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Review

An Analysis of Similarities and Differences Between the Correspondences of the Five Tones and Five Elements and the Phonological Categories in Medieval Chinese Rime tables

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Abstract: This review examines the correspondences between the five tones and the five elements in medieval Chinese rime tables, and compares these correspondences with the broader phonological categories that organize the tables. The five tones, understood as articulatory classes of initials, were systematically mapped onto the five elements, producing a cosmological framework that coexisted with purely phonetic classifications of initials, finals, and tones. By analyzing the structural logic of these mappings, the paper identifies both similarities-such as the shared use of correlative thinking and hierarchical organization-and differences, including the restricted scope of five-element assignments and inconsistencies across different rime table traditions. The study further addresses interpretive challenges arising from terminological ambiguity and the historical distance between medieval phonological theory and modern linguistics. It argues that the five tones–five elements correspondence should be understood not as an empirical phonetic statement but as a culturally embedded classificatory scheme. Future research may benefit from integrating philological methods with computational analysis to systematically evaluate the coherence and variation of these mappings. The review concludes that these correspondences illuminate the deep entanglement of phonological analysis and cosmological thought in medieval China, offering valuable insights into the intellectual history of Chinese linguistics.

Keywords: Five tones; Five elements; Rime tables; Phonological categories; Medieval Chinese

1. Introduction

1.1. Background and Significance

The medieval Chinese rime tables represent a watershed in the history of phonological thought, constituting the first systematic attempt to tabulate the syllabic inventory of Chinese according to intersecting parameters of initial consonants, finals, and tones [1, 2]. Beyond their descriptive function, these tables embed a distinctly cosmological architecture, most notably through the correspondences drawn between the five tones and the five elements [3, 4]. This integration of phonological categories with correlative cosmology reflects an indigenous theoretical impulse to situate linguistic structure within broader patterns of cosmic order. Examining these correspondences therefore illuminates not only the internal logic of premodern phonological analysis but also the epistemological frameworks that shaped scholarly approaches to language in medieval China.

1.2. Research Questions and Scope

This study addresses two interrelated questions. The first concerns the systematic principles by which the five tones of medieval Chinese phonological theory were mapped onto the five elements, and whether this mapping followed a single coherent scheme or admitted multiple competing traditions [4, 5]. The second examines how these correspondences intersect with the internal phonological architecture of the rime tables,

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specifically the categories of initials, finals, and tones. The scope is deliberately restricted to the medieval rime table tradition, encompassing its formative period and subsequent systematization, rather than extending to earlier cosmological texts or later phonological reforms [5].

1.3. Methodological Approach

The methodological framework adopted in this study is primarily comparative and synthetic, drawing upon the extensive body of existing scholarship rather than introducing new empirical data [6]. The approach involves a systematic collation of textual evidence from medieval Chinese rime tables and related phonological treatises, juxtaposed with the theoretical correspondences articulated in early Chinese cosmological texts. By analyzing these sources in parallel, the study seeks to identify structural parallels and discrepancies between the two systems [2, 7]. This comparative analysis focuses on the internal logic of each framework, examining how the five tones and five elements were mapped onto phonological categories and evaluating the consistency of these mappings across different historical and textual contexts.

2. Historical Overview

2.1. Origins of Five Tones and Five Elements

The conceptual antecedents of the five tones lie in early Chinese phonological and musicological taxonomies, where distinctions of initial consonants were gradually systematized according to articulatory and acoustic properties [8, 9]. Parallel to this linguistic development, the five elements emerged as a pervasive cosmological framework, classifying phenomena across natural, medical, and ritual domains into five mutually generative and overcoming categories [10]. Although these two systems originated independently, their shared numerical symmetry and classificatory function facilitated subsequent attempts at correlation within the medieval rime-table tradition [4, 11].

