On the (Encoding) Dialects of the Voynich Manuscript: A Meaningless or a Meaningful Hoax (Polyphonic Cipher)?

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Abstract

This current work provides numerous quantitative, clear-cut evidences for the presence of at least four (encoding) dialects in the Voynich text. These are mostly based on the syllable and hapax legomena densities. Furthermore, this paper also aims at resolving the dichotomous division of the Voynich community concerning the nature and possible contents of the Voynich text by providing a coherent embedding explanation on the text creation in the framework of a self-cited polyphonic cipher accounting for the numerous puzzling features observed so far. Based on my proposed polyphonic cipher key (including medieval Latin abbreviations and word-ending truncations), I established a novel transcription of the full Voynich text, which can be considered as the first layer of decryption. This Latin-like text includes numerous Latin words, and its word-length distribution is consistent with those of regular Latin texts. These findings further corroborate the presence of an elaborate polyphonic cipher in the Voynich manuscript. Intriguingly, the long-standing division of the Voynich community was not without reason. It well reflected the dualistic concepts (toward deception) behind the creation of the Voynich cipher, according to my proposed decryption of the manuscript's ars poetica encrypted on folio 65v.

Keywords: Voynich manuscript, hoax, dialects, polyphonic cipher, John Dee, Liber Loagaeth tables

1. Introduction

The Voynich manuscript is considered by numerous eminent codebreakers and scholars as the most mysterious book ever written [Voynich_Beinecke, D'Imperio78, Altrideicktus24-25]. During its modern-day research history, spanning more than a century, a deluge of diverse theories has been proposed about its origin and possible contents. There appear three major theory types: the meaningless hoax, the cipher, and the natural-language theories. Besides its baffling linguistic and statistical features, the long-standing division of the Voynich community about these theories unequivocally proves that *the Voynich manuscript represents an elusively complex, inherently multidisciplinary object*.

Toward supporting the meaningless hoax theory, Rugg (2004) proposed an efficient table and grille method (TGM) to generate a corpus of a meaningless hoax texts. Later, Zandbergen (2021) suggested some generalizations to Rugg's table and grille method. Alternatively, Timm and Schinner (2020) proposed an intuitive self-editing text generation algorithm such that the generated texts matched many statistical-linguistic features of the Voynich text remarkably well.

The paper of Schinner (2007) demonstrated one of the most elusive yet crucial property of the Voynich text, namely, its self-correlated nature (characterized by non-Brownian scaling behavior in its letter representation sequences). This puzzling feature, along with some other unusual statistical measures, made Schinner to consider the Voynich text a meaningless hoax.

Based on a detailed statistical-linguistic analysis of the Voynich text, Currier (1976) suggested the presence of two distinct languages, A and B. The word-based statistical approaches of Lindemann (2022) supported this hypothesis or the presence of dialects. In terms of further inhomogeneities in the Voynich manuscript, the paleographic analysis of Davis (2020) inferred the involvement of five different scribes.

In addition, Rugg and Taylor (2017) observed abrupt changes and surges in the syllable densities of the Voynich text, and based on these puzzling features, they excluded the natural text hypothesis. This conclusion was further corroborated by the non-Brownian scaling behavior in the glyph sequence representations, as revealed by Schinner (2007), and the related, positive autocorrelations (in contrast to the negative traits for natural languages), as pointed out by Timm (2016), Timm and Schinner (2020), Daruka (2021), and Gaskell and Bowern (2022). Furthermore, Timm and Schinner (2020) demonstrated the presence of puzzling correlations among the frequency, similarity, and spatial vicinity of Voynich words. They also pointed out that similar Voynich words (differing only in one glyph, that is, being within an edit distance of one) form a quite homogeneous, densely connected network. These latter, exotic features are certainly not shared by regular texts written in natural languages.

Although Amancio et al. (2013) and Bowern and Lindemann (2021) argued that some larger-scale statistical features (word- and line-level metrics as well as some word-network properties) appeared consistent with those characteristic of natural languages, based on the above-mentioned rather unusual yet crucial statistical and network features (not shared by regular texts written in natural languages), I consider that the Voynich text does not represent a regular (plain)text written in an unidentified natural language. In this regard, I note that in a later paper, Gaskell and Bowern (2022) sided more with the meaningless hoax scenario. On the contrary, Lindemann (2022) suggested that the Voynich text encoded a meaningful content. In the light of these insights, the remaining question concerns whether the Voynich text represents a meaningless or a meaningful hoax (the latter conveying a special type of cipher).

Consistent with the meaningful hoax (cipher) theory, Vogt (2012), Zandbergen (2021), and Feaster (2022) demonstrated the presence of several highly non-trivial glyph patterns in terms of their favored line and paragraph positions. I note that some of these textual inhomogeneities are not present in regular texts written in natural languages [Zandbergen21] or appear only in special types of texts, such as poetry [Feaster22]. Furthermore, the elaborate network of closely-related Voynich tokens, as revealed by Montemurro and Zanette (2013), further suggests that the Voynich text may convey a semantic content. In addition, I can also mention my proposed decryption the Voynich text in the framework of an inhomogeneous polyphonic cipher [Altrideicktus24-25].

In this paper, through the presentation of my multilateral statistical analysis and a novel Voynich transcription based on my proposed cipher key [Altrideicktus24-25], I elaborate on the central question *whether the Voynich manuscript represents a cheap, meaningless hoax or an elaborate work of some cryptographer genii?* In this pursuit, I proceed toward resolving the long-standing division of the Voynich community on these crucial matters.

2. A meaningless hoax? – text generation algorithms and their shortfalls

In order to mimic the abrupt changes and clumping features in the syllable densities as conceived from the syllabic visualization of the Voynich text, Rugg and Taylor (2017) generated two sorts of meaningless text samples with the help of their proposed table and grille method. Their first text sample (labeled as “RT hoax 1”) was generated with a table including randomly arranged Voynich syllables. However, their second text sample (labeled as “RT hoax 2”), designed to demonstrate the (shorter-scale) clumping behavior of the syllables, was prepared with a table hosting periodic re-arrangements in the invoked Voynich syllables. It is important to note that in both generated text samples, the pertinent syllable frequencies were sampled from the Voynich text. This directly implies that the letter and syllable frequencies of these hoaxed texts will automatically match those of the Voynich text. Therefore, their comparison is not informative.

Furthermore, Rugg and Taylor (2017) pointed out that some of their meaningless text samples (generated by their table and grille method) could produce binomial word-length distributions matching that of the Voynich text, and the word-frequency-rank distribution was also consistent with the Zipf’s distribution. Here, besides revisiting the pertinent Zipf plots, I compare two more basic statistical features, namely, the Heaps plot (characterizing the number of distinct tokens as a function of all counted tokens) and the running fraction of hapax legomena, the words occurring only once in the investigated texts.

Figs. 2.1a-c demonstrate that these basic statistical properties of the first text sample (based on randomly distributed Voynich syllables; “RT hoax 1”, in magenta) are consistent with the pertinent Voynich distributions. However, the basic statistical features of the second text sample (based on periodically structured Voynich syllables; “RT hoax 2”, in black) are prohibitively different from the pertinent Voynich distributions. Thus, this latter text type, also generated by the table and grille method, cannot be considered an adequate (model) representation of the Voynich text. I remind the reader that this latter type of meaningless text was generated (with the involvement of periodically structured tables) to account for the local clumping of syllables as observed by Rugg and Taylor (2017). Interestingly, as will be pointed out in Section 3, some of these local surges in the syllable densities are artifacts of the mixed Voynich folio order (especially in the *Herbal1* section).

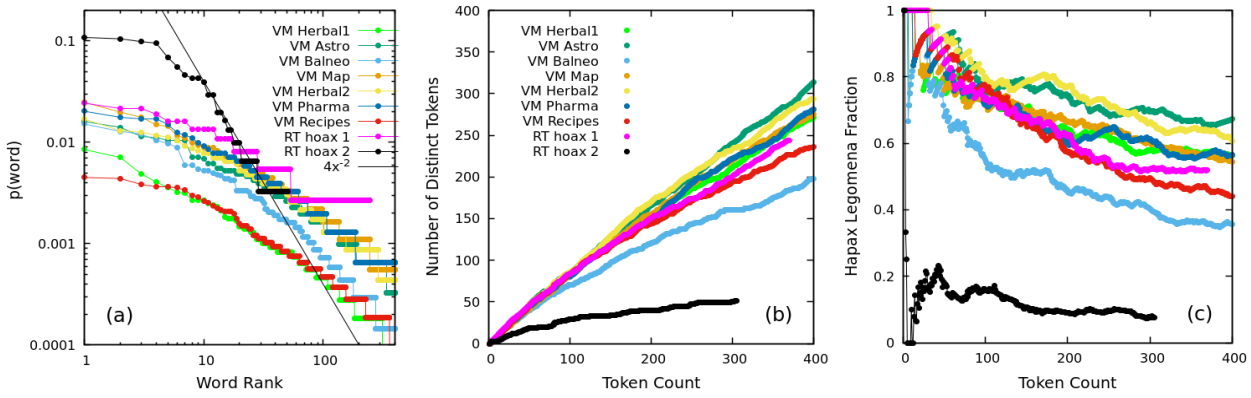


FIG. 2.1. BASIC STATISTICAL PROPERTIES FOR THE VOYNICH MANUSCRIPT'S SECTIONS AND RUGG AND TAYLOR'S (2017) MEANINGLESS TEXT SAMPLES CREATED BY THEIR TABLE AND GRILLE METHOD: (A) WORD-RANK DISTRIBUTION (ZIPF PLOT); (B) HEAPS PLOT; AND (C) THE RUNNING FRACTION OF HAPAX LEGOMENA. WHILE THE CURVES FOR THE FIRST HOAXED TEXT SAMPLE ("RT HOAX 1", IN MAGENTA) ARE CONSISTENT WITH THE PERTINENT VOYNICH CURVES, THE CURVES FOR THE THE SECOND HOAXED TEXT SAMPLE ("RT HOAX 2", IN BLACK) ARE PROHIBITIVELY OUT OF RANGE.

At this point, the reader may judge that so far so good. However, these were only some basic, "introductory" statistical properties that generated text samples should obey in order to qualify as adequate (model) representations of the Voynich text. As already mentioned in the Introduction, one of the most puzzling yet crucial statistical property of the Voynich text is its inherently non-local, non-Brownian scaling behavior of its letter sequence representations, as pointed out by Schinner (2007).

It is clear that neither the randomly nor the periodically arranged ("structured") text-generator tables, as originally proposed by Rugg (2004) and Rugg and Taylor (2017), will be able to produce texts with such inherently non-local, non-Brownian departures for they lack the underlying self-correlations [Timm16, Timm_Schinner20]. Occasionally breaking the text generation rules would not help at all, as these non-Brownian departures represent an inherently non-local feature. Furthermore, the possible generalizations of the original table and grille method, as suggested by Zandbergen (2021), would not help either in this regard.

Timm (2016) and Timm and Schinner (2020) identified the aforementioned self-correlation (or "self-citation") patterns in the Voynich text (in terms of word co-occurrences) as the source of these non-Brownian departures. These could not be explained by any of the so-far-presented table and grille methods, simply for their random or periodically structured syllable arrangements lack any of such self-citation traits. Furthermore, the readout of these tables with the invoked grilles is a linear or quasi-linear process [Rugg04] that would not introduce any sort of self-citation mechanism either. Based on these insights, *the lack of non-Brownian scaling and the absence of the underlying self-citation traits (both being inherent, crucial features of the Voynich text) disqualify these proposed table and grille techniques to be considered as the text generation method for the Voynich manuscript.*

In order to tackle these prohibitive discrepancies, Timm and Schinner (2020) proposed a "self-citation" process as a possible text-generator algorithm for the creation of the Voynich text. Similarly to the above-discussed table and grille method, this latter text-generation mechanism also produces gibberish, but these hoaxed texts exhibit the above-mentioned non-Brownian departures [Schinner07] and also being consistent with the related self-correlation traits of the Voynich text [Timm16, Timm_Schinner20]. Furthermore, this novel text generation algorithm could produce

meaningless texts which obey Zipf's first and second laws, exhibit binomial-like word-length distribution, and display the non-Brownian scaling behavior as well [Timm_Schinner20], in agreement with the pertinent statistical properties of the Voynich text. I note here that Rugg's (2004) table and grille method could *qualitatively* be improved to include such a self-citation mechanism in the construction of its tables. However, with such a substantial amendment, it would become functionally equivalent with Timm and Schinner's (2020) self-citation algorithm. Therefore, I will discuss only this latter (meaningless) text generation scheme in the following.

Similarly to the meaningless text samples hoaxed by the table and grille method [Rugg04, Rugg_Taylor17], I also (re)-checked some basic statistical properties of a text sample generated by Timm and Schinner's (2020) self-citation algorithm (labeled as "TS20" in the following). Figs. 2.2a-c display these features in comparison with the corresponding entities of the Voynich text. While the Zipf curve for the hoaxed text sample matches well the pertinent Voynich curves (Fig. 2.2a), the Heaps (Fig. 2.2b) and the hapax legomena curves (Fig. 2.2c) for the the hoaxed text sample remain somewhat below of the pertinent Voynich curves. But these minor quantitative departures are not prohibitive at all, these could probably be improved by some optimization of the model parameters.

Further investigating the meaningless text produced by Timm and Schinner (2020), I found that the notorious Voynich token *"qokeedy"* was practically missing from it (cf. Appendix 2). This appeared inconsistent with the substantially higher density (frequency) of this particular Voynich token in the *Recipes (Text-only)* section of the Voynich manuscript (cf. Appendix 1), from which the initializing Voynich phrase was taken for this particular text-generator algorithm. Furthermore, I also noticed that the text sample produced by Timm and Schinner (2020) displayed 11 distinct token types including the rare "tabletop" Voynich glyph, ⟙, but only 2 of these 11 token types (18%) could be located in the *entire* Voynich text. These substantial quantitative departures could possibly be mitigated by some further optimization (fine-tuning) of the model parameters. However, if there were several discrepancies to be resolved (at the same time), their *synchronous* optimization may not turn out viable or effective. As an example, I would mention the text samples created by Rugg and Taylor (2017). In order to account for the local surges in some syllable densities, they assembled spatially structured text-generator tables. As a "side effect", several statistical features of the generated text got prohibitively out of range, as demonstrated in Fig. 2.1 (black curves).

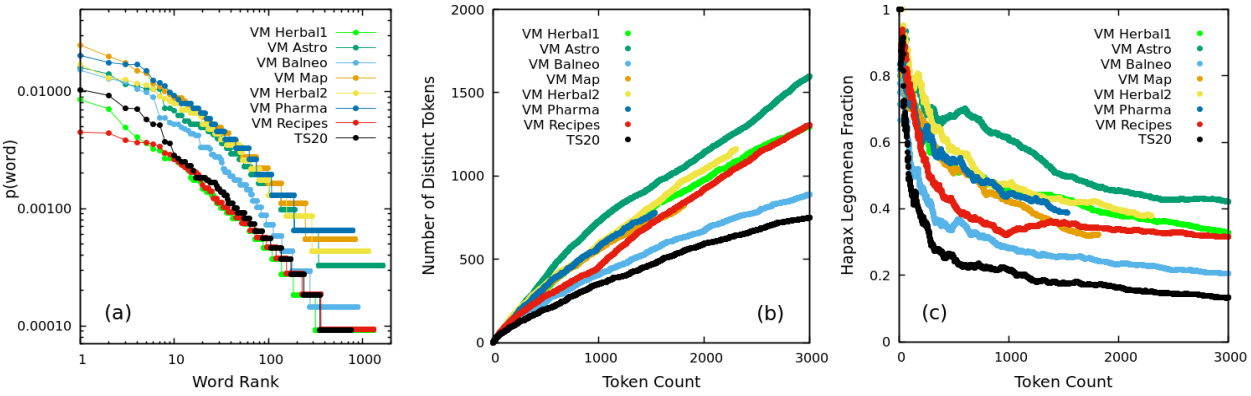


FIG. 2.2. BASIC STATISTICAL PROPERTIES FOR THE VOYNICH MANUSCRIPT'S SECTIONS AND TIMM AND SCHINNER'S (2020) MEANINGLESS TEXT SAMPLE: (A) WORD-RANK DISTRIBUTION (ZIPF PLOT); (B) HEAPS PLOT; AND (C) THE RUNNING FRACTION OF HAPAX LEGOMENA. WHILE THE ZIPF CURVE (A) FOR THE HOAXED TEXT SAMPLE ("TS20", IN BLACK) MATCHES WELL THE PERTINENT VOYNICH CURVES, THE HEAPS (B) AND THE HAPAX LEGOMENA (C) CURVES FOR THE THE HOAXED TEXT SAMPLE ("TS20", IN BLACK) REMAIN SOMEWHAT BELOW OF THE PERTINENT VOYNICH CURVES.

Once I heard that "*statistics is like a bikini*. *It reveals much, but covers up the most important details.*" And the Devil lurks in the details, as the adage says… In this regard, I mention the following. Besides the above-discussed quantitative, statistical departures, there also appear several *qualitative* and *conceptual* problems concerning the above-discussed text generation algorithms producing meaningless texts.

First, the Voynich text includes rare and very rare glyphs (for example, the frequency of the above-mentioned "tabletop" Voynich glyp,  , is about 0.0002), and the rank distributions of glyph and bigram frequencies comprise continuous specta, similar to those obtained for natural languages [Daruka21]. If the Voynich text was created by a cheap, effective hoaxing method, why to bother with inventing and implementing such rare glyphs whose frequencies are organically embedded into a glyph frequency spectrum reminiscent of that obtained for natural languages. Several centuries ago, when the Voynich text was created, there were no statistical measures to assess and control these properties, so its creator(s) might not have dealt with these issues consciously. Furthermore, the very scarce presence of these rare glyphs would not add anything to the overall value and apparent complexity of the script. Furthermore, *if the Voynich text comprised only a meaningless hoax*, it could not be decrypted, and these rare glyphs would exhibit no linguistic or cryptographic value either. In this case, *the presence of such rare glyphs would make no rational sense at all.* On the contrary, if the Voynich text conveyed a cipher, the organic presence of these rare glyphs would make a good sense [Altrieicktus24-25, Altrideicktus_VMS_Transcription].

Second, the Voynich text includes some special glyphs coined as gallows:  ,  , and  . Their enriching presence already lends the Voynich script an mysterious character. However, in some occasions, these gallows are written into another Voynich glyph,  , to form composite gallows, such as  , , and . Zandbergen (2022b) expressed that "*these characters still present an unresolved issue in the understanding of the script*". Similarly to the presence of rare Voynich glyphs, the presence of these composite gallows would not add much to the overall value and apparent complexity of the script, and if the Voynich text comprised only a meaningless hoax, these would turn out meaningless as well. However, if the Voynich text conveyed a cipher, the presence of these composite gallows would make a good sense [Altrideicktus24-25], as will also be discussed in Section 4. Furthermore, the Voynich text includes even more complicated, "super-composite" glyph structures, such as  , , , , etc. Again, if the Voynich text comprised only a meaningless hoax, why to bother with the implementation of such elaborate forms, the creation of which appears rather time consuming. The lack of these "super-composite" glyphs in the hoaxing approaches of Rugg, Timm, and Schinner corroborates this argument. However, if the Voynich text conveyed a cipher, the presence of these latter, "super-composite" gallows would make a good sense [Altrideicktus24-25, Altrideicktus_VMS_Transcription].

Third, there are several Voynich glyphs that appear very alike, as being variants of each other. For example, I mention here the Voynich glyphs  , , and . These variants occur multiple times in the Voynich text. If the Voynich text was a meaningless hoax, there could not have been a rational basis for implementing such minuscule differences. The lack of these glyph variants in the hoaxing approaches of Rugg, Timm, and Schinner corroborates this argument. However, if the Voynich text conveyed a cipher, the presence of such glyph variants would make a good sense [Altrideicktus24-25], as will also be discussed in Section 4.

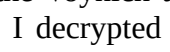
Fourth, dissociated forms of some Voynich glyphs recur in the Voynich text. For example, I mention here the Voynich glyphs (and their dissociated forms)  () and (). Again, if the Voynich text comprised a meaningless hoax, as proposed by Rugg (2004), Rugg and Taylor (2017), and Timm and Schinner (2020), there could not have been a rational basis for the presence of such barely noticeable dissociations. The lack of such dissociated glyph forms in the hoaxing approaches of Rugg, Timm, and Schinner corroborates this argument. However, if the Voynich text conveyed a

cipher, the presence of such dissociations would make a good sense [Altrideicktus24-25], as will also be discussed in Section 4.

Fifth, as mentioned in the Introduction, the line- and paragraph-position-dependent glyph patterns in the Voynich text, as revealed by Vogt (2012), Zandbergen (2021), and Feaster (2022), represent non-occasional inhomogeneities ("graphemic gradient effects") and pose severe (or even prohibitive) problems for the the self-citation text generation scenario [Timm_Schinner20]. Indeed, if the Voynich text comprised a meaningless hoax, as proposed by Timm and Schinner (2020), there was no rational basis for such line- and paragraph-position-dependent graphemic inhomogeneities, as the meaningless hoax was complex enough in its appearance even without such "graphemic gradient effects". However, if the Voynich text conveyed a cipher, especially a polyphonic-homophonic cipher [Altrideicktus24-25], the presence of such graphemic inhomogeneities could consistently be interpreted by the pertinent narrative of Feaster (2022): "*Fifteenth-century ciphers often sought to increase security by providing multiple options for encoding each plaintext character, and for this ploy to work as intended, a writer needed to alternate repeatedly among those options. One strategy for ensuring that happened would have been to favor different options in different areas of the page.*"

Sixth, the Voynich text is written in rather minuscule glyphs. For example, the *Balneo* and *Text-only* sections comprise densely-packed lines of such tiny glyphs. According to my measurements, their middle zone heights were below 2mm. If the Voynich text comprised only a meaningless hoax and assuming no masochistic scribe(s), filling the pages with substantially larger glyphs arranged in more spacious lines (thus creating much less quantities of text) would have been quite adequate. Interestingly, I note here that some of John Dee's multiple handwriting styles also exhibited such minuscule letters, as I found out by studying his spiritual diary [Dee_Diary].

