical questioning and computational indexing develop different ways of making evidence usable. [18, 68]
1952	Linear B decipherment; founding of RISM	Linguistic reconstruction and international source documentation extend comparative access. [24, 51]
1953	Philosophical Investigations	Analysis of language use exposes kinds of conceptual confusion. [31]
1960	The Singer of Tales; Truth and Method	Oral composition and historically situated understanding receive influential formulations. [5, 29]
1964	Inference and Disputed Authorship	Statistical comparison is applied to a concrete attribution problem. [73]
1966	Completion of the eighteen parvans of the Mahabharata Critical Edition	A large constituted text and apparatus preserve extensive editorial comparison. [22]
1969	Skinner on the history of ideas	Interpretive claims are tested against historically available contexts. [67]
1972–1976	Narrative Discourse, Metahistory, and A Theory of Semiotics	Narrative form and signification become explicit objects of methodological analysis. [36, 37, 66]
1975–1979	Harris Matrix publication and first stratigraphy book	Archaeological ordering is represented through documented relationships. [48, 49]
1978	Orientalism	Scholarly representations are examined in relation to institutional and imperial power. [60]
1983	Exposure of the purported Hitler diaries	Coordinated scrutiny rejects a sensational documentary claim. [63]
1986	Scott on gender; McKenzie's lectures published; Law's Empire	Categories, material forms, and interpretive commitments become objects of criticism. [2, 32, 59]
1987–1994	TEI established; P3 Guidelines released	Encoding develops as a means to preserve and exchange scholarly distinctions. [69]
1991	Portelli's collected oral-history studies	Discrepancy becomes evidence about memory as well as chronology. [57]
1994	IDP founded; Nara Document adopted	Cooperation and cultural context reshape access and authenticity debates. [47, 70]
1995–1999	Trouillot and Smith; historical performance synthesis	Silence, research authority, and reconstruction are examined in their specific settings. [52, 55, 61]
2002–2003	Burrows's Delta; The Archive and the Repertoire	Quantitative style and embodied memory extend different forms of comparison. [53, 74]
2008–2011	Venus in Two Acts; Drucker on graphical display	Narrative limits and the representation of interpretation become explicit concerns. [56, 83]
2013–2016	PROV, PREMIS 3.0, and FAIR	Provenance, preservation events, and reuse become more systematically representable. [80, 81, 82]
2016	En-Gedi virtual unwrapping study	A documented computational chain exposes otherwise inaccessible writing. [78]
2018–2019	Fossati's third revised edition; OCR and distant-reading studies	Different media and analytical tasks expose different transformation risks. [54, 72, 75]

Period or date	Development	Diagnostic significance
2020	CARE Principles paper; IIIF 3.0	Data governance and interoperable presentation address complementary conditions of access. [62, 71]
2022	Ithaca research publication	Machine suggestions assist textual restoration and attribution under evaluation. [79]
2023	Digital Florentine Codex	Multilingual and visual evidence becomes jointly searchable and comparable. [40]

Appendix B Glossary

Abduction. The proposal of an explanatory hypothesis for observed evidence. The hypothesis requires further assessment; its ability to make an observation intelligible does not establish that it is true.

Adjoint Thread of Activity. In our trace analysis repertoire, a sequence formed by selecting messages through a chosen attribute or criterion. An analogous selection in humanities must preserve its grouping rule and evidential boundaries.

Anachronism. A feature interpreted as belonging to a different period from the one claimed. Its explanation may involve later copying, interpolation, modernization, mistaken dating, or fabrication.

Annotation. Information attached to an artifact or representation to describe, interpret, question, or relate a feature. The annotation has its own author, date, purpose, and evidential status.

Apparatus. An organized record of readings, witnesses, variants, or editorial decisions accompanying a text. Its coverage depends on the edition's stated policy.

Archetype. In textual genealogy, a reconstructed ancestor of the surviving witnesses under a particular model. It is not automatically identical to an author's original composition.

Archive. A body of records and the arrangements through which they are preserved and made available. Creation, selection, description, custody, and access shape its evidential possibilities.

Attribution. A reasoned association of an artifact with an author, workshop, place, period, or other source of production. The degree of commitment should remain explicit.

Authenticity. The support for an artifact's claimed identity or history, assessed in an appropriate context. Authenticity does not guarantee the truth of every statement an artifact contains.

Calibration. The use of an established relationship or reference to interpret a measurement. In radiocarbon dating, calibration relates radiocarbon ages to calendar estimates under a specified model.

Capta. A term used to emphasize that material for analysis is selected and constituted through interpretive acts rather than simply received as self-explanatory data.

Collation. Systematic comparison of textual witnesses to identify agreement and variation. The definition of a meaningful difference depends on the purpose and level of comparison.