2.2. Development of Rime Tables

The emergence of rime tables during the late Tang and Song periods marked a decisive shift in Chinese phonological analysis from the lexically bound format of the qieyun tradition toward a systematic, paradigmatic representation of sound structure [12]. These tables arranged syllables within a grid defined by the intersecting parameters of initial consonants, finals, tones, and the four deng divisions, thereby exposing co-occurrence patterns that remained implicit in rhyme-book organization. The analytical impulse behind this tabular turn is widely attributed to the influence of Indic phonological science transmitted through Buddhist translation and the study of Siddham script, which introduced Chinese scholars to the concepts of consonant classification, place of articulation, and the systematic mapping of syllable matrices [3, 13]. This cross-cultural stimulus enabled phonologists to abstract the syllable from the written character and to treat tone as an independent, manipulable dimension of phonological description.

2.3. Early Integration of Cosmological and Phonological Schemata

The earliest rime table prefaces and grid headings reveal a deliberate effort to superimpose the five tones and five elements upon phonological structure, treating tonal categories as cosmological indices rather than purely auditory phenomena [11]. As illustrated in Figure 1, the conceptual flowchart demonstrates how Buddhist phonological analysis and traditional Chinese phonological categories jointly produced the rime table structure, while within that structure the five tones as initial classes and the five elements cosmological scheme converged to form an integrated grid [9, 14]. This synthetic framework allowed the five tone-element correspondences to coexist with broader phonological classifications-initials, finals, and tones-without subsuming them, thereby preserving analytical precision alongside cosmological symbolism [2, 15].

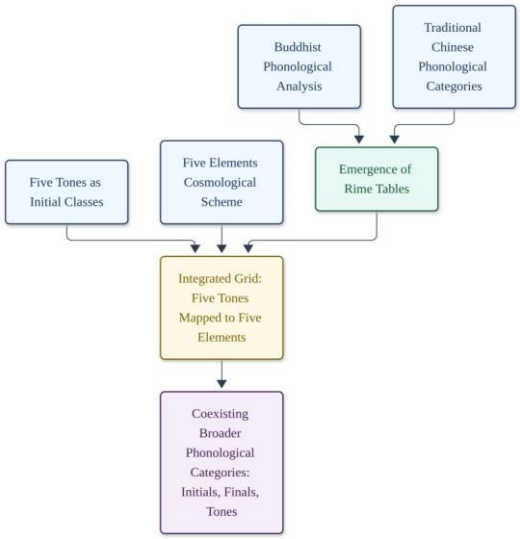


Figure 1. Conceptual Flowchart of Cosmological-Phonological Integration in Early Rime Tables

3. Core Theme a: Correspondence between Five Tones and Five Elements

3.1. Systematic Mappings in Rime Table Traditions

The systematic correlation of the five articulatory categories with the five elements constitutes one of the most stable yet internally contested features of medieval Chinese phonological cosmology. As detailed in Table 1, the standard assignment-labial to metal, lingual to wood, molar to earth, dental to fire, and guttural to water-reflects a coherent integration of articulatory position, acoustic quality, and the generative logic of the five-element system. However, this canonical mapping was not uniformly preserved across rime table traditions [8]. The Yunjing, for instance, substitutes water for metal in the labial category, a divergence explicitly justified through the principle of yin-yang reversal, whereby the labial position, associated with the initial phase of articulation, is reclassified according to its complementary elemental counterpart [3, 8]. Conversely, the Qieyun zhizhang tu retains the standard metal assignment for labials while introducing a more radical departure elsewhere: it shifts the lingual category from wood to earth, citing the generation cycle in which earth produces metal and thus mediates between the labial and lingual positions. The molar category exhibits further instability, with the Yunjing assigning metal to molars via the overcoming cycle, whereas the Qieyun zhizhang tu adheres to the standard earth [8]. For the dental category, the Qieyun zhizhang tu uniquely assigns wood, drawing upon a phonetic-acoustic analogy between dental articulation and the rising, penetrating quality of wood, while the Yunjing preserves fire. Most strikingly, both texts diverge from the standard water assignment for the guttural category: the Yunjing employs earth and the Qieyun zhizhang tu employs fire, reflecting fundamentally divergent cosmological rationales concerning the terminal position of the vocal tract and its elemental culmination.

Table 1. Comparative Table of Five Tone–Five Element Correspondences Across Rime Table Traditions

Five Tone Class	Standard Element Assignment	Variant Assignment in Yunjing	Variant Assignment in Qieyun zhizhang tu	Nature of Divergence
Labial	Metal	Water	Metal	Yunjing substitutes water for metal based on yin-yang reversal; Qieyun zhizhang tu retains metal.