In addition, further substantial or prohibitive problems for the self-citation method [Timm_ Schinner20] will be presented and discussed in the next section. These are focused on the presence of "*statistically strictly separated sub-texts*" [Timm_Schinner23] in the Voynich manuscript. In this regard, concerning the comprehensibility of the Voynich text, Timm and Schinner (2023) argued that "*the existence of two statistically strictly separated sub-texts, Currier A and B, would provide some evidence for an underlying meaningful text, either as two dialects, topics, or different encryption/ encoding schemes. Why should someone with the intention of creating nonsensical pseudo-text invent two different methods of doing so?*". Inspired by this comment, I carried out numerous comparative statistical investigations on the the meaningless text sample generated by the self-citation algorithm of Timm and Schinner (2020). The obtained statistical properties, as presented in the next section and also in Appendix 2, display a smooth behavior (with remarkable statistical fluctuations). That is, no discontinuities, no statistically separated text segments prevail therein. This is in stark contrast with the abrupt changes in the syllable densities (frequencies) of the Voynich text, as observed by Rugg and Taylor (2017). This puzzling feature will be further elaborated in the next section.

Finally, I note that the conceptual generalization of Timm and Schinner's (2020) self-citation algorithm does not exclude at all the possibility that the Voynich text conveys a meaningful, encoded content in accord with the suggestion of Feaster (2022). Indeed, the presence of a polyphonic cipher, as demonstrated in my book [Altrideicktus24-25], and to be discussed in Section 4, would provide a simple, natural explanation for the presence of a self-citation mechanism: Re-using some of the already encrypted words, word segments, or the encrypting glyphs (within a visual reach) would make the process of encoding much more efficient [Feaster22]. This scheme would render the Voynich text a *meaningful* hoax. Intriguingly, the closing phrase of the Voynich ars poetica, as I decrypted from folio 65v, fully supports this scenario:  – "*confictus ictus infinitus*" (Latin) – a hoax of an infinite blow [Altrideicktus24-25].

3. On the (encoding) dialects of the Voynich text

As mentioned in the Introduction, Currier (1976) suggested the alternating presence of two languages, A and B, in the Voynich text based on his statistical analysis. The word-based statistical investigations of Lindemann (2022) supported this hypothesis or the presence of dialects. In terms of further inhomogeneities in the Voynich manuscript, the paleographic analysis of Davis (2020) inferred the presence of five different scribes. Furthermore, Sterneck et al. (2021) pointed out that the Currier languages and the hands established by Davis aligned well, although there were apparently more "hands" than "languages". Besides, Sterneck et al. (2021) also demonstrated that there were some correlations between the hands identified by Davis and the traditionally established sections of the Voynich manuscript.

I generalized the inference of Davis (2020) by suggesting that the five different writing styles (WS) identified by her may not (all) belong to different scribes [Altrideicktus24-25]. That is, the total number of writing styles revealed by Davis may exceed the actual number of scribes involved in the creation of the Voynich manuscript. In this regard, I argued that the Voynich text might have been created under a prolonged period of time (for example, several decades) under which the handwriting of a scribe might have undergone significant changes and/or some parts of the Voynich text were created under the influence of drugs which might also have affected the involved writing styles remarkably [Bancila14, Altrideicktus24-25].

As discussed earlier, Rugg and Taylor (2017) observed the presence of remarkable discontinuities and surges in the syllable densities (frequencies) of the Voynich text. These unusual features made them consider that the Voynich text did not represent a regular text written in a natural language. However, they arrived at this conclusion by comparing the Voynich text only to single works of single authors in which no such inhomogeneities prevailed. That is, they did not consider combined (collated) texts including several works of several authors in their comparisons. This latter scenario, inspired by the findings of Davis (2020), will be investigated in the next section.

Timm and Schinner (2023) missed or disregarded these syllabic discontinuities, and their Φ-correlation (word-based cosine similarity) analysis on the Voynich folio pairs did not show any related discontinuities that could have supported the two-distinct-language hypothesis formulated by Currier (1976). Bases on their findings, Timm and Schinner (2023) considered that the Voynich text comprised a meaningless hoax exhibiting only gradual changes in its statistical-linguistic structure. They further supported this view by the presentation of their self-citation algorithm to generate meaningless Voynich-like texts [Timm_ Schinner20].

Zandbergen (2022a-b) plotted the frequencies (which I will refer to as "densities" in the following) of some of the most common bigrams occurring in the Voynich text and color-coded them by the type of Voynich illustrations. These plots displayed strong fluctuations in the pertinent bigram densities, and Zandbergen was not able to explain this puzzling behavior. Although he found some correlations between the syllable densities and the types of illustrations, quite unexpectedly, substantial differences prevailed in the investigated bigram densities even within the same illustration type, for example, between Herbal (Currier) A and Herbal (Currier) B: "*This does not demonstrate that the text is meaningful, or that the text variations are caused by different subject matter (as suggested in by Montemurro and Zanette). If that were the case, the difference between herbal A and herbal B should not exist. The cause of the (statistical) language variation is still unexplained*" (Zandbergen 2022a).

In order to clarify all these puzzling features, I carried out numerous statistical-linguistic investigations on the Voynich text making use of the original Takahashi transcription [Takahashi_VMS_ Transcription]. The obtained results and inferences turned out rather robust, appeared independent of the actual transliteration scheme. As a consistency check, I re-calculated some of these statistical

entities based on an updated (corrected) version of the original Takahashi transcription [Takahashi_Transcript_updated] and found no remarkable differences. Therefore, in the following, all presented results will be based on the original Takahashi transcription [Takahashi_VMS_Transcription].

In this pursuit, first I calculated several syllable densities for the Voynich text. But instead of the type of Voynich illustrations, I distinguished (color-coded) these syllable densities by the actual writing styles (WS) established by Davis (2020). I present three figures in this regard. Fig. 3.1 demonstrates the actual syllable densities color-coded by the involved writing styles (WS) and following the original Voynich folio order. For better visibility, the plots were shifted vertically. *The reader can notice immediately that the actual syllable densities strongly correlate with the involved writing styles*. This stunning feature immediately explains the substantial differences in the bigram densities prevailing within the same type of Voynich illustrations, for example, between Herbal (Currier) A and Herbal (Currier) B, as established by Zandbergen(2022a-b). Furthermore, Fig. 3.1 also reveals that the local surges (clumping effects) of the syllable densities in the *Herbal1* section, as observed by Rugg and Taylor (2017), are artifacts of the mixed Voynich folio order (in terms of the involved writing styles).

In order to further investigate these intriguing features, I reordered the Voynich folios within the same illustration types according to the involved writing styles and displayed the actual syllable densities in Fig. 3.2. *This plot clearly demonstrates that the strong discontinuities in the syllable densities originate from the differences in the involved writing styles (WS).*

Based on these revealed correlations, I decided to reorder the Voynich folios further, according to the involved writing styles. Following the paleographic analysis of Davis (2020), I provide here the reordered folio sequences :

WS1: 1-25, 27-30, 32, 35-38, 42, 44-45, 47, 49, 51-54, 56, 87-90, 93, 96, 99-102; WS2: 26, 31, 33-34, 39-40, 43, 46, 50, 55, 75-84, 115r; WS3: 58, 65, 94-95, 103-108, 111-114v, 115v-116r; WS4: 67-73; WS5: 41, 48, 66; WSM: 57, 85-86. [WS stands for writing style; I left Davis' (2020) numbering unchanged; and WSM refers to mixed writing styles.]

Next, I plotted the actual syllable densities based on this writing-style-grouped folio order. In Fig. 3.3, the prevailing differences in the syllable densities appear even more striking. *These clearly demonstrate that the syllabic structure (or composition) of the Voynich text substantially depends on the involved writing styles.*

Furthermore, these stunning features strongly suggest the presence of at least four (or five) dialects in the Voynich text being strongly correlated with the involved writing styles. (As the presence of Writing style 5 in the Voynich text appears rather limited, it remains uncertain whether it represents a distinct dialect.) At this point, the question prevails whether these abrupt syllabic variations may also correspond to distinct languages, as originally suggested by Currier (1976). Interestingly, as the alterations of Currier languages A and B in the Voynich text display a remarkable correlation with the involved writing styles established by Davis (2020) [Sterneck21], these current findings corroborate the legacy of Currier's work, at least in terms of dialects.

Toward supporting their "self-citation" algorithm, Timm and Schinner (2020) claimed gradual changes in the density (occurrence frequency) of the Voynich words throughout the Voynich text: "*Now, reordering the sections with respect to the frequency of token <chedy> replaces the seemingly irregular mixture of two separate languages by the gradual evolution of a single system from "state A" to "state B"*". However, they drew this conclusion based on only section-averaged word densities and not on (more local) folio-based word (or syllable) densities. As Fig. 3.3 clearly demonstrates, *their conclusion is not correct*. For example, the in-text density of the Voynich token "*chedy*" strongly correlates with the involved writing styles and displays sharp, stepwise changes

(discontinuities) accordingly. That is, instead of a gradual evolution, there are sharp, stepwise changes in the density of the Voynich token "*chedy*" in terms of the writing-style-reordered Voynich text.

In addition, concerning the comprehensibility of the Voynich text, Timm and Schinner (2023) argued that "*the existence of two statistically strictly separated sub-texts, Currier A and B, would provide some evidence for an underlying meaningful text, either as two dialects, topics, or different encryption/ encoding schemes. Why should someone with the intention of creating nonsensical pseudo-text invent two different methods of doing so?*". Well, the sharp, stepwise changes (discontinuities) in the investigated syllable and word densities, as shown in Figs. 3.1-3, clearly demonstrate the presence of such "*statistically strictly separated sub-texts*".

I further investigated these intriguing features in terms of binned letter, syllable, and token densities for the Voynich text (with folios reordered according to the involved writing styles), as shown in Figs. 3.4-7, respectively. Similarly to the abrupt changes in the syllable densities, several letter densities display similar, stepwise changes in terms of writing styles. However, there occur such discrete changes even *within* individual writing styles, in terms of the Voynich sections. For example, the in-text densities of letters "*o*", "*e*", "*i*", "*t*", and "*ch*" display significant section-wise differences for the *Herbal1*, *Herbal2*, and *Pharma* sections, even for Writing style 1 (WS1). Alternatively, some other letter densities (for example, the densities of letters "*a*", "*q*", and "*r*") remain the same for Writing styles 1 and 2 concerning the involved parts of the *Herbal1* and *Herbal2* sections, as shown in Figs. 3.4-5. For comparison, I present the pertinent plots for the Voynich text with the original folio order in Appendix 1.

Furthermore, as presented in Figs. 3.3 and 3.6-7, syllable (and token) densities also share these puzzling inhomogeneities. In particular, the densities of syllables (and tokens) "*dy*", "*ch*", "*cho*", "*chedy*", "*or*", "*al*" differ significantly for Writing styles 1 and 2, yet they remain practically the same for the *Herbal1* and *Balneo* sections for Writing style 2. Other syllables (and tokens), including "*da*", "*qo*", "*qokeedy*", exhibit unchanged densities for Writing styles 1 and 2 concerning the *Herbal1* section, yet they differ remarkably for the *Herbal1* and *Balneo* sections as far as Writing style 2 concerned. Besides, the densities of the Voynich tokens "*daiin*" and "*ol*" exhibit differences both in comparison of Writing styles 1 and 2 as well as in terms of the involved *Herbal1* and *Balneo* sections. On the contrary, the density of the Voynich syllable "s*h*" remains the same for all the involved sections in terms of Writing styles 1 and 2 but differs from that of the other writing styles. So far, I elaborated on the interrelated statistical properties of Writing styles 1 and 2, as these are the only ones which show remarkable section-wise intermixing. However, I mention that there appear remarkable section-wise differences also in some syllable and token densities for Writing style 3. These concern the following Voynich syllables and tokens: "*al*", "*dy*", "*chedy*", and "*qokeedy*", as displayed in Figs. 3.3 and 3.6-7. However, I note that the presence of Writing style 3 in the *Herbal1* and *Herbal2* sections appear rather limited and statistically underrepresented.

Such an elaborate interplay of the syllable densities clearly demonstrates that the Voynich text is not a homogeneous, meaningless hoax generated by a self-citation algorithm as suggested by Timm and Schinner (2020). For a text generated even by independent self-citation algorithms (with different initial phrases and different model parameters each corresponding to a different writing style) would not exhibit abrupt changes (discontinuities) in the letter, syllable, and token densities occurring *within* the same writing style and, *at the same time*, display unchanged density values (in terms of other syllables) connecting *different* writing styles. For comparison, I calculated the pertinent letter, syllable, and token densities for the meaningless text generated by the self-citation algorithm of Timm and Schinner (2020). These plots, presented in Appendix 2, exhibit no such discontinuities. Finally, concerning the sharp statistical differences prevailing even within the same writing style, I re-cite Timm and Schinner (2023) here: "*Why should someone with the intention of creating nonsensical pseudo-text invent two different methods of doing so?*"

Besides the presence of dialects, the elaborate interplay of the section-wise and writing-style-wise changes in the letter, syllable, and token densities also suggests the presence of (section-wise) textual cohesion in the Voynich manuscript inferring that its text is not a gibberish. This scenario is further corroborated by the comprehensive investigations of Montemurro and Zanette (2013) demonstrating the presence of "semantic word-networks" in the Voynich text. Intriguingly, these authors pointed out that the densities of the involved Voynich words (belonging to the same Voynich word-network) also display highly-correlated abrupt changes in terms of the involved Voynich sections. This behavior is in accord with the above-presented letter and syllable dynamics, and also being consistent with the presence of (encoding) dialects in the Voynich text. Based on their findings, Montemurro and Zanette (2013) concluded that "*these results together with some previously known statistical features of the Voynich manuscript, give support to the presence of a genuine message inside the book.*"

As mentioned earlier, Rugg and Taylor (2017) visually compared these abrupt changes in the syllable densities of the Voynich text to single works of single authors (representing regular texts written in natural languages) in which no such inhomogeneities were present. Based on this comparison, they concluded that the Voynich text did not represent a regular text written in a natural language. However, the work of Davis (2020) along with the above-presented multilateral statistical analysis clearly demonstrate that the Voynich text is rather inhomogeneous in its structure. It comprises at least five writing styles [Davis20] which likely represent the work of several scribes [Davis20]. Inspired by these insights, I created three combined texts by collating *several* works of *several* authors. These were written in Latin, English, and German languages [Combined_texts]. Then, I calculated numerous letter, syllable, and word densities for each of these texts, as presented in Appendices 3-5, respectively. The related findings turned out very instructive.

The combined Latin text included continuous sections of Vergil's works (Georgicon, Eclogues, and Aeneid), one work of Ovid (Amatoria), and one work of Alcuin (Rhetorica), in this order of appearance [Combined_texts]. As presented in Appendix 3, the letter densities appeared more or less constant, except for the letter "*q*", as it displayed a somewhat lower value for Vergil's Eclogues. Concerning the syllable (and word) densities, I found remarkable opus-wise differences for the syllables "*que*" and "*quod*" (also functioning as separate words). Interestingly, as these two Latin words are related to each other, they also displayed a pronounced anti-correlation behavior in their in-text densities exhibiting a Pearson correlation coefficient of -0.71 (for a bin size of 5000 letters). Furthermore, there also occurred some significant, opus-wise differences in the density of the syllable "*tus*".

The combined English text included continuous sections of Dickens' Bleak House, Shakespeare's Hamlet, his Sonnets, and Huxley's Brave New World, in this order of appearance [Combined_ texts]. While the investigated letter frequencies did not exhibit significant differences, I found remarkable opus-wise changes in the densities of the syllables "*ed*", "*ha*", "*ing*", and "*the*" (cf. Appendix 4). Interestingly, the presence of the first three syllables appear related to the tense of texts, and the last one ("*the*") appears more associated with the descriptive (and prosaic) character of texts.

Finally, the combined German text included continuous sections of Goethe's Werther, Rilke's Poems, and Mann's Zauberberg, in this order of appearance [Combined_texts]. Here, similarly to the combined English text, I found no significant changes in the investigated letter densities (cf. Appendix 5). However, noticeable opus-wise changes occurred in the density of the syllables "*ge*" and "*ich*", and the differences appeared remarkable in the case of the syllable "*ung*". Although my German knowledge is limited, it appears that the presence of syllables "*ge*" and "*ung*" may also be related to the stylistic (tense and descriptive) aspects of texts, similarly to their English counterparts.

These instructive examples clearly demonstrate that the abrupt changes in the syllable densities, based on which Rugg and Taylor (2017) excluded the natural language scenario, can also be present in regular (combined) texts written in natural languages. However, based on the detailed comparison of the pertinent plots, the prevailing differences appear remarkably larger for the Voynich text. This suggests the presence of dialects in the case of the Voynich text, instead of writing-style(-or scribe)-related stylistic differences.

Finally, it is important to note that even stylistically or language-wise combined regular texts will not display a self-citation behavior [Timm_Schinner20] that is an inherent property of the Voynich text [Schinner07, Timm_Schinner20, Daruka21]. This self-citation property along with the related non-Brownian scaling behavior turn out to be the distinctive features that exclude the “regular text written in a natural language” scenario for the Voynich manuscript. By its inherently self-correlated nature, the self-citation process may result in local surges, remarkable fluctuations (cf. Fig. 3.3 and the plots of Appendix 2), and positive autocorrelations [Timm16, Timm_Schinner20, Daruka21, Gaskell_Bowern22] in the involved letter, syllable, and token densities.

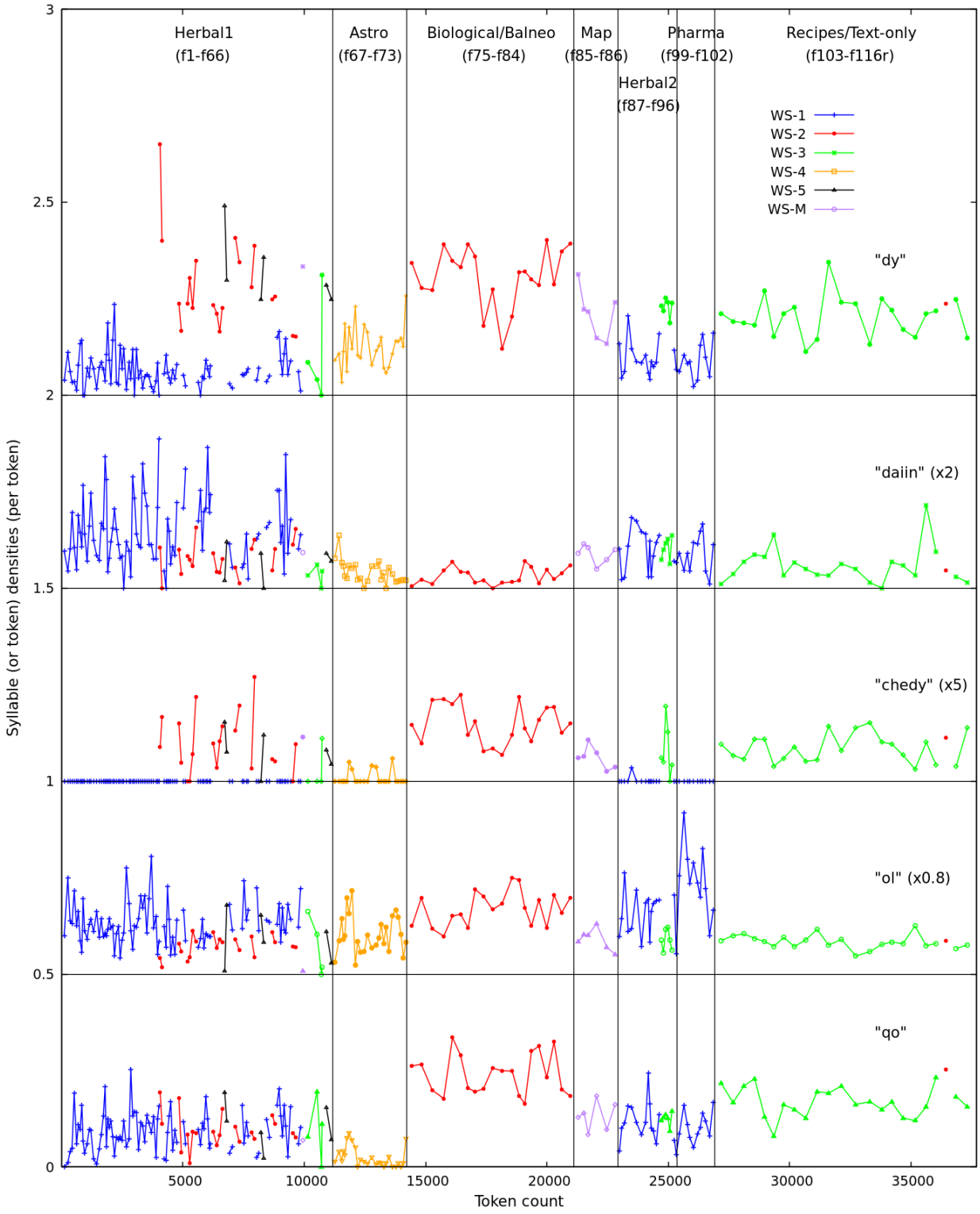


FIG. 3.1. SYLLABLE (OR TOKEN) DENSITIES (PER TOKEN) FOR THE VOYNICH TEXT COLOR-CODED BY THE INVOLVED WRITING STYLES (WS; IDENTIFIED EARLIER BY DAVIS (2020)). THE PLOTS DISPLAY REMARKABLE SECTION-WISE DISCONTINUITIES BEING STRONGLY CORRELATED WITH THE INVOLVED WRITING STYLES. THE PLOTS WERE SHIFTED VERTICALLY FOR BETTER VISIBILITY.