Concordance. An organized collection of occurrences of words or expressions with their contexts. It makes comparison easier while reflecting choices about text, segmentation, and indexing.

Conjecture. A proposed reading or explanation not directly attested in the relevant surviving evidence. It may be strongly reasoned but must remain distinguishable from observation.

Conservation. Investigation and care directed toward the preservation of cultural material and its significance. Treatment can change the evidence and should retain an account of the intervention.

Contamination. In textual criticism, mixed transmission in which a witness draws on more than one source. It can complicate a simple branching genealogy.

Context. The relationships relevant to interpreting a feature or claim. Context may be textual, material, linguistic, institutional, temporal, or connected with transmission and use.

Corpus. A defined collection of material assembled for analysis. Its boundaries and preparation history are part of the evidence needed to interpret results derived from it.

Critical edition. An edition that presents a text or textual tradition through stated scholarly methods and evidence. Different editions can pursue different goals without one common definition of an original.

Decipherment. The establishment of a usable interpretation of a writing system through the coordination of signs, language, and other constraints. Visible marks alone do not provide their reading.

Derived artifact. An object produced by transforming or selecting other material, such as a transcription, normalized text, search index, visualization, or restoration image.

Diplomatics. The critical study of documents through their forms, production, transmission, and authenticity. It is distinct from diplomacy in the ordinary sense of international negotiation.

Discontinuity. A gap or interruption in an observed sequence. Its cause may concern the underlying activity, the recording process, preservation, selection, or display.

Emendation. An editorial change intended to correct a text. The reading before correction and the grounds for intervention should remain available where they matter to the edition.

Epigraphy. The study of inscriptions, including their writing, material setting, language, and historical interpretation. A restored text must distinguish surviving marks from supplied content.

Evidence. Material used in support of a particular claim through an argument. The same artifact can have different evidential value for different questions.

Fixity. The condition of remaining unchanged at a specified representational level. Digital fixity concerns bytes; it does not establish historical authenticity or interpretive accuracy.

Forgery. An artifact produced or altered to support a deceptive claim about origin, identity, or authority. It can become evidence for the history of its fabrication and reception.

Hermeneutics. Inquiry into interpretation and the conditions of understanding. It examines relationships among parts, wholes, language, history, and the interpreter's assumptions.

Inference. A reasoned movement from observations or premises to a claim. Its strength depends on both the evidence and the assumptions connecting that evidence with the conclusion.

Interpolation. Material inserted into a text during its transmission or development. Its status and significance require historical examination rather than automatic removal.

Isnad. A chain of transmission associated with a hadith report. Its evaluation belongs to historically developed practices that should not be reduced to a modern citation count.

Lacuna. A gap in a text or artifact. The gap may be visible in the surviving object or inferred through comparison; proposed completions should preserve that distinction.

Lemma. In a critical apparatus, a selected or base reading; in linguistic analysis, a dictionary or normalized headword. The two uses must be distinguished.

Matn. The content of a hadith report, distinguished from its chain of transmission. Assessment of content and transmission can interact within particular scholarly methods.

Message Context. An analysis pattern concerned with messages related to a selected message. Its humanistic analogue asks which surrounding or linked evidence makes a passage intelligible.

Message Invariant. A recurring structural portion distinguished from varying information. In documentary comparison, a formula can help locate differences without proving that the documents share one origin.

Meta Trace. In our trace analysis repertoire, a narrative about the evolution of traces or logs. An analogous inquiry follows changes in editions, catalogs, or other representations.

Microhistory. Historical inquiry conducted through close examination of a restricted case or setting. Detailed evidence can reveal possibilities and relations without automatically establishing their prevalence.

Narrative order. The sequence in which a narrative presents material. It need not match the order of events, their discovery, or their recording.

Observability. In this book's comparative usage, the conditions that make evidence relevant to a claim available for inspection. It does not imply complete or unique reconstruction of a historical state.

OCR. Optical character recognition, which transforms images of writing into machine-readable text. Recognition errors and coverage decisions can affect retrieval and subsequent analysis.

Paleography. The study of historical handwriting and scripts. Dating and localization rely on comparison and context, with limits introduced by variation, imitation, and incomplete evidence.

Palimpsest. A writing support reused after earlier writing was erased or obscured. The surviving object may preserve several textual and material histories.

Provenance. Information about an artifact's origin, custody, transformations, and relations. A recorded provenance statement is itself a claim whose basis may require examination.

Recension. A historically or editorially distinguished form or family of a text. The term's application depends on the particular transmission and scholarly convention.

Restoration. An intervention or reconstruction intended to recover a specified aspect of an artifact. Material recovery, image processing, and conjectural completion have different evidential status.

