

TECHNICAL FINDINGS REPORT

ABAD Adaptive ZD30 v4.2

Cross-Validated Folio-to-Contributor Atlas

Date	15 August 2026
Decision	PASS — FROZEN TWO-GROUP STRUCTURAL ATLAS
Sample	223 folios; 22,209 eligible transitions
Held-out stability	99.37% mean repeated-fold agreement
Interpretive limit	Groups are structural modes, not yet identified people or languages

Executive finding

Outcome: A language-blind structural search independently resolves the analyzed manuscript into two highly stable folio groups. The complete clustering search beats selection-aware controls at $p = 0.00498$, and folio assignments reproduce at 99.37% mean stability.

This validates two primary structural modes. It does not isolate five individual scribes. The two modes overlap multiple hands and quires, indicating that the strongest division is a shared system-level distinction—closely related to Currier A/B—on top of which individual contributors may have added smaller innovations.

Frozen result	Value
Selected number of groups	2
Fold selections	2, 2, 2, 3, 2
Held-out distance gain	0.01959
Selection-aware p	0.00498
Mean assignment stability	99.37%

What changed

- Folio isolation is now based on structure learned without knowing hand, quire, illustration, Currier label, or candidate language.
- Two primary systems can be frozen before any language-origin test begins.
- Writer-level attribution remains a second-stage question inside those systems.

1. Anti-circular discovery design

The atlas used four language-independent feature blocks. All labels that might encourage a desired historical answer were forbidden until assignments were sealed.

Discovery feature	What it measures
Final glyph × next class	Ending-conditioned broad structural behavior
Current × next ABAD class	Local state transitions
Frozen prefix distribution	Token-family usage
Suffix length × next class	Ending geometry tied to forward behavior

Protection	Operational rule
Training-only model choice	K = 2-8 selected by penalized silhouette inside each fold
Held-out score	Distance reduction versus the training global centroid
Selection-aware controls	Every null reselected K and rescored untouched pages
Null preservation	Geometry quartiles preserved; feature co-organization destroyed
Atlas stability	Ten repeated five-fold held-out assignments aligned by centroid matching

Integrity rule: Hand, quire, illustration, Currier, dictionaries, and language hypotheses were inspected only after the two groups were frozen.

2. Frozen group composition

Group	Folios	Stability	Largest hand counts	Currier composition
G1	82	99.51%	2 (38), 3 (28), 1 (12), 5 (3)	B (68), A (13), ? (1)
G2	141	99.29%	1 (101), 4 (25), 2 (8), 5 (4)	A (101), ? (26), B (14)

G1 contains 82 folios and is dominated by Currier B plus Hands 2/3. G2 contains 141 folios and is dominated by Currier A plus Hands 1/4. Neither group is identical to a single hand, quire, illustration section, or Currier label.

3. Post-freeze label associations

External label	Normalized mutual information	Interpretation
Currier A/B	0.356	Strongest measured association
Hand	0.312	Substantial, not one-to-one
Illustration	0.242	Moderate organizational overlap
Quire	0.201	Moderate block overlap

Main result: The manuscript's strongest reproducible structural split resembles the Currier distinction but is not defined by it. Hand identity contributes, yet multiple hands participate in each structural mode.

This fits a continued-system model better than a simple one-person-per-code model: contributors appear to operate inside inherited structural regimes. Individual writers may be visible as smaller, group-specific innovations rather than as the primary division.

4. Implication for multilingual testing

Correct test order: Freeze G1 and G2 first. Then test candidate language origins independently inside each group. Do not allow dictionaries to move folios between groups.

- Run the identical candidate set and complexity budget in each group.
- Permit different winning base languages, abbreviation inventories, or semantic ontologies by group only after selection-aware correction.
- Require held-out coverage, morphology, phase recurrence, illustration-conditioned shifts, and full rediscovery nulls.
- A language difference counts only if it improves over a shared-language model and replicates on untouched folios.

The current atlas does not make English, Latin, Germanic, Romance, or multilingual evidence stronger by itself. It supplies a non-circular partition on which those hypotheses can finally be tested fairly.

5. What is—and is not—isolated

Now isolated	Not yet isolated
Two stable structural modes	Five individual scribes
A frozen assignment for 223 folios	Chronological order of contributors
Mode-specific folio corpora for mapping tests	A language for either mode
A reproducible system-level division	Authorship, death, replacement, or later insertion

Accurate statement: We have isolated two candidate inherited systems. We have not yet isolated each writer. The next structural analysis must remove the G1/G2 shared core and search within each group for reproducible contributor-specific innovations.

6. Next decisive protocol

Recommended v4.3: Within G1 and G2 separately, learn the shared rule inventory on training folios; subtract that common component; cluster only the residual innovations; and require held-out folio stability against nulls that repeat the entire within-group search. Compare resulting subgroups with hands and quires only after freezing.

If stable subgroups align with hands, the folio-to-writer atlas becomes defensible. If they do not, hand differences are weaker than the inherited structural regimes and language testing should remain at the two-group level.

Delivered atlas

The accompanying FOLIO_ATLAS.csv lists every analyzed folio, frozen group, assignment stability, hand, quire, illustration class, Currier label, and sample size. These assignments must remain unchanged during later language-origin tests.

Receipt item	Hash
v4.2 specification	393ef3cb64e30df3384c1c842db4e1a19aae0c45ca72665fd20ada3e24101fe1
Page feature matrix	7035f24a6e492378887fced83da27f1950d4a9b4e5979b42bcd58098374b6ae9
Terminal receipt	98180c544f65f14a65e8129a67adb901f128b92c3c278225e9df55aeed73a2c6