Lingual	Wood	Wood	Earth	Qieyun zhizhang tu shifts lingual to earth citing the generation cycle; Yunjing matches standard.
Molar	Earth	Metal	Earth	Yunjing assigns metal to molar via overcoming cycle; Qieyun zhizhang tu follows standard earth.
Dental	Fire	Fire	Wood	Qieyun zhizhang tu assigns wood to dental due to phonetic-acoustic analogy; Yunjing retains fire.
Guttural	Water	Earth	Fire	Both texts diverge from standard water: Yunjing uses earth, Qieyun zhizhang tu uses fire, reflecting divergent cosmological rationales.

3.2. Theoretical Rationale for Correspondences

The conceptual architecture underlying the five tone–five element correspondences rests on several intersecting rationales rather than a single axiomatic principle. As illustrated in Figure 2, the labial–metal pairing is justified primarily through yin-yang interaction, since both categories were perceived as sharing a yin quality of contraction and inwardness. The lingual–wood correspondence draws upon the generation cycle, wherein wood generates fire and thereby mediates the lingual's indirect relationship to the dental category [3]. Conversely, the molar–earth assignment invokes the overcoming cycle, with earth overcoming water and thus subordinating the guttural category with which water is associated [3, 9]. The dental–fire pairing exemplifies phonetic-acoustic analogy, both being characterized as sharp or acute in articulatory and elemental terms. The guttural–water correspondence, however, emerges from a combination of yin-yang interaction and the overcoming cycle, revealing the synthetic character of traditional classificatory thought [4]. Critically, Figure 2 also indicates that these rationales do not operate in isolation; dashed edges show how competing principles could generate variant assignments, producing systematic inconsistencies across different rime table traditions [9].

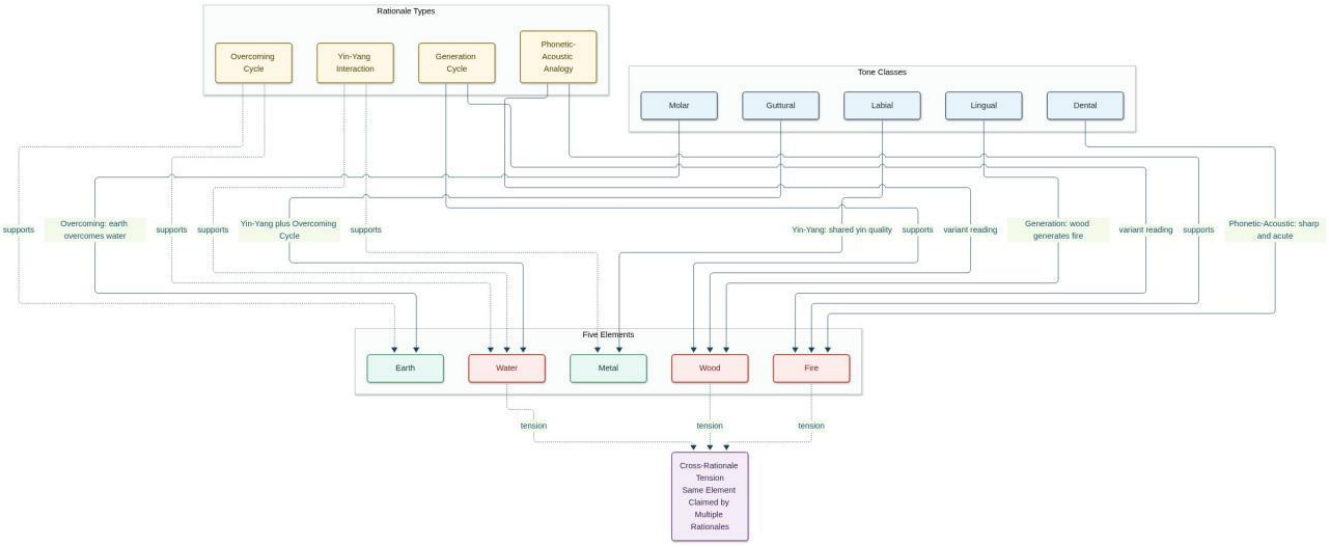


Figure 2. Conceptual Map of Rationales Underlying Five Tone–Five Element Correspondences