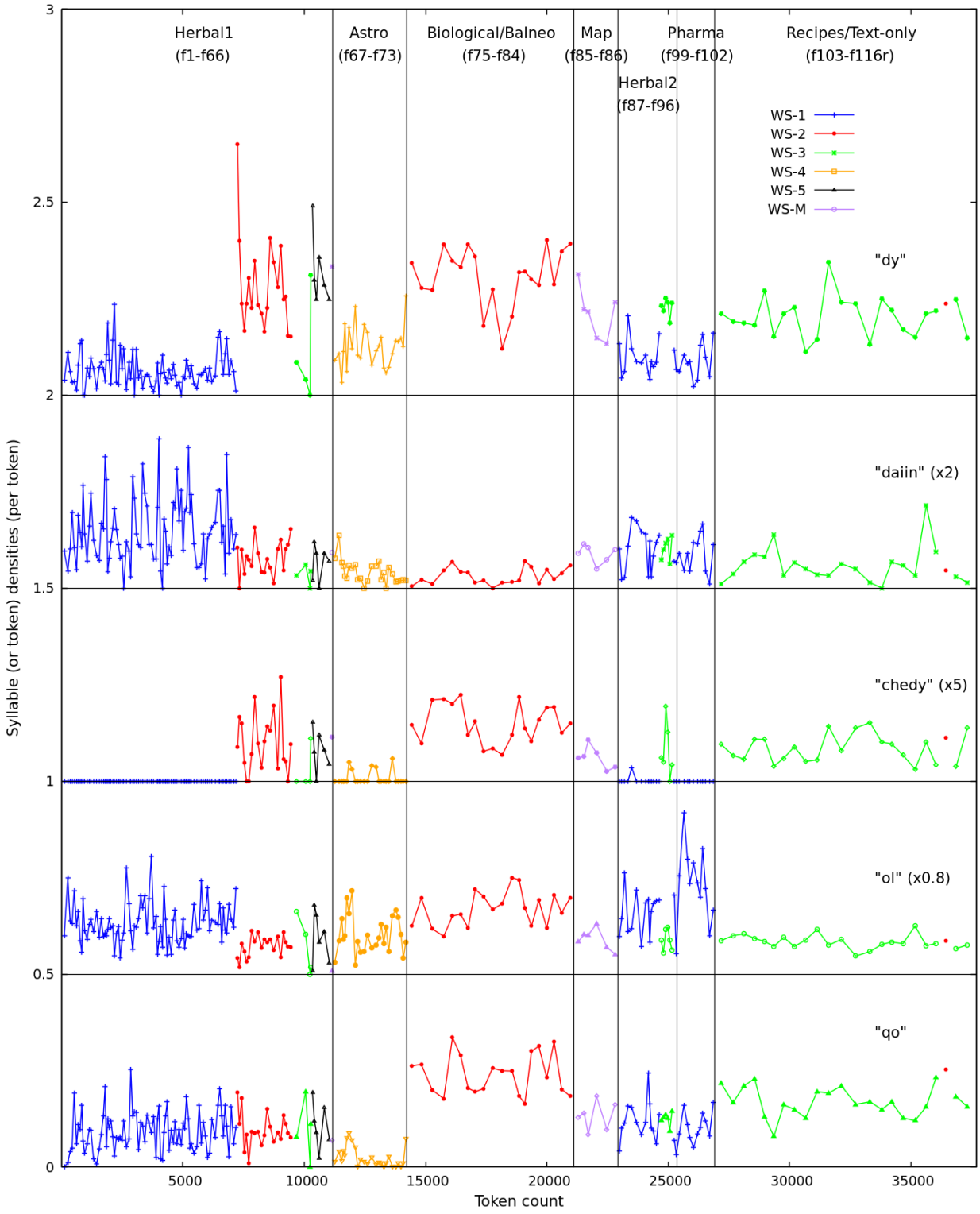


FIG. 3.2. SYLLABLE (OR TOKEN) DENSITIES (PER TOKEN) FOR THE VOYNICH TEXT COLOR-CODED BY THE INVOLVED WRITING STYLES (WS). THE VOYNICH FOLIOS WERE PARTIALLY REORDERED WITHIN EACH SECTION ACCORDING TO THE INVOLVED WRITING STYLES. THE PLOTS DISPLAY REMARKABLE DISCONTINUITIES BEING STRONGLY CORRELATED WITH THE INVOLVED WRITING-STYLES. FURTHERMORE, THE PLOTS WERE SHIFTED VERTICALLY FOR BETTER VISIBILITY.

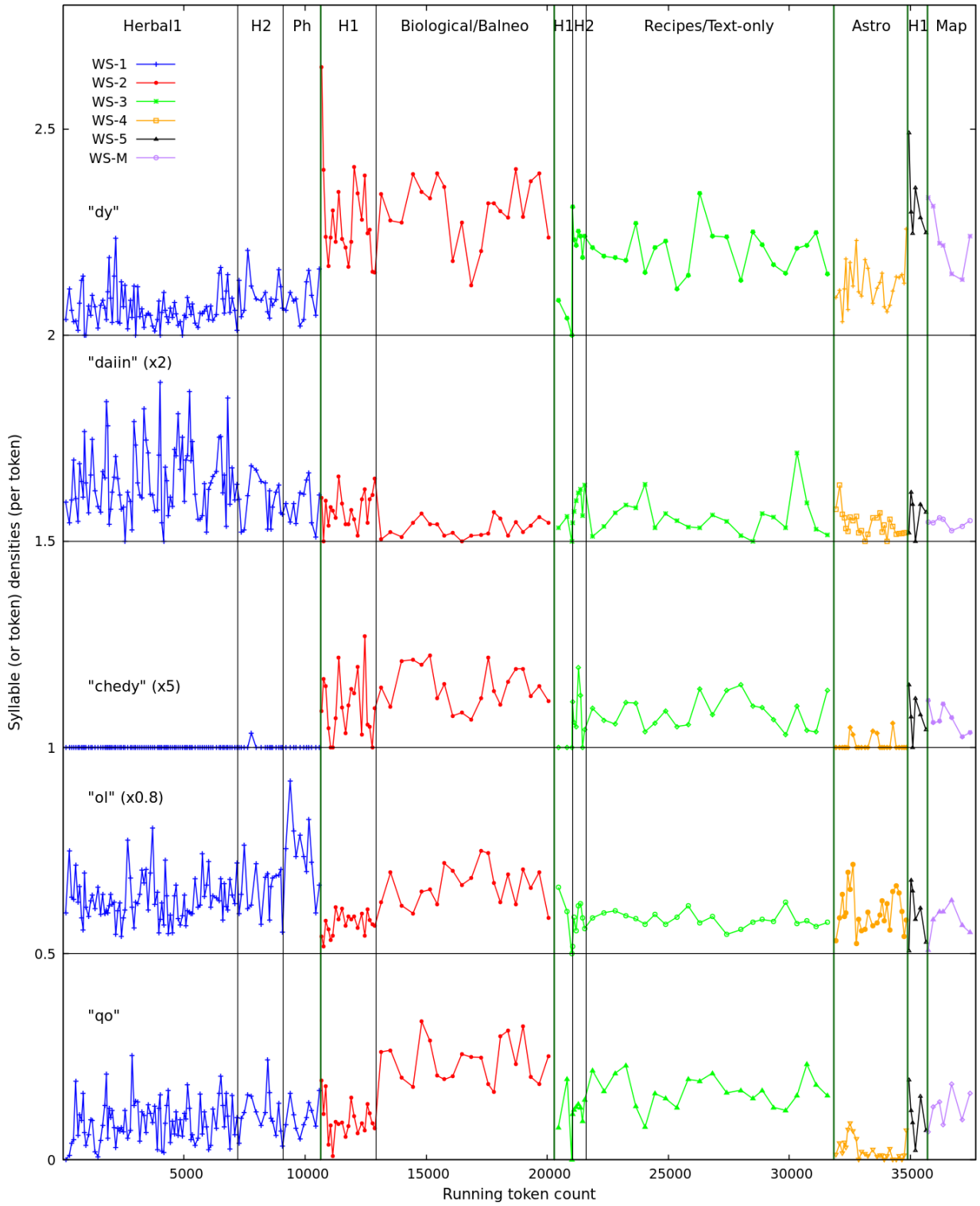


FIG. 3.3. SYLLABLE (OR TOKEN) DENSITIES (PER TOKEN) FOR THE VOYNICH TEXT COLOR-CODED BY THE INVOLVED WRITING STYLES (WS). THE VOYNICH FOLIOS WERE REORDERED ACCORDING TO THE INVOLVED WRITING STYLES. THE PLOTS DISPLAY REMARKABLE DISCONTINUITIES BEING STRONGLY CORRELATED WITH THE INVOLVED WRITING-STYLES. FURTHERMORE, THE PLOTS WERE SHIFTED VERTICALLY FOR BETTER VISIBILITY.

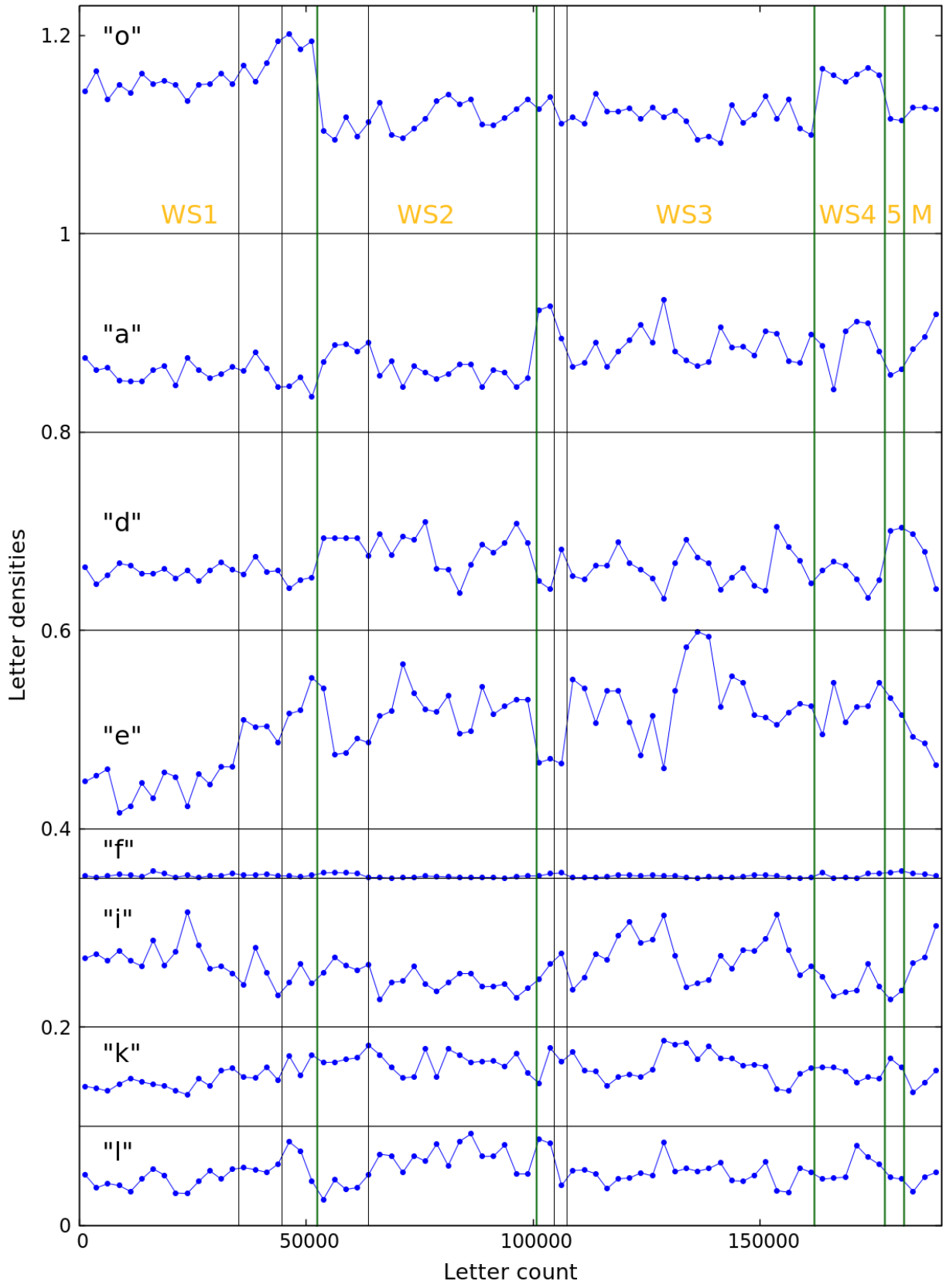


Fig. 3.4. Binned in-text letter densities for the Voynich text based on the writing-style-reordered folio sequence. Note the strong dependence on the writing style in the case of letters "o" and "e". The pertinent section titles are displayed in Fig. 3.3, and the plots were shifted vertically for better visibility. [Bin size = 2500 letters]

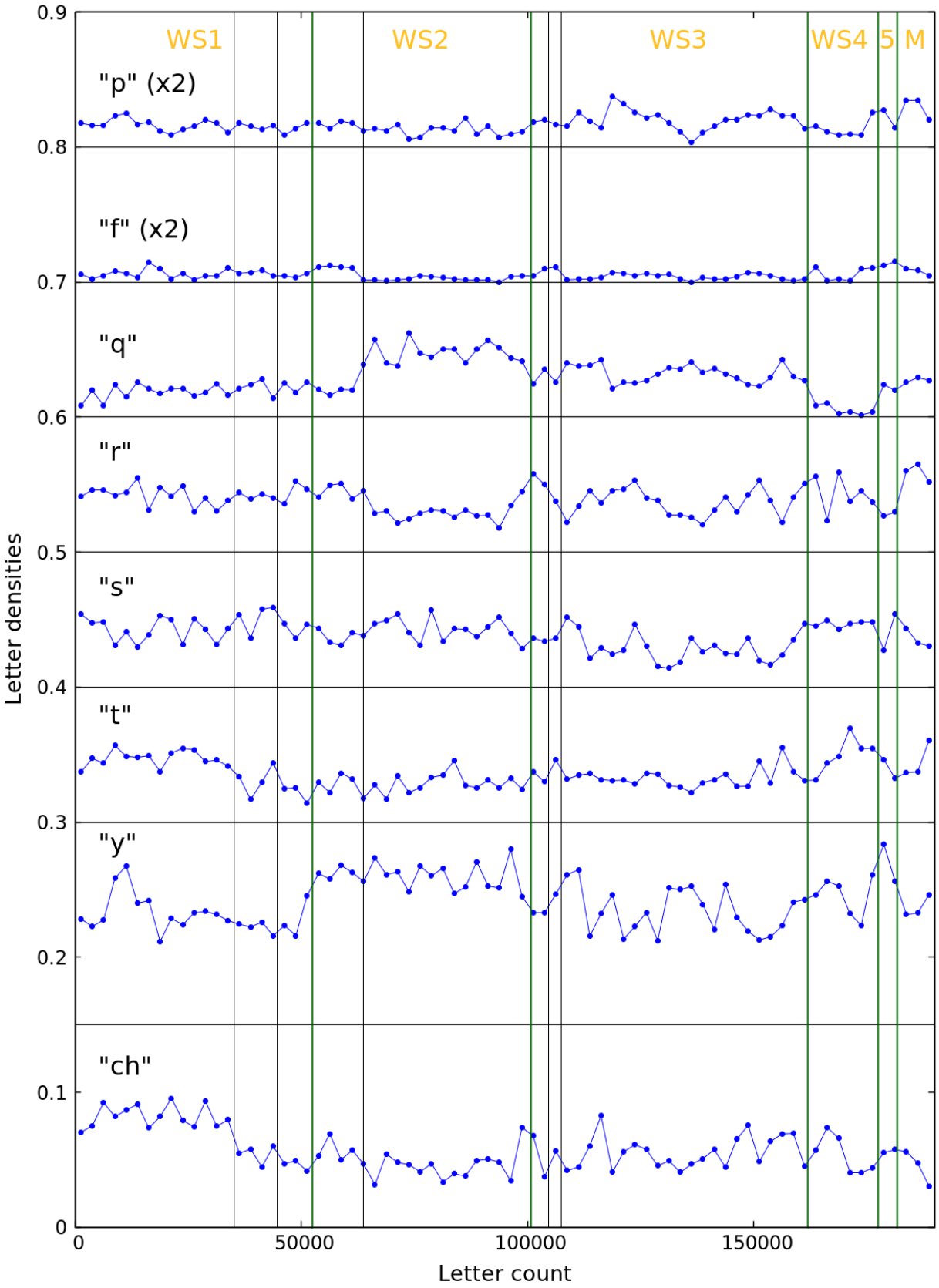


Fig. 3.5. Binned in-text letter densities for the Voynich text based on the writing-style-reordered folio sequence. Note the strong dependence on the writing style in the case of letters "q" and "ch". The pertinent section titles are displayed in Fig. 3.3, and the plots were shifted vertically for better visibility. [Bin size = 2500 letters]

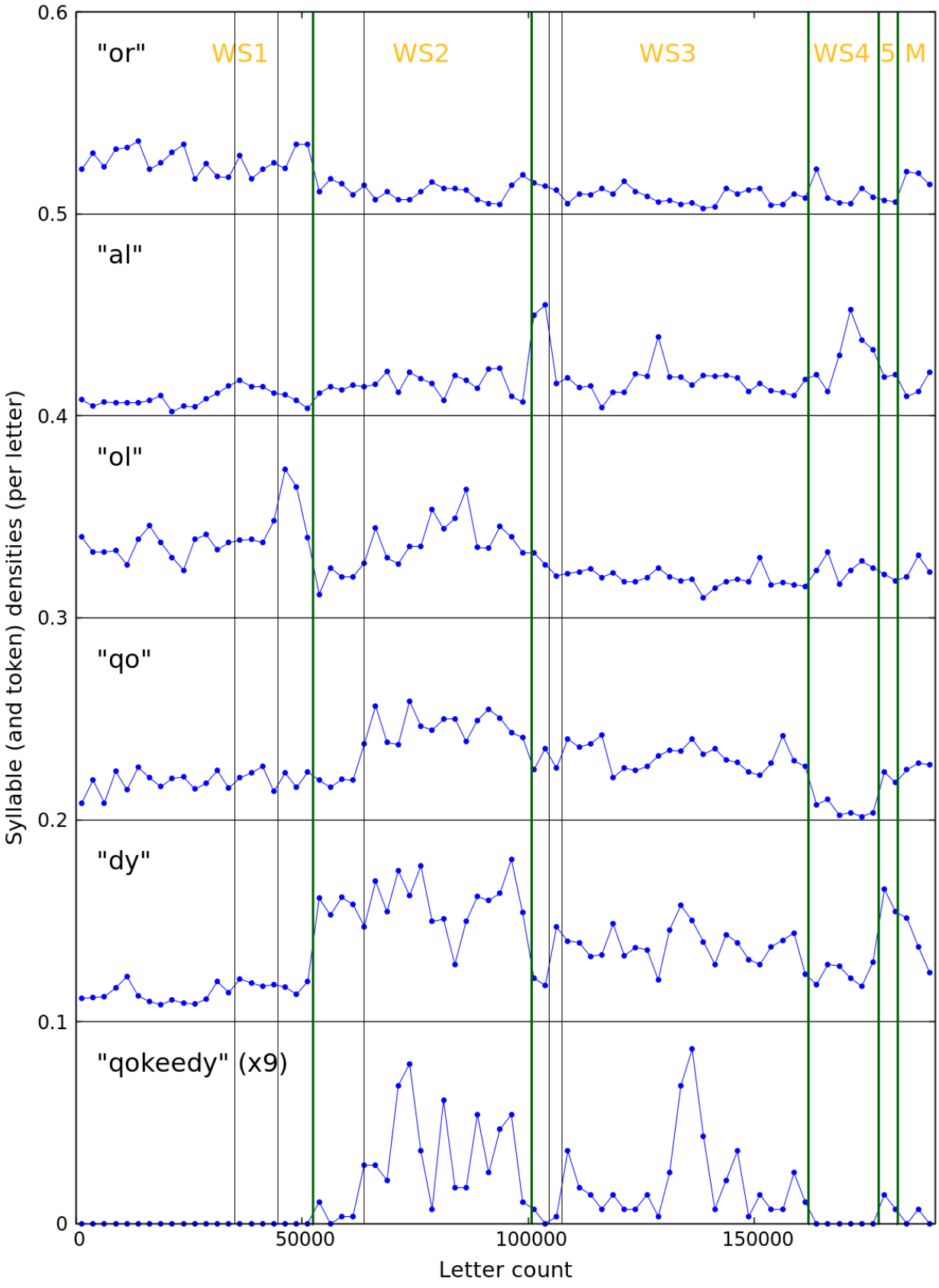


Fig. 3.6. Binned in-text syllable (and token) densities for the Voynich text based on the writing-style-reordered folio sequence. Note the strong dependence on the writing style. The pertinent section titles are displayed in Fig. 3.3, and the plots were shifted vertically for better visibility. [Bin size = 2500 letters]