Silence. An absence or suppression relevant to a historical question. Its interpretation depends on opportunities for recording, survival, access, and representation.

Stemma. A model of genealogical relationships among textual witnesses. Its structure and inferred ancestors depend on the evidence and assumptions used to construct it.

Stratigraphic unit. A deposit, interface, or other distinguished element of archaeological stratification. Its observed relationships contribute to reconstruction of a sequence.

Stylometry. Quantitative analysis of stylistic features represented from texts. Its historical interpretation depends on the corpus, feature choices, and possible alternative causes of similarity.

Textual witness. A particular source preserving evidence of a text, such as a manuscript, printed edition, quotation, or translation. Witnesses may be dependent on one another.

Variant. A difference among readings, versions, or performances. It may result from error, revision, adaptation, or other historical processes and is not inherently a defect.

Appendix C Evidence taxonomy and blind spots

The following taxonomy distinguishes the material available to an investigation from the claim it can support. A strong analysis often combines several classes. Their combination is useful when dependencies and transformations remain visible, not simply when a larger quantity of material is assembled.

Evidence class	What it can support	Characteristic blind spot
Manuscript or printed witness	Readings, layout, marks, and material features of a particular source.	It may descend from another witness and need not preserve an authorial original.
Inscription	Surviving marks in a material setting and constrained proposals for reading.	Damage, displacement, and modern restoration can affect the interpretation.
Administrative record	Activities and categories relevant to the producing institution.	Institutional visibility can omit experience and self-representation.
Personal correspondence	Reported events, relationships, and acts of communication.	Survival, selection, performance of identity, and missing replies affect the record.
Oral account	Recollection, narrative form, and the interview interaction.	A remembered chronology and an event chronology can differ.
Performance recording	A selected audiovisual representation of a particular event.	Position, framing, editing, and absent contextual knowledge remain consequential.
Material or technical analysis	Composition, structure, and selected traces of manufacture or intervention.	A material observation does not by itself establish meaning or authorship.
Archaeological context	Documented relationships among deposits, interfaces, finds, and samples.	Disturbance, residual material, and incomplete recording complicate association.
Critical apparatus or catalog	Scholarly descriptions, comparisons, classifications, and decisions.	Coverage and certainty may be uneven; repeated descriptions can hide dependence.
Digital image or scan	Signals captured under specified acquisition conditions.	Cropping, lighting, processing, and resolution constrain what can be seen.
Transcription or OCR	A derived reading that supports retrieval and comparison.	Normalization and recognition errors can become apparent historical patterns.
Statistical or model output	Relations within a defined representation and evaluation setting.	Confounding, training dependence, and coverage limit historical inference.
Restoration or reconstruction	A reasoned representation of a specified aspect of an artifact.	Observed material and supplied content can become visually indistinguishable.
Provenance and treatment record	An account of custody, transformations, agents, and decisions.	The record may be incomplete or inaccurate and may itself require criticism.

C1 Questions to carry with an artifact

We begin with identity and purpose. What is the artifact, and what claim are we asking it to support? Who or what produced it, under which conditions, and for which audience? The date of the event, the

date of recording, the date of the surviving witness, and the date of the current representation should be distinguished wherever they affect the argument.

We then examine transmission and selection. Which copying, translation, restoration, cataloging, digitization, or filtering operations stand between the artifact and the result in front of us? What has been omitted deliberately? What may be absent through damage or incomplete coverage? Are several apparently corroborating items independent, or do they repeat one source?

Finally, we examine the proposed explanation. Which observations support it? Which features remain unexplained? What alternative would produce a similar result? What further evidence would discriminate among the alternatives, and is that evidence still obtainable? These questions can lead to a correction, but they can also establish a reasoned limit on the conclusion.

C2 Keeping levels of evidence distinct

Level	A suitable check	What passing it does not establish
Material artifact	Examine support, marks, condition, and relevant physical relationships.	That every statement made by the artifact is true.
Transcription	Compare a reading with the relevant source image or witness.	That the source is authentic or complete.
Edition or dataset	Inspect selection, normalization, annotation, and version history.	That the representation is suitable for every research question.
Transformation	Check inputs, rules, output, and records of processing.	That the historical interpretation of the result is justified.
Inference	Compare explanations, dependencies, and disconfirming evidence.	That no alternative account can ever become better supported.
Published narrative	Trace significant claims to their sources and inferential steps.	That narrative coherence proves the reconstructed events.

These levels interact without being interchangeable. If the physical artifact is unavailable, we may still assess a published transcription, but our conclusion should state the resulting dependency. If an interpretation remains contested after the transcription is corrected, the correction still has value. Good diagnostic memory preserves both what the investigation changed and what it did not settle.

References

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