3.3. Case Examples from Representative Rime Tables

The earliest extant rime tables exhibit a striking convergence in assigning the five tones to the five elements, yet subtle divergences reveal distinct theoretical commitments. In the Yunjing tradition, the four tones proper are systematically correlated with the four

cardinal directions and their corresponding elements, while the entering tone is treated as a special category whose affiliation shifts according to the final consonant type [6]. This arrangement reflects an underlying phonological rationale: the entering tone, being checked by an unreleased stop, resists straightforward alignment with the sonorant-based tonal categories. By contrast, the Qieyun zhizhang tu adopts a more schematic correspondence, mapping the five tones directly onto the five elements in their conventional generative sequence, with less attention to the articulatory peculiarities of the entering tone. The consistency across these works lies in the shared cosmological framework that legitimizes phonological description through elemental taxonomy; the divergence lies in whether phonological reality or cosmological symmetry takes precedence when the two conflict. Later redactions often attempt to reconcile these tensions by introducing mediating categories, such as assigning the entering tone to water on the basis of its occlusive quality, thereby preserving both the quinary structure and the phonetic distinctiveness of the checked syllables [3].

4. Core Theme B: Phonological Categories in Medieval Chinese Rime Tables

4.1. The Four Tones and Their Cosmological Associations

The phonological architecture of Medieval Chinese rime tables rests upon a four-way tonal taxonomy whose primary function was lexically contrastive rather than cosmologically generative [8]. The level tone was characterized phonetically by an even, sustained pitch contour; the rising tone by an ascending pitch movement; the departing tone by a falling or departing contour; and the entering tone by an abruptly checked syllable closed with an unreleased obstruent [3]. As detailed in Table 2, these four categories occasionally attracted secondary cosmological correlations, with the level tone associated with yang, the rising tone with wood, the departing tone with metal, and the entering tone with water [5]. Such associations, however, remained sporadic and unsystematized within the core rime-table tradition. The crucial analytical distinction lies in the categorical referent: the four tones constitute lexical pitch categories operating on the syllabic rhyme, whereas the five tones denote articulatory classes of initials defined by place and manner of consonant production [8]. Although both systems intersect with correlative cosmological schemes, their phonological objects are fundamentally incommensurable. The table clarifies that any apparent parallelism between the four tones and the five elements is secondary, inconsistent, and cannot be mapped onto the systematic five-tone initial classification.

Table 2. Qualitative Comparison of the Four Tones and Their Occasional Cosmological Associations

Tone Category	Phonetic Characterization	Occasional Cosmological Association	Distinction from Five Tones as Initial Classes
Level	Even, sustained pitch contour	Associated with yang in sporadic correlative schemes	Different category: a lexical pitch category operating on the syllabic rhyme, not an articulatory initial class; the five tones classify initials by place and manner of consonant production, and the yang association is secondary and unsystematized
Rising	Ascending pitch movement	Associated with wood in sporadic correlative schemes	Different category: a lexical pitch category operating on the syllabic rhyme, not an articulatory initial class; the five tones classify initials by place and manner of consonant production, and the wood association is secondary and unsystematized

Departing	Falling or departing pitch contour	Associated with metal in sporadic correlative schemes	Different category: a lexical pitch category operating on the syllabic rhyme, not an articulatory initial class; the five tones classify initials by place and manner of consonant production, and the metal association is secondary and unsystematized
Entering	Abruptly checked syllable closed with an unreleased obstruent	Associated with water in sporadic correlative schemes	Different category: a lexical pitch category operating on the syllabic rhyme, not an articulatory initial class; the five tones classify initials by place and manner of consonant production, and the water association is secondary and unsystematized