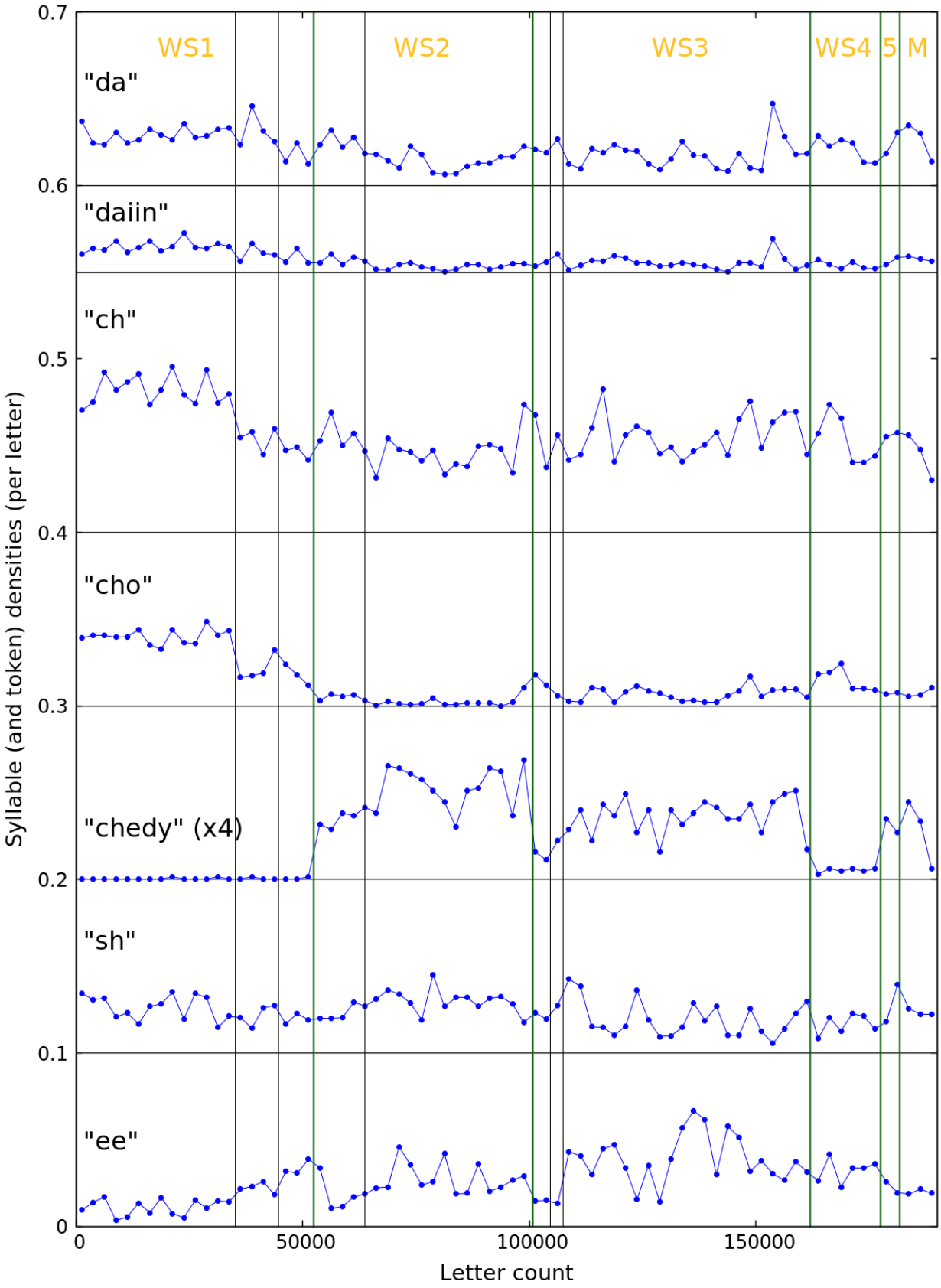


Fig. 3.7. Binned in-text syllable (and token) densities for the Voynich text based on the writing-style-reordered folio sequence. Note the strong dependence on the writing style. The pertinent section titles are displayed in Fig. 3.3, and the plots were shifted vertically for better visibility. [Bin size = 2500 letters]

As discussed above, Timm and Schinner (2023) investigated the Φ-correlation (word-based cosine similarity) of the Voynich folio pairs (the description of methodology is provided in their paper) and did not observe any related discontinuities that could have supported the two-distinct-language hypothesis of Currier (1976). In this regard, they expressed that "*This behavior confirms the hypothesis of a continuous evolution from Currier A to B, which had been derived previously [28] on the basis of token/word statistics. Consequently, the Currier languages should be seen as simplified (coarse grained) by-products of the generating algorithm, as well as the scribe's growing experience with it.*" However, the above-presented findings, displaying the presence of remarkable abrupt changes in the Voynich letter, syllable, and token densities (even within a single writing style), clearly demonstrate that *their conclusion is not correct*. I conceived that the rank-ordered Φ-correlation plot is not sensitive enough to resolve these differences originating from the presence of (at least four) dialects due to their remarkable (self-citation-based) variances in the Φ-correlations.

In order to clarify these crucial issues, I re-calculated this rank-ordered Φ-correlation curve for the Voynich folio pairs, as shown in Fig. 3.8 (blue curve). It appeared identical with the corresponding plot of Timm and Schinner (2023). In addition, I also calculated the Φ-correlation (word-based cosine similarity) for a composite (collated) document including Latin (Ovid – Amatoria), French (Villon – Ballade; accents removed), and Italian (Dante – Divina Commedia; accents removed) texts [Combined_texts]. The corresponding rank-ordered Φ-correlation plot is also displayed in Fig. 3.8 (red curve). The presence of the three (Latin) languages manifest itself in terms of steps. However, these steps are somewhat smoothed due to the inherent variances in the Φ-correlations for each language. Comparing the two curves shown in Fig. 3.8, I inferred that the smoothness of the Voynich curve (relative to the combined-languages curve) indicates that *the Voynich text conveys (at least four) dialects instead of distinct languages*.

Furthermore, in addition to the remarkable discontinuities in the letter and syllable densities, the presence of Voynich dialects also manifest itself in terms of a word-level metric, namely, in the Φ-correlation (word-based cosine similarity) of consecutive Voynich folios, as presented in Fig. 3.9. Besides the remarkable section-wise differences, the reader can observe that the pertinent changes in writing style (indicated by red vertical line segments based on Davis (2020)) infer substantially lower Φ-correlation values even *within* the same Voynich section. That is, consecutive Voynich folios conveying different writing styles remarkably differ also in their word-based (cosine) similarity. *This remarkable feature further corroborates the presence of dialects in the Voynich text, now in terms of vocabulary display.* Finally, I note that these abrupt changes further refute Timm and Schinner's (2023) above-cited conclusion concerning the "*continuous evolution from Currier A to B"*.

Out of curiosity, I also calculated the Φ-correlation for the (consecutive "binned folios" of the) meaningless hoax text generated by the self-citation algorithm of Timm and Schinner (2020). As expected, no discontinuities could be observed in the pertinent Fig. 3.10.

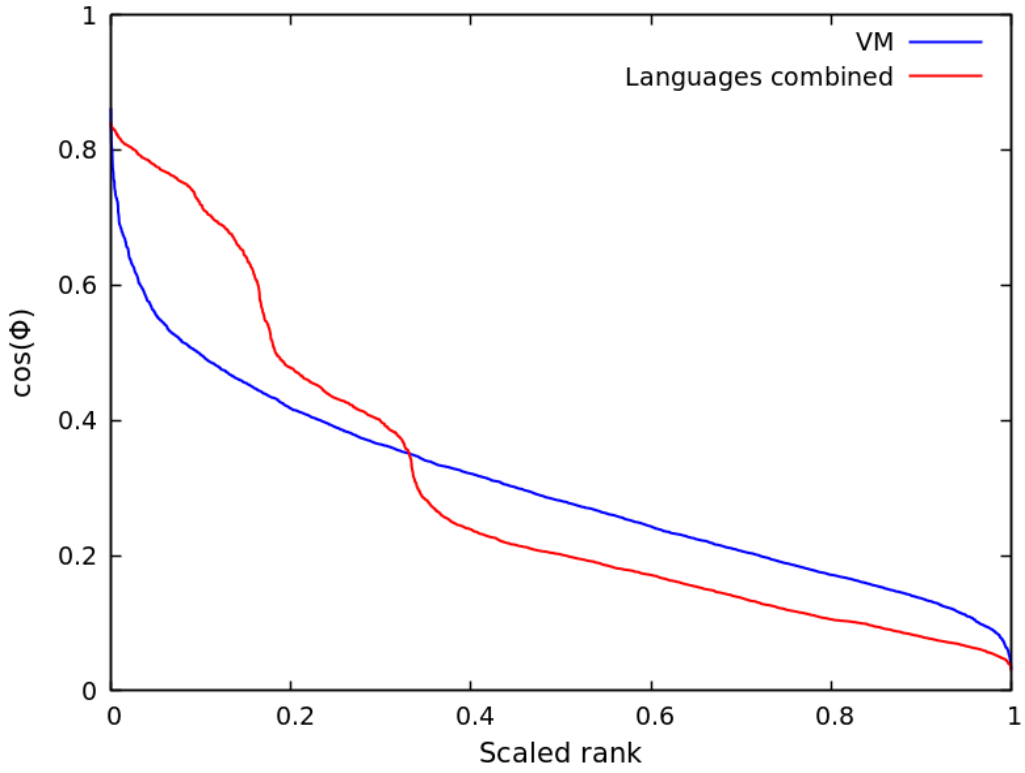


Fig. 3.8. Rank-ordered Φ-correlation (word-based cosine similarity) plot for all Voynich folio pairs (blue curve) and for a combined (collated) document including Latin (Ovid – Amatoria), French (Villon – Ballade; accents removed), and Italian (Dante – Divina Commedia; accents removed) texts (red curve) [Combined_texts]. The smooth Φ-correlation curve for the Voynich folio pairs appears identical with the one presented by Timm and Schinner (2023). In the "combined languages" curve, the presence of three (Latin) languages manifest itself in terms of steps. Howevee, these steps are somewhat smoothed due to the inherent variances in the Φ-correlations for each language. [Bin size = 500 letters for the combined-language text.]

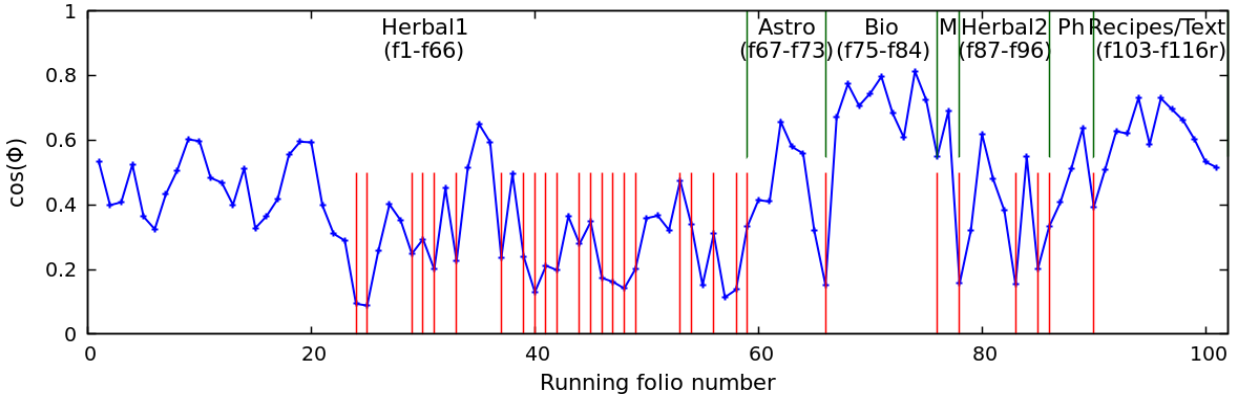


Fig. 3.9. Φ-correlation (word-based cosine similarity) plot for the consecutive Voynich folios. Remarkable section-wise differences can be observed. The red vertical line segments indicate changes in the writing style (based on Davis (2020)). Their locations appear strongly correlated with the low cosine similarity (cos(Φ)) values and the local minima occurring in the plot.

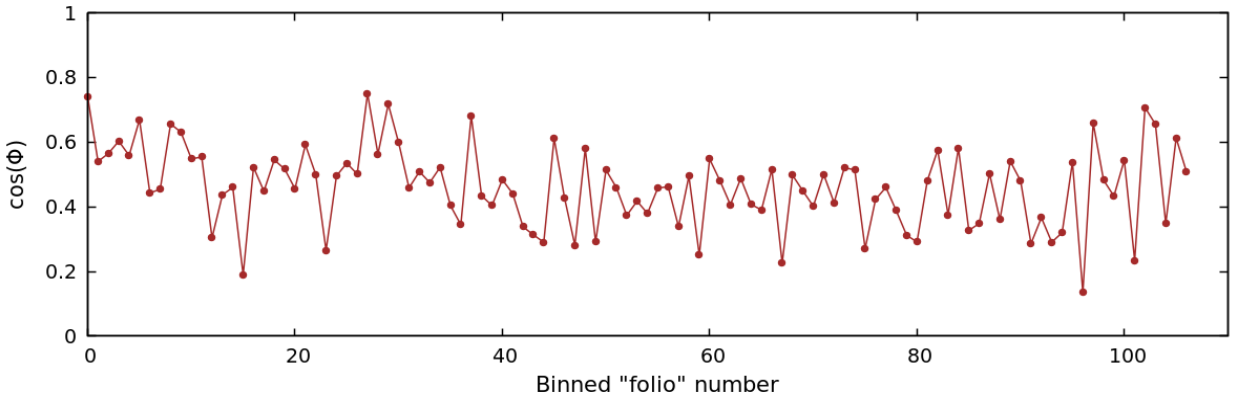


Fig. 3.10. Φ-correlation (word-based cosine similarity) plot for the (consecutive "folios" of the binned) meaningless text sample generated by Timm and Schinner (2020) based on their self-citation method. No discontinuities occur. [Bin size = 100 letters]

Toward further characterizing the distribution and vocabulary display of words occurring in the Voynich text, besides the above-discussed word-based cosine similarity (Φ-correlation) metrics, I also investigated two aspects of hapax legomena, namely, the words that occur only once in the text.

Concerning hapax legomena in the Voynich text, Timm and Schinner (2023) argued "*that the VMS text contains a rather high number of hapax legomena, compared to other (natural language) corpora*". In order to verify this assessment, first I calculated the running fraction of hapax legomena for all Voynich sections, as presented in Fig. 3.11a. Similarly to the syllable densities discussed above, this hapax legomena plot also displays remarkable section-wise differences, that is, far from being homogeneous. In particular, the uppermost curve corresponds to the *Astrology* section and the lowermost curves represent the *Balneo* and *Recipes* sections. This relation makes sense as the *Astrology* section appears rich in labels (or listings, being more abundant in distinct word types), and the other two sections appear much more descriptive (thus more repetitive in terms of word occurrences). In addition, I also plotted the running fraction of hapax legomena for the meaningless text generated by the self-citation algorithm of Timm and Schinner (2023), also plotted in 3.11a (in black). This latter curve remains somewhat below the pertinent Voynich curves.

Then, for a linguistic comparison, I also plotted the running fraction of hapax legomena for several Latin, English, and German texts, displayed in Figs. 3.11b-d, respectively. First of all, the reader may notice that the Latin poetry curves run above most of the Voynich curves (cf. Figs. 3.11a-b). Therefore, it is simply not true "*that the VMS text contains a rather high number of hapax legomena, compared to other (natural language) corpora*", as claimed by Timm and Schinner (2023). Furthermore, the reader may also notice that in comparison, the pertinent Voynich curves (cf. Fig. 3.11a) lie in the envelope spanned by the hapax legomena curves obtained for natural languages (cf. Figs. 3.11b-d). Interestingly, the poetry curves (Ovid, Vergil, Rilke) are usually marked by higher values of hapax legomena. Along these lines, while analyzing the puzzling grapheme patterns in the Voynich text, Feaster (2022) noted that *"Exploratory studies of a few well-known works of poetry show that similar patterns can be detected in them, presumably due to a complex interplay of grammatical, metrical, and stylistic factors"*.

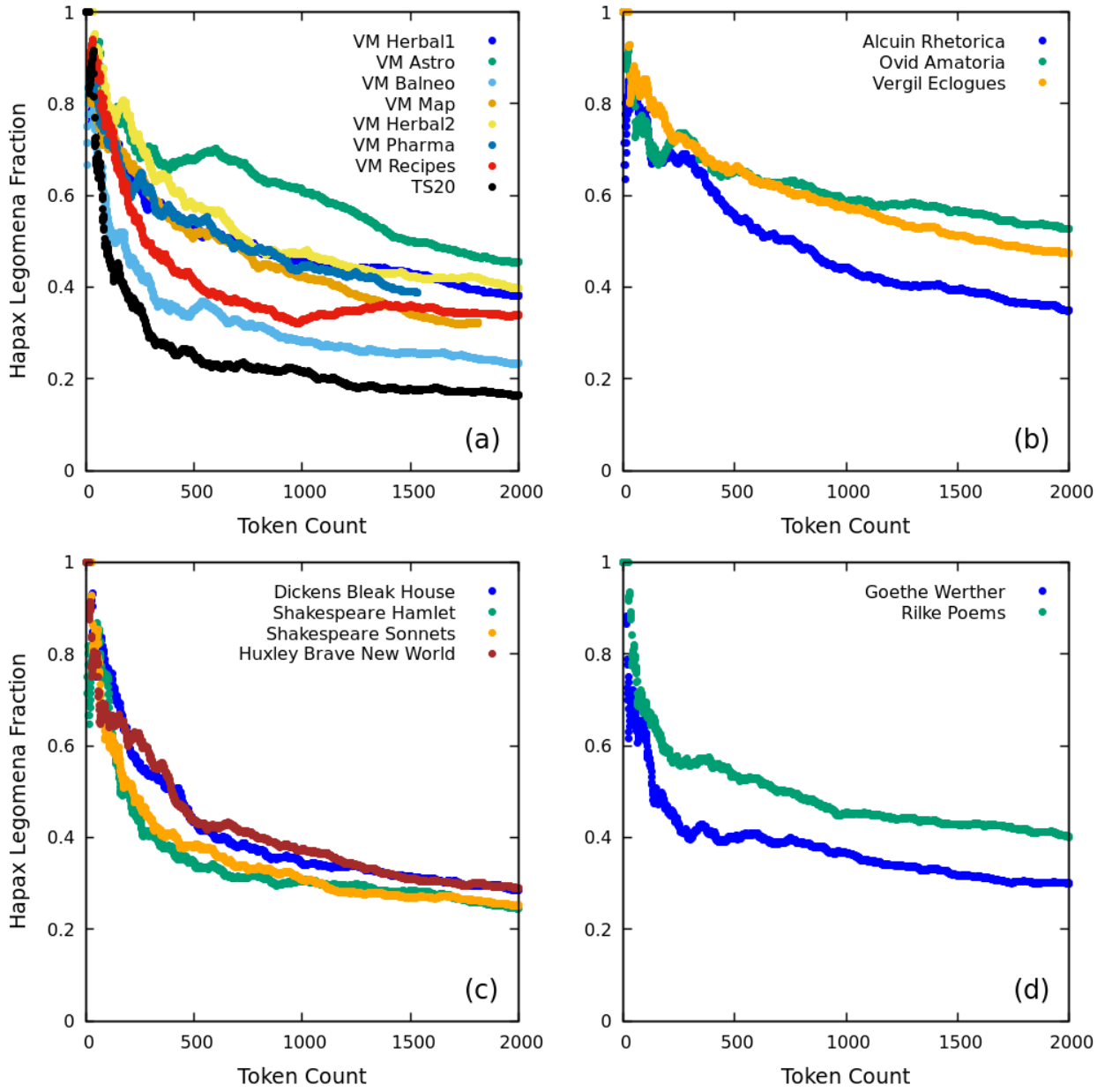


FIG. 3.11. RUNNING FRACTION OF HAPAX LEGOMENA FOR (A) THE SECTIONS OF THE VOYNICH MANUSCRIPT AND THE MEANINGLESS HOAX TEXT GENERATED BY TIMM AND SCHINNER (2023); (B) LATIN TEXTS; (C) ENGLISH TEXTS; AND (D) GERMAN TEXTS [COMBINED_TEXTS]. THE HAPAX LEGOMENA CURVE FOR THE MEANINGLESS HOAX TEXT GENERATED BY TIMM AND SCHINNER (2023) REMAIN SOMEWHAT BELOW OF THE CORRESPONDING VOYNICH CURVES. FURTHERMORE, POETRY (OVID, VERGIL, RILKE) IS USUALLY MARKED BY HIGHER VALUES OF HAPAX LEGOMENA.

Besides the running fraction of hapax legomena, I was also interested in their actual in-text densities. In this pursuit, I calculated the in-text density of hapax legomena for the Voynich text in two ways. First, I performed a folio-wise calculation based on the writing-style-reordered Voynich folios, and second, I also investigated the word-binned (and writing-style-reordered) Voyich text in this regard. With these two approaches, my motivation was to reveal the possible differences originating from the remarkably different quantities of words the individual Voynich folios exhibit. For example, the *Herbal* folios contain remarkably less words than those of the *Balneo* or the *Text-only* sections.

Fig. 3.12a shows the (folio-wise) hapax legomena density for the writing-style-reordered Voynich folios, and Fig. 3.12b displays the same entity for the word-binned (and writing-style-reordered) Voyich text. The two curves appear very similar and both demonstrate remarkable differences in the hapax legomena density for the different writing styles (WS). For example, the hapax legomena density fluctuates around 0.25 in the *Astrology* section, 0.2 in the *Herbal1* section, 0.15 in the *Text-only* section, and 0.1 in the *Balneo* section. These are indeed substantial differences in the pertinent averages of the in-text hapax legomena densities. Furthermore, the hapax legomena density appears the highest for the *Astrology* section and the lowest for the *Balneo* and *Text-only* sections. This behavior is fully consistent with the pertinent results obtained for the running fraction of hapax legomena, displayed in Fig. 3.11a.

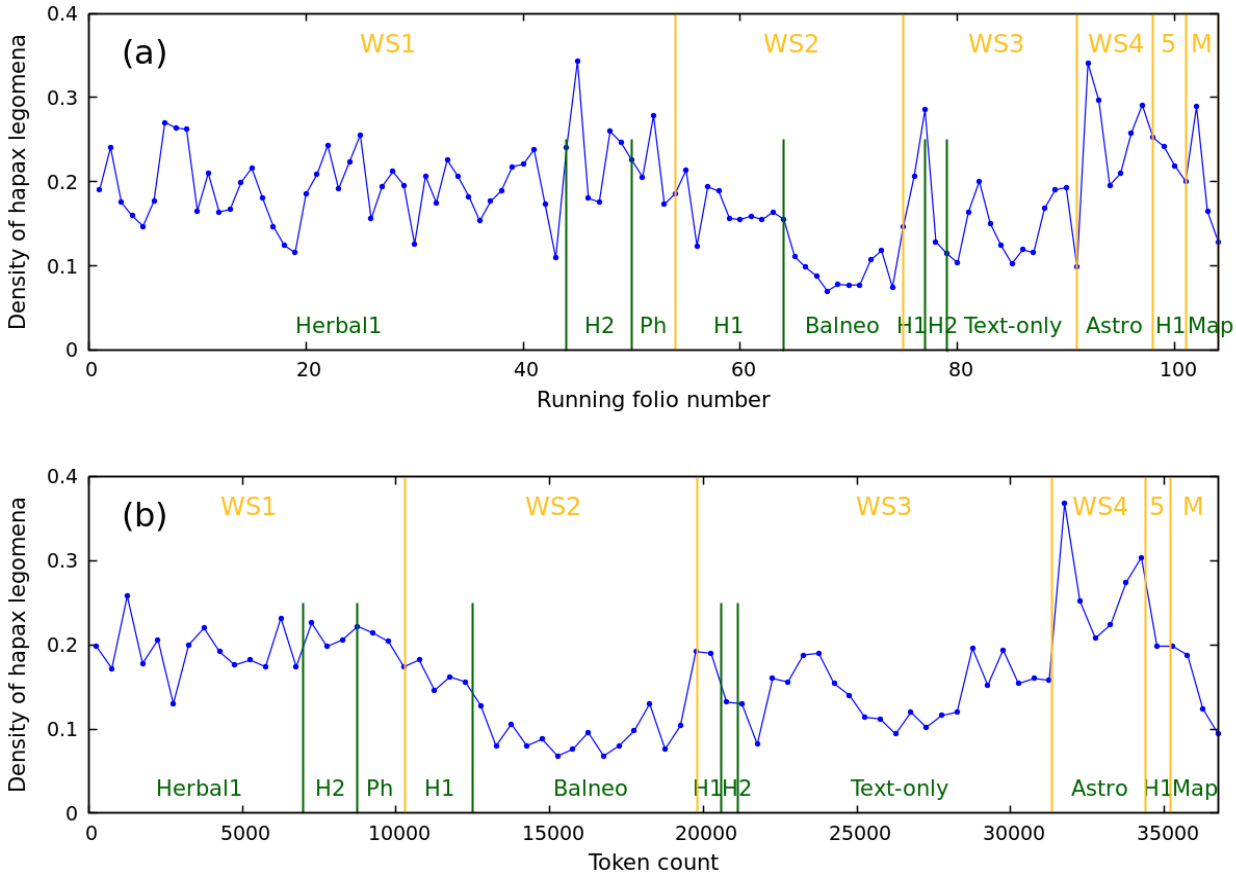


Fig. 3.12. In-text density of hapax legomena for (a) the writing-style-reordered Voynich folios and (b) the word-binned Voynich text reordered according to the involved writing styles (WS). The hapax legomena density depends remarkably not only on the writing styles but also on the Voynich sections. [Bin size = 500 letters]

For most of the involved writing styles, as demonstrated by Fig. 3.12a-b, the hapax legomena density fluctuates around a writing-style-specific average and displays no gradient effects. However, quite intriguingly, in the case of Writing style 2, there appear two, well-separated averages distinguishing the *Herbal1* and *Balneo* sections. In addition, the hapax legomena averages concerning the pertinent *Herbal1* section parts practically coincide for all the involved Writing styles 1, 2, 3 and 5. This elaborate interplay between the writing-style-wise and section-wise hapax legomena densities, similarly to those already established for the syllable densities (cf. Figs. 3.1-7), suggests the presence of textual cohesion and further corroborates that the Voynich text is not a meaningless hoax.

It is clear that these elaborate relations concerning the remarkable inhomogeneities in the hapax legomena densities would not appear in meaningless texts generated by the homogeneous self-citation algorithm of Timm and Schinner (2020). Furthermore, even the assumption that the Voynich text was generated by different, writing-style-specific self-citation algorithms could not account for the co-occurrence of a remarkable discontinuity in the hapax legomena density *within the same* writing style (Writing style 2) *and* the matching sectional averages for *different* writing styles (Writing styles 1 and 2 for the *Herbal1* section). For the self-citation algorithm of Timm and Schinner (2020) can produce texts exhibiting only homogeneous (or slowly drifting) hapax legomena densities (apart from statistical fluctuations), as displayed in Fig. 3.13. As demonstrated earlier, the investigated Voynich syllable densities also share such stunning interplays, suggesting the presence of textual cohesion and meaningful contents.

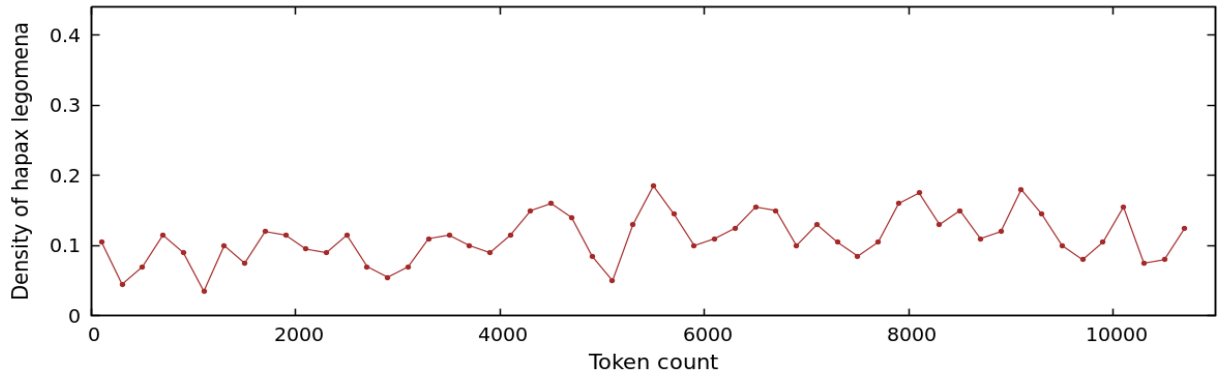


Fig. 3.13. In-text density of hapax legomena for the meaningless text generated by Timm and Schinner (2023). No abrupt changes (discontinuities) can be observed. [Bin size = 200 letters]

For a linguistic comparison, I also plotted the in-text hapax legomena densities for the previously discussed combined (collated) Latin, English, and German texts [Combined_texts], as shown in Fig. 3.14. I assembled these text samples such that they included different works of the same author and works of different authors as well [Combined_texts]. Similarly to the pertinent behavior obtained for the syllable densities (cf. Appendices 3-5) and similarly to the pertinent Voynich curves (cf. Fig. 3.12), the hapax legomena densities for these combined natural-language texts also exhibit remarkable differences. These sharp changes occur not only for works of different authors, but also prevail for different works of the same author. As an example for this latter case, I mention Vergil's investigated works here (cf. Fig. 3.14c and Appendices 3-5).

Furthermore, I estimated the ranges of the opus-wise hapax legomena averages as follows: English works: 0.05 – 0.1; German works: 0.1 – 0.15; and Latin works: 0.15 – 0.2 (cf. Fig. 3.14). I assessed that the actual changes in these hapax legomena traits appear smaller than those obtained for the Voynich text (cf. Figs. 3.11, 3.12, and 3.14). Nevertheless, all these findings clearly demonstrate that some syllable densities as well as the in-text hapax legomena density for combined regular texts written in the same natural language exhibit discontinuities similar to those established for the Voynich text.

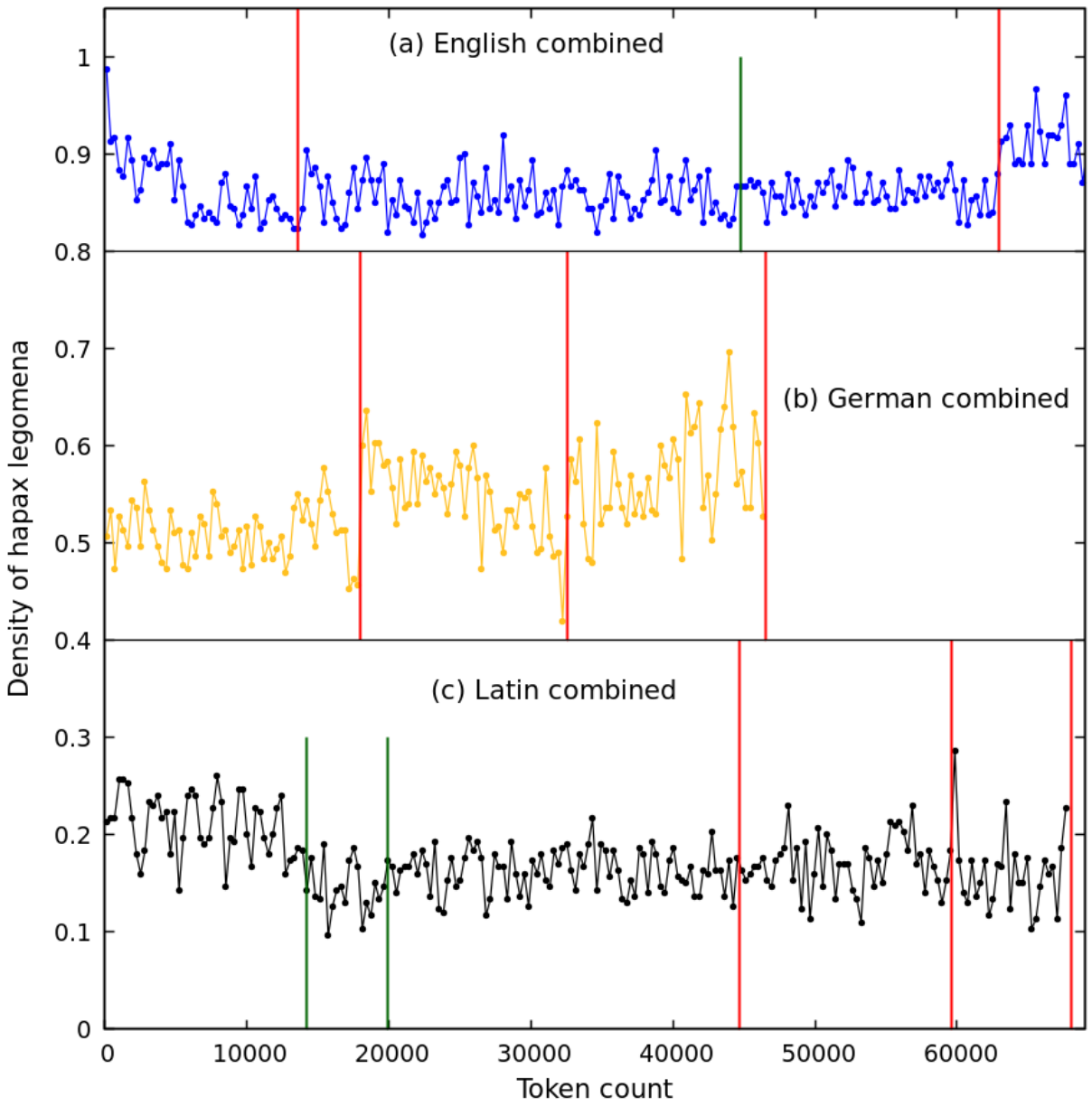


Fig. 3.14. In-text hapax legomena densities for combined (collated) texts: (a) English (Dickens – Bleak House, Shakespeare – Hamlet, Shakespeare – Sonnets, Huxley – Brave New World); (b) German (Goethe – Werther, Rilke – Poems, Mann – Zauberberg); and (c) Latin (Vergil – Georgicon, Vergil – Eclogues, Vergil – Aeneid, Ovid – Amatoria, Alcuin – Rhetorica) [Combined_texts]. The red line segments separate works of different authors and the dark green line segments separate different works of the same author. These plots clearly demonstrate that the hapax legomena densities may remarkably differ not only for the works of different authors but also for the different works of the same author (for example, Vergil's works (c)). These abrupt changes in the hapax legomena densities appear similar to those obtained for the Voynich text, but in the latter case the differences appear more pronounced (cf. Fig. 3.12). The plots were shifted vertically for better visibility. [Bin size = 300 letters]

The above-discussed statistical-linguistic similarities between the Voynich text and the combined regular texts [Combined_texts] in terms of discontinuities in the syllable and hapax legomena densities raise the question whether all these statistical inhomogeneities observed in the Voynich manuscript indicate the presence of stylistic changes, dialects [Altrideicktus25], or distinct languages [Currier76].

Concerning the distinct language hypothesis [Currier76], the smoothness of the rank-ordered Φ-correlation (word-based cosine similarity) plot for the Voynich text, contrasting the step-like curve for the combined text including different languages (cf. Fig. 3.8), strongly suggests that there are no distinct languages present in the Voynich text, in agreement with the earlier conclusion of Timm and Schinner (2023). This inference is further corroborated by the numerous, section-wise unchanged letter and syllable densities as well as their elaborate interplay (in terms of discontinuities) bridging different Voynich sections and writing styles, and also inferring textual cohesion (cf. Figs. 3.1-7). Furthermore, the matching statistical discontinuities in the combined regular text samples that were written in the *same* language (cf. Fig. 3.14 and the plots in Appendices 3-5) also corroborate the scenario that there are no distinct languages present in the Voynich text.

However, the prevailing discontinuities in the syllable and hapax legomena densities appear much more pronounced and widespread in the case of the Voynich text (in comparison with the combined regular text samples) *inferring the presence of dialects* instead of stylistic changes. In this regard, I note that the preliminary results presented in my book have already suggested the presence of *encoding dialects* and the related correlations with the involved writing styles [Altrideicktus25].

Indeed, in the presence of a polyphonic cipher, the prevailing discontinuities in the syllable densities can naturally be interpreted as complementary shifts in the use of certain (encrypted) Voynich syllables that represent the same plaintext syllables. For example, according to my proposed solution, the Voynich syllables “*daiin*” () and “*dy*” () both have a partial rendering expressing the Latin syllable (and word) “tum” [Altrideicktus25]. Therefore, these (encrypted) Voynich syllables, and , may function as partial substitutes of each other. This relationship is also manifested in the anti-correlation behavior of their in-text densities (cf. Fig. 3.3), characterized by the Pearson correlation coefficient of -0.372 (-0.534) for a bin size of 500 (2500) letters. In the light of these insights, the above-presented findings are consistent with the presence of *encoding dialects* in the Voynich text.

4. A meaningful hoax – clues for the presence of a polyphonic cipher in the Voynich text

Through its four centuries of known history, the Voynich enigma baffled many erudite scholars and preeminent codebreakers. Even after more than a century of its modern-day research history, the Voynich community appears still clueless and substantially divided about its way of creation and the comprehensibility of its possible contents. This "permafrost" state of affairs indicates that *the Voynich manuscript represents an elusively complex, inherently multidisciplinary object*.

The inherent presence of self-correlations in the Voynich manuscript [Timm_Schinner20, Timm_ Schinner23] and the related non-Brownian scaling behavior [Schinner07, Daruka21] exclude the "regular text written in a natural language" scenario. Nevertheless, I provided clear evidences in the previous section that the Voynich text conveys several dialects and these strongly correlate with the involved writing styles. Furthermore, my related statistical investigations also inferred the presence of textual cohesion in the Voynich text suggesting that it is not a gibberish. Based on these insights, the question prevails *whether the Voynich manuscript represents a cheap, meaningless hoax or an elaborate work of some cryptographer genii?* In the following, I elaborate on these crucial matters.

To begin with, as discussed in Section 2, the line- and paragraph-position-dependent glyph patterns in the Voynich text, as revealed by Vogt (2012), Zandbergen (2021), and Feaster (2022), represent non-occasional inhomogeneities ("graphemic gradient effects") and pose severe (or even prohibitive) problems for the the self-citation algorithm [Timm_ Schinner20]. Indeed, if the Voynich text comprised a meaningless hoax, as proposed Timm and Schinner (2020), there was no rational basis for such line- and paragraph-position-dependent graphemic inhomogeneities as the meaningless hoax was complex enough in its appearance even without such "graphemic gradient effects". However, if the Voynich text conveyed a cipher, especially a polyphonic-homophonic one [Altrideicktus24-25], the presence of such graphemic inhomogeneities could consistently be interpreted by the pertinent narrative of Feaster (2022): "*Fifteenth-century ciphers often sought to increase security by providing multiple options for encoding each plaintext character, and for this ploy to work as intended, a writer needed to alternate repeatedly among those options. One strategy for ensuring that happened would have been to favor different options in different areas of the page.*" In this regard, I noted in my book that "*Roger Bacon have already proposed similar approaches 800 years ago [Newbold28]. Similar cryptographic techniques were also implemented in the sixteenth century [Eckler75, Tomokiyo17a-b], however, because of their inherent ambiguities, these polyphonic codes did not infiltrate into the mainstream of cryptological approaches [Eckler75]*".

Furthermore, as also discussed in Section 2, the Voynich text includes some special glyphs coined as gallows:  , , and . Their enriching presence already lends the Voynich script a mysterious character. However, in some occasions, these gallows are written into another Voynich glyph, , to form composite gallows, such as , , and . Zandbergen (2022b) expressed that "*these characters still present an unresolved issue in the understanding of the script*". Similarly to the presence of rare Voynich glyphs (for example,), the presence of these composite gallows would not add much to the overall value and apparent complexity of the script. However, if the Voynich text conveyed a cipher, the presence of these composite gallows would make a good sense [Altrideicktus24-25]:

According to my proposed solution, these composite gallows encrypt several salient Latin syllables, namely, "*mini*", "*fini*", "*pini*", etc., respectively [Altrideicktus24-25]. I arrived at these renderings by considering John Dee's Enochian letter [Dee_Diary] and rendering the three above-mentioned gallows to the three similar-looking Latin letters M (m), N (n), and P (p), respectively. Proceeding this way, the composite gallows could for example be interpreted as "(letter) *m* (written) *in* (letter) *i*" = "*mini*", etc. With these renderings, the Voynich token ("*pchocthy*" in the Takahashi transcription [Takahashi], appearing as the first token on folio 10r and occurring three

times in the Voynich text) can be decrypted as (the Latin word) "*piaminis*", corresponding to "atonement" in English. In this final rendering, I assumed that the token-ending Voynich glyph, ୨, is identical with the word-ending Latin abbreviation denoting "-us", "-os", "-s", etc. [Cappelli82].

In addition, as discussed in Section 2, the Voynich text includes even more complicated, "super-composite" glyph structures, such as  , , , , etc. Again, if the Voynich text comprised only a meaningless hoax, why to bother with the implementation of such elaborate forms, the creation of which appears rather time consuming. The lack of these "super-composite" glyphs in the hoaxing approaches of Rugg, Timm, and Schinner corroborates this argument. However, if the Voynich text conveyed a cipher, the presence of these latter, "super-composite" gallows would make a good sense [Altrideicktus24-25, Altrideicktus_VMS_Transcription].

As also discussed in Section 2, there are several Voynich glyphs that appear very alike, as being variants of each other. For example, I mention here the Voynich glyphs  , , and . These variants occur multiple times in the Voynich text. If the Voynich text was a meaningless hoax, there could not have been a rational basis for for implementing such minuscule differences. The lack of these glyph variants in the hoaxing approaches of Rugg, Timm, and Schinner corroborates this argument. However, if the Voynich text conveyed a cipher, the presence of such glyph variants would make a good sense [Altrideicktus24-25]. Indeed, I found out that the shape of the Voynich glyph variant  closely resembles a medieval Latin abbreviation mark standing for "*de*" and "*di*" [Cappelli82]. By morphological analogy, I considered that the other glyph variant, , could stand for "c*e*" and "c*i*". In terms of my proposed solution, these examples point to the invocation of abbreviations in the Voynich cipher, rendering it an inhomogeneous polyphonic cipher.