4.2. Initial and Final Classifications

The thirty-six initials of the medieval Chinese rime tables constitute a closed inventory, traditionally grouped into the five sounds (labial, lingual, molar, dental, and guttural) and, in the more refined seven-sound scheme, further distinguished by the addition of semi-lingual and semi-dental categories. Finals, by contrast, are classified along multiple intersecting axes: rhyme group (she), open versus closed mouth, inner versus outer, and division (I–IV). As illustrated in Figure 3, the taxonomic hierarchy of phonological categories decomposes systematically into initials, finals, tones, and the grid framework, with each branch descending into progressively finer classificatory levels [13]. The four tones-level, rising, departing, and entering-are further split by yin-yang registers, while the grid framework arranges table cells by initial row and final column with tonal rows. Critically, the five-element correspondence attaches only to the five sounds of initials, forming a closed analogical mapping at a single node of the hierarchy [7]. It does not extend to finals, tones, or the grid framework, whose classificatory principles derive from phonological and phonotactic criteria rather than cosmological schemata [8]. The diagram thus reveals a structural asymmetry: the five-element scheme intersects the classification system at precisely one point, leaving the remainder of the taxonomic architecture untouched by correlative cosmology.

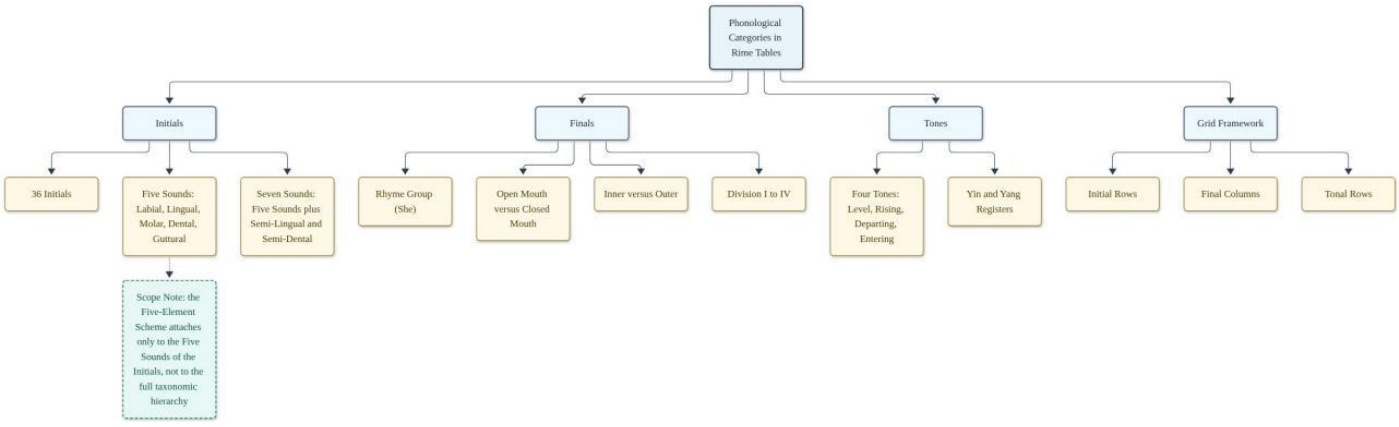


Figure 3. Taxonomic Hierarchy of Phonological Categories in Medieval Chinese Rime Tables

4.3. Tonal and Grid Frameworks

The rime tables impose a second, independent layer of organization upon the phonological material already classified by the five tones and five elements. Within the grid framework, each of the four tonal categories-level, rising, departing, and entering-is assigned a fixed row or band, while the vertical columns encode distinctions of place and manner of articulation, as well as the division of initials into clear and muddy series. The interaction between tone and the yin–yang register distinction is particularly consequential: syllables with voiceless initials are systematically aligned with the upper

register, whereas those with voiced or nasal initials gravitate toward the lower register, producing a bipartite tonal structure that crosscuts the earlier five-element correspondences [6]. This grid-based arrangement privileges relational position over symbolic affinity. A syllable's phonological identity is determined not by its elemental association but by its coordinates within a matrix defined by tone, register, and articulatory class [8]. Consequently, the rime tables reveal a shift from cosmological analogy toward systematic phonological analysis, in which tonal and registral contrasts function as primary sorting principles [3, 13]. The five-element scheme, though still present in the broader intellectual context, becomes subordinate to the internal logic of the tabular grid.