Besides, as also discussed in Section 2, dissociated forms of some Voynich glyphs recur in the Voynich text. For example, I mention here the Voynich glyphs (and their dissociated forms)  () and (). Again, if the Voynich text comprised a meaningless hoax, there could not have been a rational basis for such barely noticeable dissociations. The lack of such dissociated glyph forms in the hoaxing approaches of Rugg, Timm, and Schinner corroborates this argument. However, if the Voynich text conveyed a cipher, the presence of such dissociative forms would make a good sense [Altrideicktus24-25]. According to my proposed solution, most Voynich glyphs are compound objects representing themselves and the full or partial sum of their constituent parts. For example, the Voynich glyph  represents Latin letters "*c*" and "*i*", but also stands for the sum of the constituent glyphs + = "*c*" + "*i*" = "*ci*". Similarly, the Voynich glyph represents the Latin letters "*a*" and "*u*", and its constituent parts, and , have further letter renderings [Altrideicktus24-25].

In Section 2, I elaborated on the shortfalls of the text generation algorithms that produce gibberish aimed at mimicking the statistical properties of the Voynich text [Rugg_04, Timm_Schinner20]. In particular, I pointed out that the table and grille method suggested by Rugg (2004) cannot reproduce the ubiquitous self-correlations and the related non-Brownian departures that comprise inherent features of the Voynich text. These discrepancies turn out prohibitive for the table and grill method to be considered as the text generation scheme for the Voynich text. However, the inclusion of self-citation motifs in the table and grille method toward a *qualitative* improvement would make it functionally equivalent with the "self-citation" algorithm proposed by Timm and Schinner (2020).

This "self-citation" algorithm of Timm and Schinner (2020) successfully reproduced numerous statistical properties of the Voynich text including the puzzling self-correlations and the related non-Brownian scaling behavior as well. However, as discussed in Section 2 and also above, there are *numerous quantitative and qualitative features* of the Voynich text the presence of which appears inconsistent with Timm and Schinner's self-citation algorithm in its current form, as producing gibberish.

It appears that even the consecutive, independent invocations of the self-citation algorithm would not be able to reproduce the elaborate interplay between the section-wise and writing-style-wise statistical differences (discontinuities) in the Voynich text (inferring textual cohesion) revealed and discussed in the previous section. In this regard, I repeat Timm and Schinner's (2023) argument that "*the existence of two statistically strictly separated sub-texts, Currier A and B, would provide some evidence for an underlying meaningful text, either as two dialects, topics, or different encryption/ encoding schemes. Why should someone with the intention of creating nonsensical pseudo-text invent two different methods of doing so?*" In my understanding, these discrepancies turn out prohibitive for the current (probabilistic) implementation and (meaningless hoax) interpretation of Timm and Schinner's self-citation algorithm to be considered as the text generation scheme for the Voynich manuscript. However, as suggested earlier, the invocation of a self-citation mechanism in the creation of the Voynich text would also be consistent with the presence of a polyphonic cipher, inferring the meaningful hoax scenario [Altrideicktus24-25].

Timm and Schinner (2020) revealed further crucial features of the Voynich text to be explained by the cipher theory. Namely, they demonstrated that similar Voynich tokens (differing only in one glyph, that is, being within an edit distance of one) form a quite homogeneous, densely connected network. Besides, they also called attention on the presence of puzzling correlations among the frequency, similarity, and spatial vicinity of Voynich tokens. The authors attributed these latter correlations (between the similarity and spatial vicinity of Voynich tokens) to self-citation effects. I note that these exotic properties are not shared by regular texts written in natural languages. Therefore, these evidences provide further grounds for excluding the natural-language scenario.

Indeed, the presence of a quite homogeneous, densely connected network of similar tokens in the Voynich text, as such, appears inconsistent with the natural language hypothesis [Timm_ Schinner20]. This inconsistency is based on the assumption that the Voynich tokens directly correspond to meaningful words (in some unidentified language) or through a letter-wise bijective, one-to-one letter rendering. This implies that the invocation of simple (one-to-one) substitution ciphers can also be ruled out in the context of a conveyed meaningful text [D'Imperio78, Timm_ Schinner23].

However, there appears no such inconsistency if there were no (local, letter-wise) bijective, one-to-one letter renderings between the Voynich tokens and the meaningful words they represented. In other words, the quite homogeneous, densely connected network of similar Voynich tokens in the context of a conveyed meaningful text is not against the presence of certain types of polyphonic ciphers, especially the one suggested by Doctor Mirabilis Roger Bacon [Newbold28, D'Imperio78, Altrideicktus24-25]. Interestingly, at the court of Emperor Rudolf II in Prague, John Dee was proposing at a fevered pitch that the Voynich manuscript was the work of Roger Bacon (1220?-1292?), whose books he passionately collected [D'Imperio78].

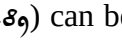
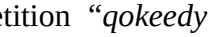
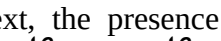
Here, I cite the D'Imperio (1978) concerning the ingredients of the cipher suggested by Roger Bacon: "*He recommends, for the concealment of great and potent secrets, and to prevent them from being abused by the common herd of mankind, the use of the following expedients: 1) characters and verses (or "incantations"); 2) fables and enigmas; 3) leaving out certain letters, especially vowels (as the Hebrews, Chaldeans, and Arabs do to make their secrets harder to read!); 4) mixing letters of different kinds (as, for example, the astronomer Ethicus hid his knowledge by a mixture of Hebrew, Greek, and Latin letters); 5) employing letters "strange to one's own culture"; 6) creating characters from one's own imagination (this last being, according to Bacon, an especially good method, used by Artephius in his Book of the Secrets of Nature); 7) using geometric figures combined with dots and signs instead of alphabetic characters, and finally 8) the "notory art", which Bacon though was the best method of all: the art of writing "as briefly and rapidly as one desires". Bacon claimed to have used some, at least, of these methods in his own writings.*"

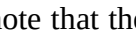
Based on this description, Bacon was explicitly suggesting the use of strange and invented characters (glyphs), which are ubiquitously present in the Voynich text. Furthermore, he was also suggesting the omission of certain letters. Besides missing letters, I frequently encountered extra letters as well during the decryption process. In addition, Bacon also suggested the invocation of "notory art", that is, the use of shorthand. (In this regard, I note that John Dee possessed a copy of *Ars Notaria* [James21, Haines14].) The invocation of abbreviations would introduce inherent inhomogeneities into the invoked polyphonic cipher and would substantially alter the edit distances of the involved plaintext words. However, even without the presence of abbreviations, the multiple, locally non-bijective (no one-to-one) letter renderings of the invoked polyphonic cipher would also change the edit distances of the involved plaintext words. These cunning cryptographic features, at the level of plaintext words, would immediately disassemble (destroy) the homogeneous, densely connected network of similar (encrypted) Voynich tokens [Timm_Schinner20]. These insights clearly demonstrate that the presence of a polyphonic cipher in the Voynich manuscript would be consistent with the homogeneous, densely connected network of similar (encrypted) Voynich tokens such that the Voynich text conveyed a meaningful (encrypted) content. In this regard, I note that my proposed polyphonic cipher displayed a remarkable overlap with the cipher suggested by Roger Bacon. Based on the revealed similarities, I considered the proposed Voynich cipher as a variant of the Bacon cipher [Altrideicktus24-25].

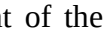
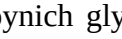
Likewise, due to the suggested presence of multiple, (letter-wise) non-bijective letter and word renderings, the similar-token-similar-frequency correlations, as established by Timm and Schinner (2020), could also be consistent with a polyphonic cipher and the related meaningful plaintext scenario. For the occurrence frequencies of the encrypted Voynich words (tokens) would substantially be different from those of the corresponding plaintext words. Furthermore, the suggested polyphonic cipher scenario would straightforwardly explain the notorious word repetitions in the Voynich text as well, as each encrypted Voynich word may stand for several plaintext words. Therefore, a repeated sequence of (encrypted) Voynich words may correspond to a sequence of different plaintext words, as will be demonstrated shortly.

In order to elaborate on these points, I provide here a few decrypted (notorious) Voynich words based on my proposed solution (the list of renderings may not be complete) [Altrideicktus25]: "*daiin*" (): tum, tund[], sum, sunt, salis, sulis, ciant, actum, dialis; "*chedy*" (): ictus, ictum, citus, citum, cessus, cessum, cetus, cetum; "*chol*" (): colis/caulis, calix; "*ol*" (): ad, oles, anus, anum, ani; "*or*" (): ater; "*qokeey*" (): vanus, vafris; and "*qokeedy*" (): vanitas, vanitatum, vafriss[im]us, vafriss[imor]um, vafriss[imar]um. (Concerning the last two Voynich tokens including the gallows , I note that according to my proposed solution, the Voynich gallows represent composite cryptographic objects possessing several renderings. For example, ~ {n, f, r, nr, fr, …}. Besides, I mention that due to the multiple letter renderings and the presence of Latin abbreviations in the proposed polyphonic cipher, the Voynich sequences , , and may all represent the Latin word "anus".) Finally, I note that the above-listed tokens occupy central nodes in Timm and Schinner's (2020) similar-Voynich-token network. In full accord with their network centrality, according to my proposed solution, they also play a central role in expressing what the (decrypted) Voynich text is really about… [Altrideicktus24-25].

These examples clearly demonstrate that even the same Voynich token may possess several plaintext renderings that substantially differ from each other. That is, the individual Voynich tokens, representing individual nodes of the similar-Voynich-token network established by Timm and Schinner (2020), would correspond to several, non-connected nodes in their decrypted, plaintext forms. Furthermore, I note that the decrypted Latin words "*actum*" (; "act" in English) and "*ictus*" (; "blow, stroke" in English) appear somewhat related in the revealed context, so they may function as synonyms (and partial substitutes of each other). Interestingly, their binned in-text densities display an anti-correlation behavior (cf. Fig. 3.3 as well) exhibiting a Pearson correlation coefficient of -0.361 (-0.554) for a bin size of 500 (2500) letters.

In addition, according to my solution [Altrideicktus25], the repeated Voynich token "*chedy chedy*" () can be translated as "*ictus citus*" or "*ictus cessus*" (depending on the actual context). Besides, the repeated Voynich sequence "*ol ol*" () can be rendered as "*ad anum*", and the triple word repetition "*qokeedy qokeedy qokeedy*" () may correspond to "*vanitas vanitatum vafriss[imar]um*". However, as I decrypted only a small portion of the entire Voynich text, the presence of evocative word repetitions (for example, the Voynich sequence  standing for "*vanitas vanitas vanitas*") cannot be excluded. Interestingly, I found several triple-repetitive sequences in John Dee's spiritual diary including "*Dee, Dee, Dee*"; "*Come, Come, Come*"; "*Huseh Huseh Huseh*"; and "*Peleh Peleh Peleh*" [Dee_Diary].

I further note that the Voynich tokens  and differ only in one glyph, so they appear as connected tokens in the similar-Voynich-token network of Timm and Schinner (2020), contributing to its homogeneous, densely connected character. According to my proposed solution [Altrideicktus25], these words can be decryped as "*vomitum*" and "*vanitas*", respectively (further translations are possible). However, these Latin plaintext words differ in three letters, inferring that their edit distance is three, and therefore, they would not be considered as similar (plaintext) words according to the "edit distance one" criterion of Timm and Schinner (2020).

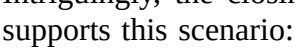
Concerning the presence of extra or omitted letters, I mention the two Voynich words displayed on the last Voynich page, folio 116v:  . I decrypted these as "*uratur ince[ns]us*" ("burn incense" in English) [Altrideicktus25]. This solution matches well the overall context of the text displayed on the last Voynich page, which I also decrypted: it conveys an aphrodisiac recipe [Altrideicktus25]. The reader may notice that two letters are omitted from the second word. The replacement of the omitted letters/glyphs (for example, ) would change (rarefy the links of) the similar-Voynich-token network established by Timm and Schinner (2020). In this regard, I further mention that double consonants are not marked explicitly in the Voynich text. Instead, they are marked as single. Furthermore, according to my proposed solution, the single and double Voynich glyphs,  and (or and) may represent the same Latin letter "*i*" (or "*n*"), among other possible renderings [Altrideicktus25]. The pervasive presence of these cunning cryptographic features in the Voynich text would also infer substantial changes in the similar-Voynich-token network of Timm and Schinner (2020) by further rarefying its links at the level of plaintext word representations.

These examples clearly demonstrate that the homogeneous, densely connected similar-Voynich-token network, as established by Timm and Schinner (2020), would cease to exist at the level of plaintext word representations in the presence of the suggested polyphonic cipher in the Voynich manuscript [Altrideicktus24-25].

Finally, I conceive that the *statistical* success of the meaningless self-citation approximation [Timm_Schinner20] may lie in the constellation of the following features. First, and most importantly, a similar self-citation mechanism was indeed invoked for the construction of the Voynich text. However, in my understanding, this self-citation mechanism was invoked for encryption purposes: Re-using some of the already encrypted words, word segments, or encrypting glyphs (within a visual reach) made the process of encoding much more efficient [Feaster22]. Furthermore, my proposed decrypted text segments (comprising mostly pervasive erotic obscenities) [Altrideicktus24-25] and the novel Voynich transcription I established [Altrideicktus_VMS_Transcription] suggest that a remarkable portion of the (meaningful) Voynich contents might have been created in an encryption- *and* content-wise self-citing process of writing. As such, also corroborated by my proposed solutions, the decrypted text segments exhibited a restricted (Latin) vocabulary [Altrideicktus24-25].

Besides, during the decryption process, I encountered numerous words having extra or missing letters and displaying remarkable grammatical deviatios as well. This way, the decrypted Voynich text segments comprised a noisy, distorted Latin text. At this point, I could not assess whether these grammatical departures were incidental (for example, the text might have been created under the influence of drugs) or intentional (to accommodate two independent solutions as I found in a few cases). Either way, these deviations, together with the cunning cryptographic features of the invoked inhomogeneous polyphonic encoding rendered many properties of Voynich text (in its encrypted form) similar to that of a gibberish.

Further aspects contributing to the statistical success of the meaningless self-citation approximation [Timm_Schinner20] include the tripartite structure of numerous encrypted Latin words [Altrideicktus24-25] and the corresponding Voynich tokens (prefix, middle, and suffix [Stolfi00, Rugg04]); the low-(h2-)entropy features [Bennett76, Lindemann_Bowern21] of the invoked polyphonic-homophonic encryption method (preserving this tripartite word structure) [Altrideicktus24-25]; and related to it, the presence of a "more polarized" bigram-rank frequency spectrum leading to a sharper crossover between the frequent and rare bigram representations [Daruka21].

The elaborate interplay of all these features renders the Voynich text a *meaningful* hoax. Intriguingly, the closing phrase of the Voynich ars poetica, as I decrypted from folio 65v, fully supports this scenario:  – "*confictus ictus infinitus"* (Latin) – "a hoax of an infinite blow" (in English) [Altrideicktus24-25].

In search of further clues for the presence of a polyphonic cipher in the Voynich text, I took a detour and considered another baffling document, namely, John Dee's Liber Loagaeth (or Enochian) tables [Dee_LL]. These tables were created around 1583 allegedly during the spiritual conferences mediated by Dee's confidant scryer, Edward Kelly [Laycock01]. Laycock (2001) conceived that John Dee's Enochian texts, including his Liber Loagaeth letter tables, comprised a gibberish: "*it is possible to assert, with a high degree of confidence, that there is no cipher contained in the 'angelical' language, or in the Enochian Calls"*.

Interestingly, Daruka (2021) established strong statistical-linguistic ties between the Voynich text and the Liber Loagaeth tables. These were based on the very good agreements between the letter- and bigram-frequency-rank distributions (down to very small frequencies), the key-letter-separation distributions and their fluctuation spectra, and the bigram polarity spectra. But most intriguingly, Daruka (2021) also demonstrated that John Dee's Liber Loagaeth tables displayed the same non-Brownian scaling behavior as the Voynich text [Schinner07], both exhibiting the same fluctuation exponent ≈ 0.75. Based on the multiple statistical matches, Daruka (2021) rendered these two documents into the same linguistic universality class. In terms of further connections between Dr. Dee's Liber Loagaeth (Enochian) sequences and the Voynich text, I found numerous letter-wise-matched sequences including the Enochian 'or', 'ar', 'ox', 'ax', 'om', 'am', 'ox ox', 'oxox', 'oxor', 'oxar', 'axax', 'axor', 'axar', and 'oxam'; and the Voynich tokens  , , , , , , , , , , , , , and , respectively (with the intuitive renderings: , , , , and) [Dee_Diary, Dee_LL, Altrideicktus24-25]. Furthermore, Daruka (2021) conceived that similarly to the Liber Loagaeth tables, created allegedly during spiritual conferences, most likely the Voynich text also comprised a gibberish.

However, contrasting this view and that of Laycock (2001), "*the famous polymath Robert Hooke shared Casaubon's opinion and suspected that Dee's Enochian sequences concealed a code, similar to Johannes Trithemius' steganographic approaches [Hooke1705]*" [Altrideicktus24-25]. Based on the strong statistical ties [Daruka21] as well as letter-wise matches between the Voynich text and John Dee's Liber Loagaeth tables [Altrideicktus24-25], it is clear that if one of these documents

conveys a cipher, than the other document should also include one. Or alternatively, both documents may comprise a gibberish, as conceived by Laycock (2001) and Daruka (2021).

Based on these intriguing relationships and also considering my proposed decryption of Dee's Liber Loagaeth (Enochian) sequences [Altrideicktus24-25], I decided to quantitatively investigate the letter and "syllable" densities also for the Liber Loagaeth tables, as presented in Appendix 6. For my investigations, I utilized Peterson's transcription [Dee_LL].

Before I discuss these findings, I mention that the Liber Loagaeth tables comprise four sectional units. The first section, including table Leaves 1a and 1b, mostly consists of a running text (without tabulation) featuring Enochian words and some accented letters as well. The second section spans between Leaves 2a and 25a. The letter tables of this section comprise 49 rows and 49 columns hosting 2401 letters each. The third section, including Leaves 25b through 28b, displays more complex table arrangements in terms of (geometrically) rotated letters. Finally, the fourth section, including Leaves 29a through 48b, consists of tables hosting about 1200 letters each in a checkerboard arrangement. Interestingly, I note that the Voynich manuscript also comprises four major (distinct) units, including the *Herbal*, *Astro*, *Balneo*, and *Text-only* sections. Furthermore, in the original Takahashi transcription [Takahashi_VMS_Transcription], the letter-wise length of the Voynich text matches remarkably well that of the Liber Loagaeth tables.

As demonstrated by the plots displayed in Appendix 6, some letter densities for the Liber Loagaeth tables exhibit remarkable fluctuations, section-wise changes, and some puzzling long-range gradients as well (especially in the last section). The fluctuations in the densities of letters "a" and "u" appear particularly strong and erraric. For example, letter "u" is missing from a remarkable portion of the second section, and its density displays a remarkable upward gradient in the last section. Similarly to the Voynich text, most syllable densities for the Liber Loagaeth tables exhibit remarkable section-wise changes, discontinuities, as presented in Appendix 6.

Inspired by the remarkable section-wise changes, I calculated the Pearson coefficients for the letter-letter density correlations prevailing in the Liber Loagaeth tables. For comparison, I also calculated this statistical measure for the Voynich text, and also for the combined (collated) Latin, English, and German text samples [Combined_texts] discussed in Section 3. Fig. 4.1 displays the rank-ordered Pearson coefficients for the letter-letter density correlations concerning the investigated documents. In order to establish a proper comparison, the pertinent ranks were scaled by the total number of letter pairs occurring in each document. Interestingly, the pertinent curves for the Latin, English, and German text samples nicely collapsed into a single curve. However, the Voynich and Liber Loagaeth curves display much stronger letter-letter density correlations and anti-correlations as well. This intriguing feature further supports the earlier findings of Daruka (2021) rendering these two documents into the same linguistic universality class. Furthermore, I conceived that these pronounced letter-letter correlations (and anti-correlations) may originate from self-citation effects [Timm_Schinner20] (in both documents) and/or from the presence of a polyphonic cipher (also inferring pronounced correlations among the rendered letter densities). Finally, I note that the prevailing differences between the Voynich and Liber Loagaeth curves may depend some on the invoked transliteration scheme (for the Voynich text).

Concerning the quantitative aspects of the letter-letter correlations in the Liber Loagaeth tables, I found the strongest anti-correlation behavior for the letter pair "a" and "u", exhibiting a Pearson coefficient of **-0.81**. Intriguingly, according to my proposed (polyphonic) cipher key for the Liber Loagaeth tables, these letters are substitutes of each other [Altrideicktus24-25]. Therefore, in Fig. 4.2, I plotted the densities of letters "a" and "u", as well as the sum of their letter densities, "a+u". I also included here the density of letter "v", which also served as a partial substitute for letter "a" [Altrideicktus24-25]. As demonstrated by Fig. 4.2, the densities of letters "a" and "u" exhibit substantial ("positive" and "negative") bursts, which appear almost mirror images of each other.

The pertinent regions are indicated by red rectangles. Intriguingly, the sum of these letter densities, “a+u”, or “a+u+v” appears smooth enough (apart from some regular fluctuations) as the “positive” and “negative” bursts perfectly cancel each other. This stunning feature infers the existence of a low dimensional letter rendering subspace and *strongly suggests the presence of a polyphonic cipher in John Dee’s Liber Loagaeth tables*, representing his Enochian language [Dee_Diary, Laycock01]. Furthermore, these findings are in full accord with my proposed solution for the Liber Loagaeth sequences as representing a polyphonic cipher [Altrideicktus24-25].

These intriguing relations prompted me to further investigate the letter-letter correlations for the Voynich text, especially in the light of my proposed polyphonic cipher key [Altrideicktus24-25]. According to my proposed cipher key for the Voynich text, glyph  represents both Latin letters “a” and “u”. Therefore, unlike in the case the above-discussed Liber Loagaeth tables, the densities of this particular letter pair could not be compared meaningfully. Instead, I compared the writing-style-grouped densities of two Voynich glyph pairs chosen in terms of the overlap in their letter renderings [Altrideicktus24-25]. First, I considered the glyph pair  (“*ch*” in the Takahashi transcription) and  (“*ee*” in the Takahashi transcription) as both have a partial rendering representing the Latin letter “i” [Altrideicktus24-25]. As presented in Fig. 4.3, the in-text density of “*ch*” (“*ee*”) remains remarkably above (below) the overall average for Writing style 1 and *Herbal1* section, but the sum of their densities (“*ch*”+“*ee*”) becomes more balanced. Next, I compared the in-text densities of the Voynich glyphs  (“*k*” in the Takahashi transcription) and (“*i*” in the Takahashi transcription), as both have a partial rendering representing the Latin letter “n” [Altrideicktus24-25]. As displayed in Fig. 4.4, the in-text density of “*k*” (“*i*”) remains somewhat below (above) the overall average for Writing style 1 and *Herbal1* section, but the sum of their densities (“*k*”+“*i*”) becomes much more balanced (apart from shorter-range fluctuations). These findings further hint at the presence of a polyphonic cipher in the Voynich manuscript and are in agreement with my proposed solution [Altrideicktus24-25]. Finally, I note that according to my proposed polyphonic cipher key, the Voynich glyph renderings are more interwoven. Therefore, the reader should not expect a perfect anti-correlation behavior for these investigated glyph pairs.

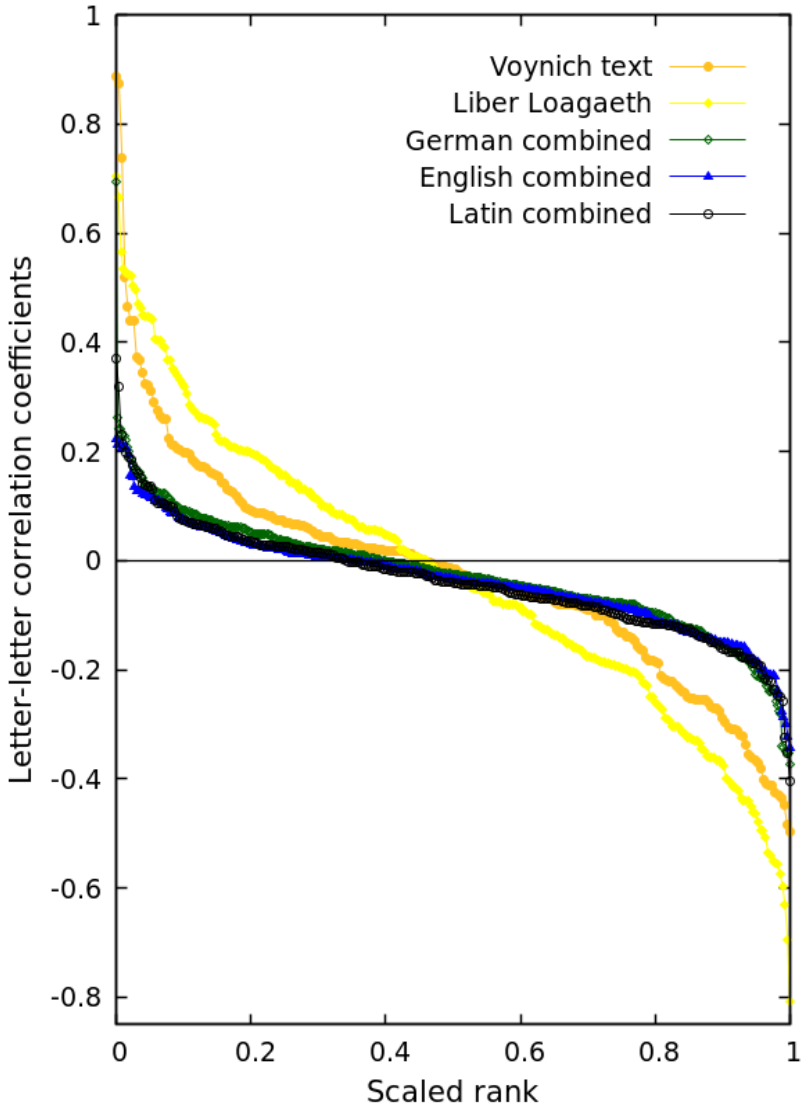


FIG. 4.1. SCALED RANK-ORDERED LETTER-LETTER DENSITY CORRELATIONS (PEARSON COEFFICIENTS) FOR THE VOYNICH TEXT, JOHN DEE'S LIBER LOAGAETH TABLES [DEE_LL], AND COMBINED (COLLATED) LATIN, ENGLISH, AND GERMAN TEXT SAMPLES [COMBINED_TEXTS]. FOR TEXTS WRITTEN IN EUROPEAN LANGUAGES, THE IN-TEXT LETTER-LETTER DENSITY CORRELATIONS NICELY COLLAPSE INTO A SINGLE CURVE. HOWEVER, THE VOYNICH AND LIBER LOAGAETH CURVES DISPLAY MUCH STRONGER LETTER-LETTER DENSITY CORRELATIONS AND ANTI-CORRELATIONS. THIS INTRIGUING FEATURE FURTHER SUPPORTS THE FINDINGS OF DARUKA (2021) RENDERING THESE TWO DOCUMENTS INTO THE SAME LINGUISTIC UNIVERSALITY CLASS. FURTHERMORE, THESE PRONOUNCED LETTER-LETTER CORRELATIONS (AND ANTI-CORRELATIONS) MAY HINT AT THE PRESENCE OF POLYPHONIC CIPHERS IN BOTH DOCUMENTS.

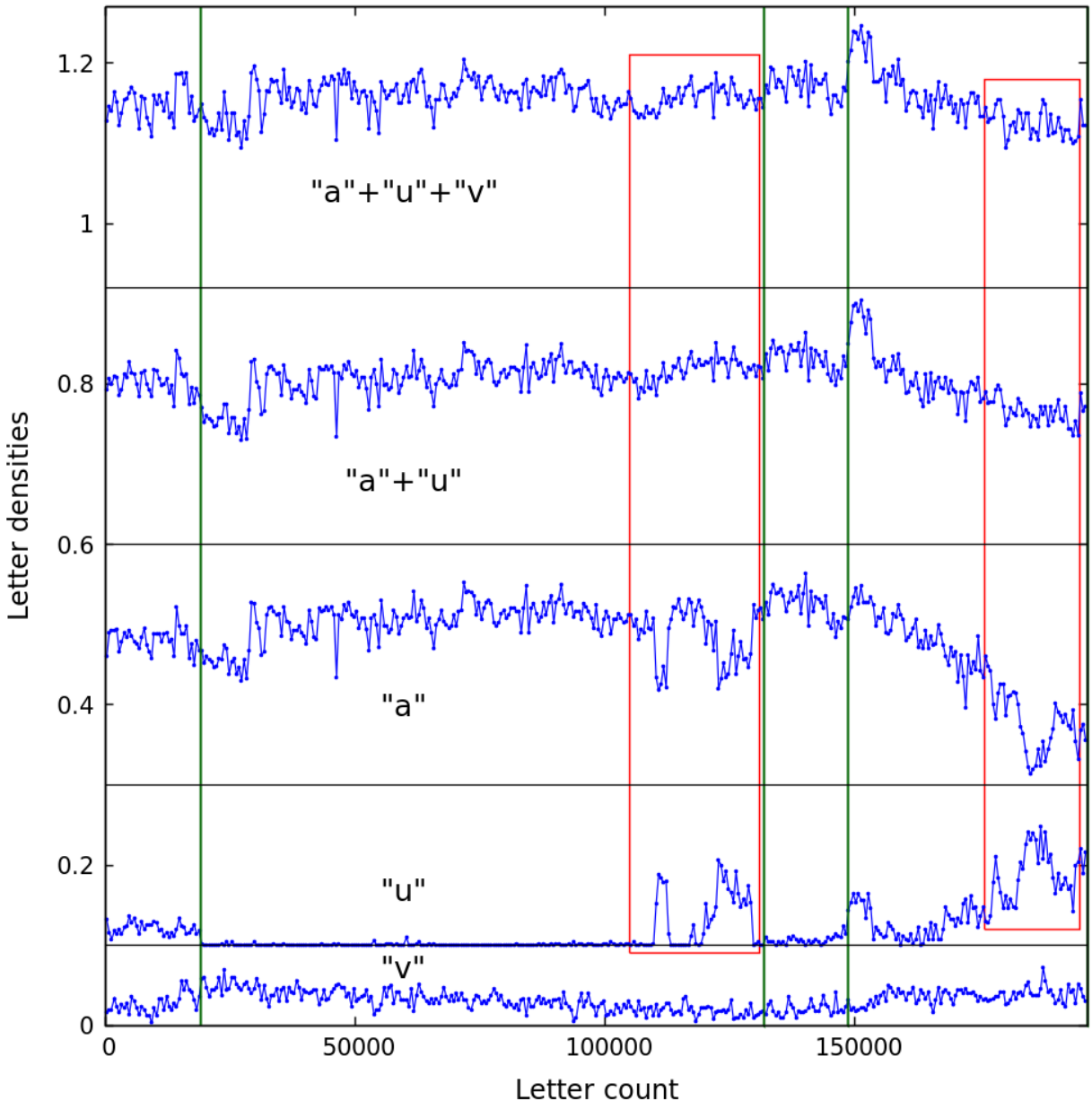


Fig. 4.2. In-text letter densities for John Dee's Liber Loagaeth tables [Dee_LL]. The vertical dark green lines indicate changes in the table structure. Surprisingly, letter "u" is practically absent in many consecutive tables, and its density displays sudden bursts, indicated by red rectangles. The in-text density of letter "a" appears almost a "mirror image" of that of letter "u", displaying downward, "negative" burst in the corresponding regions, also indicated by the same red rectangles. Intriguingly, this very strong anti-correlation behavior (Pearson correlation coefficient = -0.81) renders the sum of the letter frequencies "a" + "u" (+ "v") practically a constant throughout the tables, as demonstrated by the uppermost curve. These intriguing anti-correlation relations strongly suggest the presence of a polyphonic cipher in John Dee's Liber Loagaeth tables, representing his Enochian language [Dee_Diary, Laycock01]. I considered here the letter triad "a", "u", and "v" based on my proposed solution of Dr. Dee's Enochian cipher [Altrideicktus24,25]. The plots were shifted vertically for better visibility. [Bin size = 500 letters]

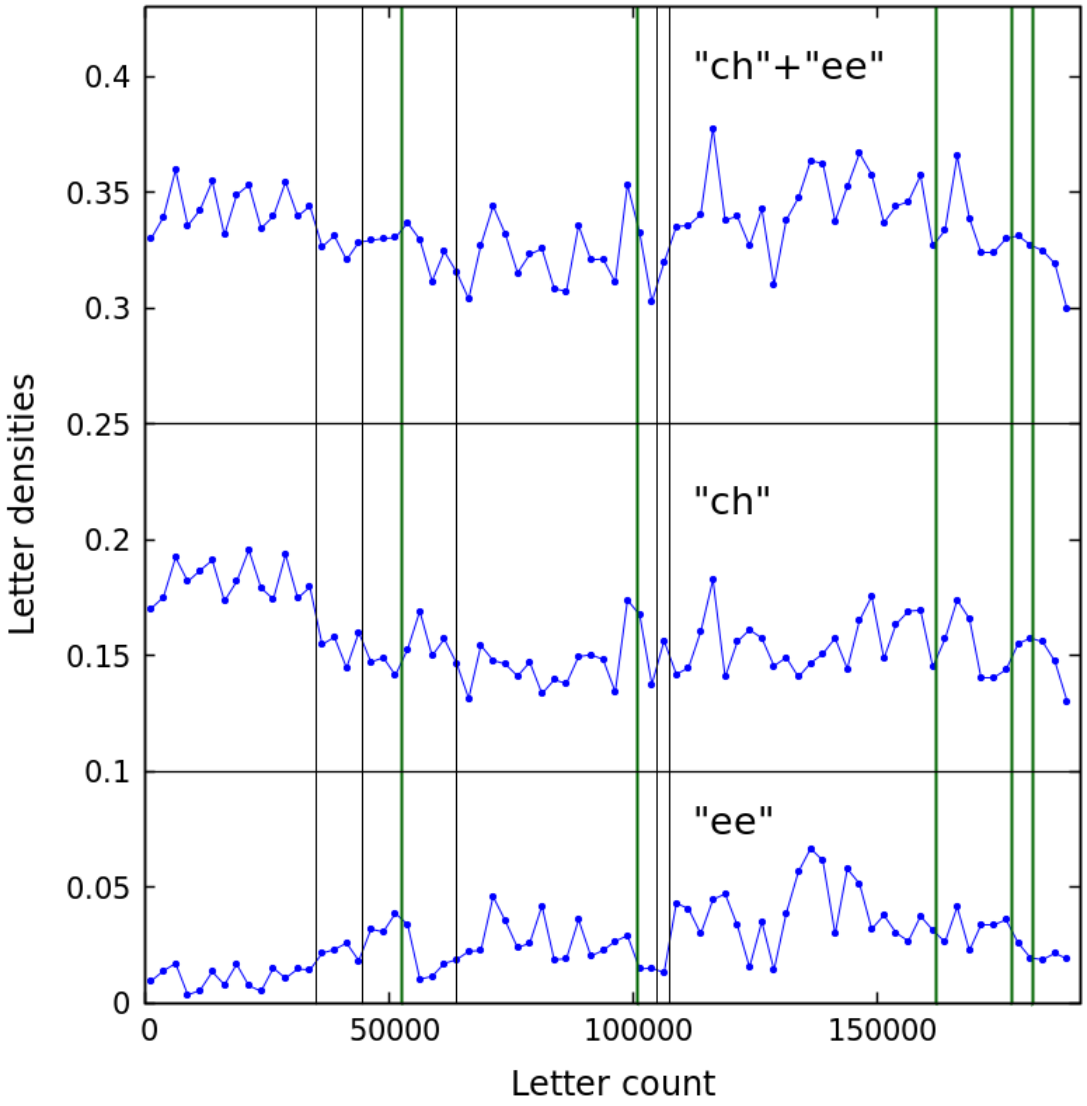


Fig. 4.3. In-text letter densities for the Voynich text based on the writing-style-reordered folio sequence. The density of letter "ch"/ⴰ (“ee”/ⴱ) appears significantly higher (lower) for writing style 1 in the first herbal section (Herbal1) than for the rest of the Voynich text. The sum of the letter densities "ch"+"ee" becomes more balanced (apart from shorter-range fluctuations). According to my proposed polyphonic cipher key, letters "ch"/ⴰ and "ee"/ⴱ can serve as substitutes for each other [Altrideicktus24-25]. The pertinent section titles are displayed in Fig. 3.3, and the plots are shifted vertically for better visibility. [Bin size = 2500 letters]

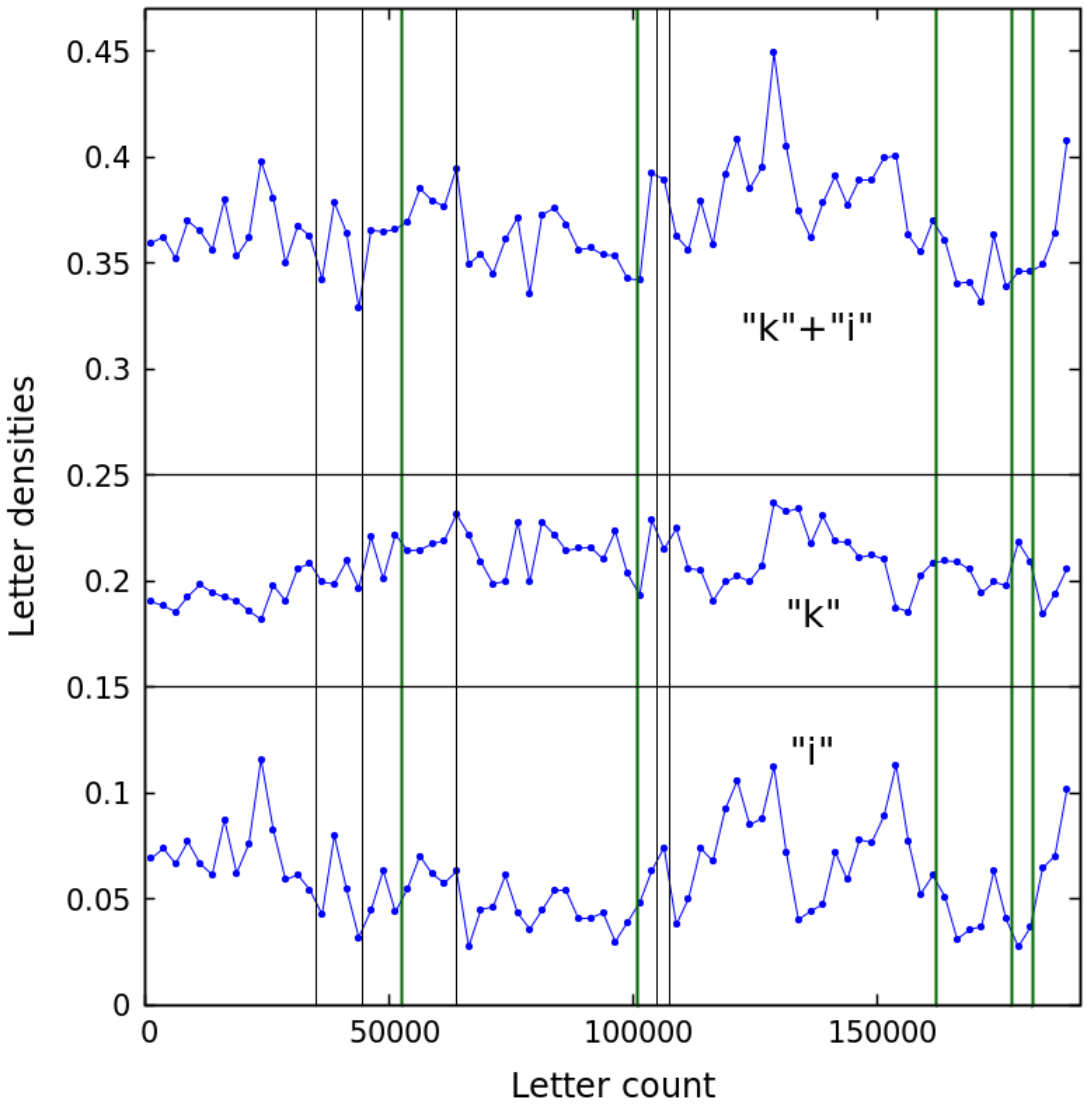


Fig. 4.4. In-text letter densities for the Voynich text based on the writing-style-reordered folio sequence. The density of letter "k"/ (“i”/) appears significantly lower (higher) for writing style 1 in the first herbal section (Herbal1) than for the rest of the Voynich text. The sum of the letter densities "k"+"i" becomes much more balanced (apart from shorter-range fluctuations). According to my proposed polyphonic cipher key, letters "k" and "i" can serve as substitutes for each other [Altrideicktus24-25]. The pertinent section titles are displayed in Fig. 3.3, and the plots are shifted vertically for better visibility. [Bin size = 2500 letters]

In this section, I provided numerous clues for the presence of a polyphonic cipher in the Voynich manuscript as well as in John Dee's closely related Liber Logaeth tables. The invocation of a polyphonic cipher would also provide a simple, natural explanation for the revealed self-citation process [Timm_Schinner20, Feaster22]. My proposed polyphonic cipher key is certainly not a simple one [Altrideicktus25]. However, it was not my choice but the author(s)'. Furthermore, if the Voynich text conveyed a relatively simple polyphonic cipher, it would have already been decrypted.

Based on these aspects, I was wondering how I could utilize a simplified version (compact subset) of my proposed Voynich cipher key and construct something with it that would be relatively easy to comprehend. Along these lines, I decided to create a novel (full) transcription of the Voynich text making use of a compact subset of my proposed cipher key. In the following, I describe the steps of this transcription. As a starting point, I utilized Takahashi's original transliteration of the Voynich text [Takahashi_VMS_Transcription].

First, I considered a compact subset of my proposed cipher key, already including some essential medieval Latin abbreviations and word-ending truncations [Altrideicktus25, Cappelli82]. Then, for instructive purposes and also as a further simplification, I considered only "*globally" applied* transformations on the involved letter sequences. That is, the same letter-sequence transformations were implemented on the whole Voynich text, in particular, on its original Takahashi transliteration [Takahashi_VMS_Transcription]. Proceeding this way, the resulting transcription can be considered as the first layer of decryption.