5. Comparison and Challenges

5.1. Similarities in Structural Logic

The comparison of the five-element correspondence scheme and the broader phonological categories of medieval Chinese rime tables reveals several shared structural logics, despite their divergent epistemological foundations. As detailed in Table 3, both systems exhibit a pronounced hierarchical organization, though the five-element scheme operates through a relatively flat one-to-one mapping of tone classes to elements, whereas the phonological categories construct nested taxonomies encompassing initials, finals, and tones with considerably greater depth and internal differentiation [7]. Correlative thinking constitutes a second point of convergence, yet its function differs markedly: the five-element scheme relies almost exclusively on cosmological cycles and analogical reasoning to justify assignments, while the phonological categories, though occasionally employing yin-yang and five-element labels, derive their primary organizational force from phonetic criteria. The pursuit of symmetry and completeness animates both enterprises, as each seeks exhaustive classification of its respective domain. However, the five-element scheme achieves symmetry through cosmological matching-striving for a full set of five correspondences-whereas the phonological categories attain completeness through empirical coverage of all attested syllables. The most significant divergence concerns systematic rigidity: variant assignments of tones to elements across different texts indicate considerable flexibility in the correlative scheme, while the classification of initials and finals remains largely stable across the rime table tradition [1].

Table 3. Structural Comparison of Five-Element Mappings and Broader Phonological Categories

Structural Feature	Five-Element Correspondence Scheme	Broader Phonological Categories	Shared or Divergent
Hierarchical organization	Maps five tone classes to five elements in a one-to-one relational scheme	Organizes many initials, finals, and tones into nested taxonomies	Shared in hierarchical principle, but depth and scope differ
Correlative thinking	Assigns elements based on cosmological cycles and analogies	Applies yin-yang and five-element labels to some categories but mainly uses phonetic criteria	Shared, but correlative logic dominates the five-element scheme while phonological categories primarily use phonetic features
Pursuit of symmetry and completeness	Seeks a full set of five correspondences for all tone classes	Aims for exhaustive classification of all syllables	Shared in completeness, but the five-element scheme achieves symmetry through cosmological matching, phonological categories through empirical coverage

Systematic rigidity	Variant assignments across texts indicate flexibility	Classification of initials and finals is largely stable across texts	Divergent; five-element mappings show more variation

5.2. Differences in Scope and Application

The most salient divergence between the two schemes resides in their respective scopes of application. As illustrated in Figure 4, the five-element correspondence scheme is fundamentally restricted to the five tone classes, functioning as a classificatory overlay imposed upon the initial categories without generating direct phonetic output. Its rationale is cosmological rather than linguistic, and its application varies considerably across different textual traditions, reflecting a lack of standardized systematization [8, 13]. In contrast, the broader phonological categories encompass all initials, finals, and tones, operating as the core organizational principle of the rime table structure. These categories are grounded in phonetic and distributional evidence, exhibit remarkable stability across texts, and directly encode phonological distinctions. The conceptual flowchart further reveals that while both branches coexist within the rime table, their integration remains superficial; dashed connectors indicate cross-references but no systematic fusion. Consequently, the five-element scheme functions as an external interpretive layer, whereas the phonological categories constitute the internal, operative framework of the rime tables [1].

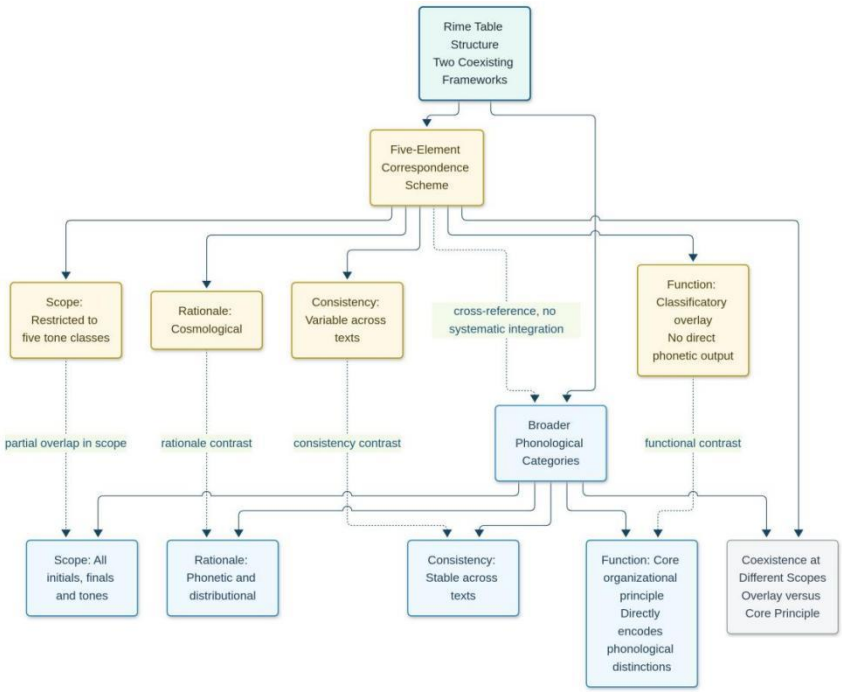


Figure 4. Conceptual Flowchart of Scope and Application Differences between Five-Element Scheme and Broader Phonological Categories

5.3. Challenges in Modern Interpretation

The most immediate obstacle to any modern interpretation is the polysemy of the term tone itself. In the medieval phonological tradition, tone referred to the lexically contrastive pitch categories of the four tones, whereas in the cosmological framework of the five tones it denoted a pentatonic scale degree whose acoustic realization was not fixed to any single pitch contour [9]. Conflating these two registers produces a category error in which a musical interval is treated as though it were a phonological feature. A second difficulty arises from the internal heterogeneity of the rime table categories. The five tones and five elements were assigned to broad articulatory classes such as labial, lingual, and

guttural, yet these classes do not correspond neatly to modern phonetic parameters of place, manner, or voicing. Any attempt to map them onto contemporary feature geometry therefore requires a degree of abstraction that risks distorting the original classificatory logic [4]. Finally, the modern reader must guard against anachronism. The rime tables were not phonetic descriptions in the present-day sense but diagrammatic instruments for mediating between canonical texts and ritualized cosmological order. Reading them solely through the lens of articulatory phonetics obscures their function as mnemonic and exegetical devices, in which structural symmetry often outweighed empirical acoustic accuracy.

6. Future Perspectives

6.1. Toward an Integrated Historical Phonology

The integration of rime table philology with comparative and typological phonetics offers a promising avenue for reassessing the five-tone and five-element correspondences. Rather than treating these mappings as either purely symbolic or phonetically arbitrary, future research should examine whether they encode recoverable phonological features-such as vowel height, consonant voicing, or syllable type-that align with cross-linguistic patterns. Typological evidence from tone systems and phonation contrasts may illuminate the perceptual motivations behind the medieval classifications [7]. Such an integrated approach would move beyond textual exegesis toward a historically grounded phonology, testing the empirical validity of these correspondences while acknowledging their cosmological framing [9].

6.2. Digital Humanities and Quantitative Approaches

Digital methods offer a decisive means of testing the coherence of cosmological-phonological mappings across the rime table corpus [4, 5]. Encoding the five tones, five elements, and phonological categories as structured relational data permits the systematic comparison of correspondence patterns that remain latent in impressionistic reading. Network visualization, in particular, can reveal whether certain element–tone pairings function as stable hubs or as marginal variants across different tables and lineages. Quantitative clustering and anomaly detection further allow scholars to distinguish principled systemic variation from idiosyncratic editorial intervention, thereby transforming the study of these correspondences from philological intuition into a reproducible and transparent analytical framework [6].

7. Conclusion

7.1. Summary of Key Findings

The preceding analysis has demonstrated that the correspondence between the five tones and five elements constitutes a specific correlative subsystem embedded within the broader architecture of medieval Chinese phonological categories. While this subsystem shares the structural logic of systematic classification and mutual implication that characterizes the rime tables as a whole, it diverges significantly in both scope and consistency. The five-element framework operates as a selective, ideologically motivated overlay rather than a comprehensive phonological taxonomy, applying its categories unevenly across the tonal inventory. Consequently, its explanatory power remains interpretive and cosmological, not rigorously descriptive of the phonological system's internal organization.

7.2. Implications for Understanding Chinese Linguistic Thought

The correspondences examined in this study demonstrate that medieval Chinese phonological analysis was never a purely descriptive enterprise but was instead deeply embedded within correlative cosmological frameworks. The systematic alignment of the five tones with the five elements reveals an epistemological orientation in which linguistic categories were understood as manifestations of the same underlying patterns governing natural and cosmic order. This integration suggests that the rime table compilers

conceived of sound systems not as arbitrary conventions but as microcosmic reflections of universal principles. Consequently, these correspondences offer valuable insight into an indigenous mode of knowledge production in which empirical observation and cosmological speculation remained mutually constitutive rather than opposed.

7.3. Concluding Remarks

The convergence of traditional phonological taxonomy and modern linguistic analysis need not resolve into a simple narrative of either confirmation or refutation. Rather, the correspondences examined throughout this study suggest that the five tones and five elements framework operated as a sophisticated heuristic, one that organized perceptual and articulatory observations within a culturally coherent cosmology. Future scholarship would benefit from treating these systems neither as primitive precursors to scientific phonetics nor as esoteric obstacles to empirical inquiry, but as historically situated models whose internal logic merits careful reconstruction. Such an approach promises richer insight into how premodern scholars conceptualized sound, system, and symbolic order.

References

1. D. Erickson and A. S. Abramson, "Electromyographic study of the tones of Thai," *J. Acoust. Soc. Am.*, vol. 53, no. 1_Supplement, p. 346, 1973.
2. T. Ogawa, "The origin of the Fan-ch'ieh spelling and the four tones and five sounds of the Chinese language," *Gengo Kenkyu (Journal of the Linguistic Society of Japan)*, nos. 19–20, pp. 35–42, 1951.
3. A. S. Abramson, "The phonetic plausibility of the segmentation of tones in Thai phonology," in *Proceedings of the 12th International Congress of Linguistics*, 1978, pp. 760–763.
4. W. Choi, "The selectivity of musical advantage: Musicians exhibit perceptual advantage for some but not all Cantonese tones," *Music Percept.*, vol. 37, no. 5, pp. 423–434, 2020.
5. X. S. Shen, "Tonal coarticulation in Mandarin," *J. Phon.*, vol. 18, no. 2, pp. 281–295, 1990.
6. J. Bing, "Default features in contour tones: Evidence from Krahn/Wobe," in *Amsterdam Studies in the Theory and History of Linguistic Science Series 4*, 1993, p. 327.
7. Z. P. Chen, "Chinese music's five elements, five tones," *The Epoch Times*, 2008.
8. P. A. Hallé, Y. C. Chang, and C. T. Best, "Identification and discrimination of Mandarin Chinese tones by Mandarin Chinese vs. French listeners," *J. Phon.*, vol. 32, no. 3, pp. 395–421, 2004.
9. Y. Chen and Y. Xu, "Production of weak elements in speech—Evidence from F0 patterns of neutral tone in Standard Chinese," *Phonetica*, vol. 63, no. 1, pp. 47–75, 2006.
10. F. Lin and J. Zhang, "Exploring the application of the five tones in individuals with five-minds constitutional types based on the constitution theory of Huangdi Neijing," *J. Beijing Univ. Tradit. Chin. Med.*, vol. 49, no. 2, pp. 201–207, 2026.
11. C. K. Leong, P. W. Cheng, and L. H. Tan, "The role of sensitivity to rhymes, phonemes and tones in reading English and Chinese pseudowords," *Read. Writ.*, vol. 18, no. 1, pp. 1–26, 2005.
12. V. A. Fromkin, "Tone features and tone rules," *Stud. Afr. Linguist.*, vol. 3, no. 1, p. 47, 1972.
13. Y. Xu, "Effects of tone and focus on the formation and alignment of F0 contours," *J. Phon.*, vol. 27, no. 1, pp. 55–105, 1999.
14. E. Zee and I. Maddieson, "Tones and tone sandhi in Shanghai: Phonetic evidence and phonological analysis," *UCLA Work. Pap. Phon.*, vol. 45, no. 1, pp. 93–129, 1979.
15. J. Gandour, S. Ponglorpisit, F. Khunadorn, S. Dechongkit, P. Boongird, R. Boonklam, and S. Potisuk, "Lexical tones in Thai after unilateral brain damage," *Brain Lang.*, vol. 43, no. 2, pp. 275–307, 1992.

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