In the following list, I display the EVA-transcribed letter sequences first (in lowercase), and then, after the rendering arrow, I indicate (in capitals) the globally implemented sequence renderings according to my proposed cipher key. Furthermore, I note that it is important to proceed according to this suggested order of "global" transformations and also include the dots before and/or after the involved sequences. Besides, in parentheses, I indicate some alternative renderings based on my proposed cipher key [Altrideicktus25], but these were not implemented during this transcription process:

b → n; f → p; ch → I (C); sh → IN; cth → MINI (VINI); ckh → FINI (RINI); cph → PINI (BINI); t → M (V); k → N (F); p → P (B); m → RIS; g → CIS; h → T; x → CUL; iin → M; in → N; iir → UL; ir → L; ol. → ALIS.; .l → .AL (.AN); l. → LIS. (NUS.); ar. → ATER. (ATUR.); or. → ATUR.; ody → ATUS; .dy. → .ACTUS.; dy. → TUS. (SUS.); dy → TU (SU); .y. → .CUM.; .y → .CON; eey → CES; ey. → CUS.; oly. → ARUM.; oy. → AS.; Iy. → IS.; y. → US.

Then, as a "fine tuning", I implemented some further, rendering-subspace-invariant *global* transformations on the involved letter sequences according to my proposed cipher key [Altrideicktus25]:

.da → .SA; .dA → .SA; da → TU; eA → CA; oC → AC; oM → AM; oN → AN; Na → NU; Neo → NCA; Nee → NEC; Ieo → ICA; Ie → IC; Io → CA; Ia → ICA; aU → ANU; oP → AP; eee → ECE; ee → CE (EC); Ce → CE (EC); II → CI; IAMI → INAMI; ea → CU; orT → ART; .s. → .EST.; do → SA; aM → UM; oTUM. → ATUM.; .ol → .ALI; qANIT → VANIT; CONNU → CUNNU; SATER → SATUR; MCET → MECT; ALAL → ARAL; AMCE → AMEC; qo → VA; oeo → OCA; y → CA; iii → NI; ii → N; oa → OCA; oe → AE; y → CA

Finally, I replaced (globally) the remaining untransformed letters based on a reduced ("mono-alphabetic") subset of my proposed cipher key [Altrideicktus25] as follows:

a → A; o → O; e → I; i → N; c → C; n → D; d → S; l → T; q → V, r → R; s → S

The full text of this transcription can be found at [Altrideicktus_VMS_Transcription], and some concise, section-wise selected text samples are provided in Appendix 7.

This novel transcription clearly comprises a Latin-like text already displaying numerous Latin words. As such, it corroborates the presence of a polyphonic cipher in the Voynich text. Furthermore, in full agreement with the already decrypted Voynich text segments [Altrideicktus24-25], the principal theme of the Voynich text (erotic obscenities) becomes apparent by some salient words ubiquitously occurring in this novel transcription (some of them are used in a metaphoric sense [Adams82]). Here, I provide a concise list of these characteristic Latin words. First, I display the vocabulary entry form of the related Latin words in parentheses and boldface, and the numbers behind the listed words indicate the total number of occurrences in the currently proposed Voynich transcription. In addition, also in parentheses, I provide the refined (iterated) decryptions after the rendering arrows and indicate the missing letters in square brackets:

(**ANUS:**) ANUS 87 ANUM 194 ANULUS 2 ANULIS 125 ALIS (→ANUS) 793; (**CUNNUS:**) CUNNUS 10 CUNNUM 30 CUNNULIS 15 VAN[N]UM 235 VAN[N]ITUS 298 IALIS (→CALIX) 361 CAPIS 7 ORALIS (→ARULIS) 21 SALIS (→SULCUS, SULCIS) 396; (**PHALLUS:**) NORUM (→FAL[L]UM) 2 NANUM (→FAL[L]UM) 2 IALIS (→COLIS) 361; CONTUS 9 CONTUM 9

(**OVIS:**) AMIS (→OVIS/OVES) 45 AMUS (→OVIS/OVES) 78 AMUM (→OVIS/OVEM) 130

(**ICO:**) ICTUS 491 (ICATUS 98) ICES 218 ICATUR 99 IATUR (→ICATUR) 193; (**ARO:**) ARATUS 14 ARATUR 6 ORATUR (→ARATUR) 5; (**OCCO**:) OC[C]AT.. 5; (**ALO:**) ALIS 793 ALATUR 38; (**SATURO**:) SATUR 326 SATER (→SATUR) 55; **ACTUS** 222; MICATUS 5; CITUS 1 ITUS (→CITUS) 144; ATER 340; PICATUS 5

These decrypted Voynich words, along with some related expressions and their embedding context, as well as the further course of the context-based decryption of the proposed polyphonic cipher are presented in my book [Altrideicktus25].

All the previously decrypted Voynich text segments [Altrideicktus24-25] as well as this novel transcript strongly suggest that *the Voynich manuscript conveys only one topic*. Quite unexpectedly, as these fully or partially decrypted texts reveal, it is mostly about erotic obscenities. I found only one Voynich page, folio 65v, which included the ars poetica of the Voynich author(s) that I also decrypted [Altrideicktus24-25]. Besides, I could also discern numerous concealed representations of genitals-resembling objects in the Voynich illustrations [Altrideicktus24-25]. These are in full accord with the decrypted erotic text segments and fully corroborate the one topic scenario.

In addition, I mention that on the last Voynich page, folio 116v, there appears a phallic illustration, the little drawing on top. I could decrypt the steganographically concealed and alphabet-mixed word written below this illustration, *falωſ*, expressing “fal[l]os” or “phal[l]us” in full agreement with the phallic object depicted above [Altrideicktus24-25]. Furthermore, I could also decrypt the concise text on the last Voynich page, folio 116v. It invoked the mixing of alphabets and languages and represented an aphrodisiac recipe [Altrideicktus24-25]. I note that this invoked alphabet mixing was in full agreement with the suggested cipher of Roger Bacon [D’Imperio78, Altrideicktus24-25]. Besides, the erotic theme of the last Voynich page matched rather well that of the rest of the manuscript. In this regard, I mention that a few months after the publication of my book [Altrideicktus24], the paper of Brewer and Lewis (2024) suggested that some Voynich illustrations conveyed erotic contents. I further note that the text segments I decrypted from John Dee’s (Enochian) Liber Loagaeth tables also concerned erotic obscenities in close relation with their Voynich counterparts [Altrideicktus24-25]. Based on this unexpected correspondence and on the strong statistical and linguistic ties between these two documents, I raised the question whether the Liber Loagaeth tables might represent a trans-coded version of the Voynich text (or some sections of it) [Altrideicktus25].

Concerning the topical analysis of the Voynich text, Sterneck, Polish, and Bowern (2021) invoked several cutting-edge topic modeling algorithms including the Latent Dirichlet Allocation. This latter analysis suggested that most of the Voynich manuscript conveyed one topic: "*While it may be possible that the manuscript is mostly about one topic, there are certain aspects of LDA that may explain these results and render LDA unfeasible to use for these analyses.*" In terms of these findings, Timm and Schinner (2023) also expressed their skepticism: "*It is especially noteworthy that from the three topic modeling techniques used the Latent Dirichlet Allocation (LDA) fails completely (by allocating the entire VMS to a single topic).*"

The Voynich manuscript may indeed create the *impression* of a medieval alchemical, astrological, or medical almanac encompassing numerous topics, as reflected by its traditionally established *Herbal, Astro, Balneo, Pharma,* and *Recipes (Text-only)* sections. However, this is only an *impression*. As such, it should not provide firm grounds for dismissing the quantitative findings that "*allocate the entire VMS to a single topic"*.

My multilateral findings, including the proposed decryption of numerous Voynich text segments, its ars poetica, and the identification of multiple steganographically concealed erotic objects in the illustrations of the Voynich manuscript [Altrideicktus24-25], unequivocally demonstrate that the *meaningful Voynich hoax was constructed toward deception, and it conveyed only one topic, as discussed above.* Intriguingly, the closing phrase of the Voynich ars poetica, as I decrypted from folio 65v, fully supports this scenario:  – "*confictus ictus infinitus"* (Latin) – a hoax of an infinite blow (in English) [Altrideicktus24-25]. In this regard, I note that the currently proposed Voynich transcript [Altrideicktus_VMS_Transcription] already includes the expression "*ictus infinitus"* from this tripartite phrase.

Another puzzling feature of the Voynich text is its symmetric, quasi-binomial word-length distribution. Earlier, in the framework of the natural-language hypothesis, this provided a reason to disregard European languages as the underlying language for the Voynich text. However, in terms of a ciphertext, my proposed polyphonic cipher key included numerous Latin abbreviations and word-ending truncations [Altrideicktus25, Cappelli82]. Therefore, I was wondering how the expansion of these abbreviations and truncations would have affected the word-length distribution in the currently proposed Voynich transcription (based on a compact subset of my proposed cipher key). Fig. 4.5. displays the word-length distribution for this novel transcript (in red). The reader may notice that the distribution became asymmetric (non-binomial) and shifted toward longer word lengths. These features indicate that the expansion of abbreviations and truncations had a remarkable effect. Next, I compared this word-length distribution to those of Latin texts. However, as my decrypted Voynich text segments exhibited mainly simple sentence structures, mostly without the explicit presence of the Latin conjunction "et" [Altrideicktus24-25], for a better comparison, I removed this particular conjunction from the investigated Latin texts. These included Ovid's Amatoria, Vergil's Aeneid, and a combined (collated) Latin text sample as well [Combined_texts]. Interestingly, Fig. 4.5 shows that there is a reasonable agreement between the Latin word-length distributions and that of this currently proposed Voynich transcript. This surprising match further corroborates the presence of a polyphonic cipher in the Voynich text.

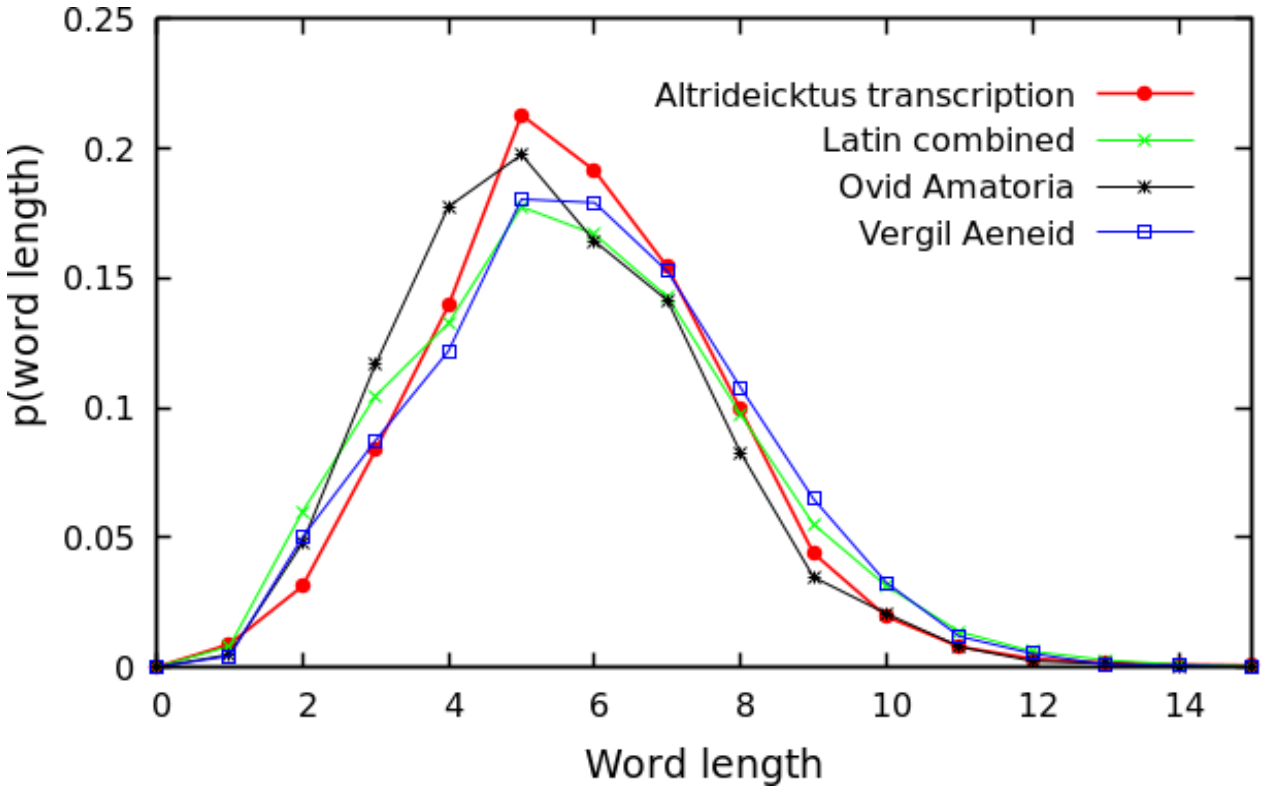


Fig. 4.5. Word-length distributions for several Latin texts [Combined_texts] and the currently proposed Voynich transcription (based on Takahashi's original Voynich transliteration (https://www.voynich.com/pages/PagesH.txt) and on a compact subset of my suggested polyphonic cipher key [Altrideicktus24-25]; the full transcription can be found at [Altrideicktus_VMS_Transcription]). After substituting the medieval Latin abbreviations and expanding the word-ending truncations [Cappelli82], the word-length distribution for the currently transcribed (partially decrypted) Voynich text becomes asymmetric and shifts toward longer word lengths. Earlier, I found that the decrypted Voynich text segments exhibited mainly simple sentence structures, mostly without the explicit presence of the Latin conjunction "et" [Altrideicktus24-25]. Therefore, for a better comparison, I removed the conjunction "et" from the investigated Latin text samples. The agreement appears reasonable.

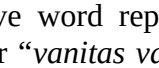
5. Conclusions

The Voynich community was long divided about the possible contents of the Voynich manuscript. During the century of the modern-day Voynich research, a vast number of investigations were pursued toward finding out whether the Voynich text comprised a gibberish, a natural-language text, or a ciphertext. However, as these studies did not turn out conclusive at all, no consensus could be reached and the baffling mystery further prevailed.

In this paper, I provided numerous quantitative evidences that the Voynich text encompasses several (encoding) dialects and conveys a polyphonic cipher. First, and most importantly, I found strong correlations between the displayed writing styles (established by Davis (2020)) and the letter, syllable, and token densities of the Voynich text. These, along with the abrupt changes in some related statistical properties (for example, the Φ-correlation for consecutive Voynich folios and the hapax legomena), served as clear-cut evidences on the presence of dialects. However, contrary to the earlier suggestions of Currier (1976), the currently revealed statistical features, in accord with the pertinent inferences of Timm and Schinner (2023), implied that these dialects did not constitute distinct languages.

Furthermore, the elaborate interplay between the writing-style-wise and section-wise syllabic and hapax legomena densities, as revealed in this study, inferred the presence of textual cohesion in the Voynich manuscript. I note here that the earlier findings of Montemurro and Zanette (2013) also implied the presence of semantic structures in the Voynich text. These clues, together with my proposed solution [Altrideicktus24-25], suggest that the Voynich manuscript conveys a cipher. I provided further evidences for the presence of a polyphonic cipher in terms of pronounced letter-letter density (anti-)correlations and also by the presentation of a novel transcript of the Voyich text (based on Takahashi's original transliteration [Takahashi_VMS_Transcription] and my proposed polyphonic cipher key [Altrideicktus25]). This novel Voynich transcript, to be considered as the first layer of decryption, already exhibited numerous Latin words, and its word-length distribution matched reasonably well that of several Latin texts.

The presence of a polyphonic cipher in the Voynich text would also provide a simple, natural explanation for the self-citation process, revealed by Timm and Schinner (2020), as it could have made the encoding much more efficient. Besides, according to my proposed decrypted text segments (comprising mostly pervasive erotic obscenities) [Altrideicktus24-25] and the novel Voynich transcript I established [Altrideicktus_VMS_Transcription], it appears that a remarkable portion of the (meaningful) Voynich contents might have been created in an encryption- *and* content-wise self-citing process of writing.

In addition, the polyphonic cipher scenario would straightforwardly explain the notorious word repetitions in the Voynich text as well, as the each encrypted Voynich word may stand for several plaintext words. However, as I decrypted only a small portion of the entire Voynich text, the presence of evocative word repetitions (for example, the Voynich sequence  standing for "*vanitas vanitas vanitas*") cannot be excluded. Interestingly, I found several triple-repetitive sequences in John Dee's spiritual diary including "*Dee, Dee, Dee*"; "*Come, Come, Come*"; "*Huseh Huseh Huseh*"; and "*Peleh Peleh Peleh*" [Dee_Diary].

I further note that the polyphonic cipher scenario would also account for the presence of line- and paragraph-based glyph patters [Vogt12, Zandbergen21, Feaster22]. Interestingly, my proposed polyphonic cipher displayed a remarkable overlap with the cipher suggested by Roger Bacon [Newbold28, D'Imperio78]. Based on the revealed similarities, I considered the proposed Voynich cipher a variant of the Bacon cipher [Altrideicktus24-25].

I found the decrypted Voynich contents quite unexpected and shocking [Altrideicktus24-25]. The pervasive presence of erotic obscenities is already apparent in the currently proposed Voynich transcript (cf. [Altrideicktus_VMS_Transcription], Appendix 7, and the above-presented concise list of decrypted words), representing the first layer of decryption. My findings strongly suggest that the traditionally established Voynich sections convey only one semantic topic (focused on such obscenities), and the cunningly designed Voynich illustrations conceal numerous erotic representations matching well the pertinent decrypted text segments [Altrideicktus24-25]. These insights reflect well master-trickster John Dee's motto: "*Omnia unum est*" [Dee_Diary] and further corroborate that the Voynich manuscript comprises a *meaningful hoax* created for deception. Intriguingly, this intent is expressed explicitly by its ars poetica that I decrypted from Voynich folio 65v: "*confictus ictus infinitus*" – a hoax of an infinite blow [Altrideicktus24-25].

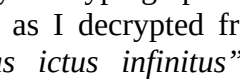
The reader may wonder why the Voynich author(s)' chose such a complex, polyphonic way of encryption. In my understanding, dealing with the encrypted forbidden texts was considered a capital sin back in those medieval and Renaissance times. Therefore, the letter-wise non-bijective (no one-to-one) renderings, such as the polyphonic encryption, turned out the only viable option to conceal these forbidden contents in order to save the author(s)' lives from the Inquisition [Altrideicktus24-25].

The paleographic analysis of Davis (2020) suggested the presence of at least five scribes in the Voynich manuscript. I generalized this scenario by suggesting that the number of scribes may be less than that of the displayed writing styles. In my book, I argued that the preparation of the manuscript could have spanned an extended period of time (possibly encompassing several decades), and/or it was created under the influence of drugs [Altrideicktus24-25]. Both options may result in remarkable changes of writing styles [Bancila14]. Furthermore, I pointed out in my book that several paleographic keys or signatures, based on which Davis distinguished the Voynich writing styles, are also present in the handwriting of John Dee [Altrideicktus24-25].

Interestingly, Rugg (2004) and Daruka (2021) associated the creation of the Voynich manuscript with John Dee and Edward Kelly, although both papers considered the manuscript a meaningless hoax. In my book, I suggested two main authorship scenarios. According to the first one, in agreement with Davis' (2020) five-hand hypothesis, at least three authors contributed to the construction of the Voynich manuscript. These, based on the revealed steganographic evidences, included cryptographer genii Leon Battista Alberti, Johannes Trithemius, John Dee, and most likely his confidant scryer Edward Kelly [Altrideicktus25]. According to the second authorship scenario, master-trickster Dee, most likely together with Kelly, hoaxed the entire manuscript and planted fake clues on the involvement of Alberti and Trithemius in order to lead the codebreakers up the garden path [Altrideicktus25]. (In this regard, I note that John Dee feverishly collected, copied, and admired the cryptographic works of Trithemius [Dee_Cecil, Trithemius_Stegano_Dee, Grafton09], who could be considered as Dee's cryptographic father [Altrideicktus25].) Intriguingly, I could discern John (or Ioannes) Dee's initials (J/I 𝒹) in the focal region of the plant drawing displayed on Voynich folio 65v [Altrideicktus24-25]. Besides, I could also identify Dr. Dee's famous *hieroglyphic monad* [Dee_Monas, Forshaw17] as concealed in the same plant drawing [Altrideicktus24-25]. In addition, I could decrypt John Dee's full name from the nearby text conveying the ars poetica of the Voynich cipher [Altrideicktus25]. These findings infer that Writing style 3 (as identified by Davis (2020)) belongs to master-trickster John Dee.

In my book, I further elaborated on these issues as follows [Altrideicktus25]. "*Concerning the actual realization of John Dee's (and probably Edward Kelly's) contributions to the Voynich manuscript, he (they) could have filled in the parchments left blank by Alberti. Besides, or alternatively, Dee could have added some further quires of old parchments as well. The parchment age discrepancy raised by this particular scenario poses no real problem as Dee could have acquired sufficient quantities of old parchments. In this regard, I mention that Dee possessed*

England's largest private library at the time, including 4000 books and manuscripts [Dee_Britannica], and during his extensive continental journeys, through his connections to booksellers, obtaining sufficient quantities of old blank parchments from the early 15th century did not seem to be a substantial problem. In fact, Rich SantaColoma found out that even at the beginning of the 21st century, it was possible to buy large quantities of blank parchments that were carbon-dated to the 15th century [Ungar-Sargon13, Rugg13]." Furthermore, in my book, I also discussed the possible incentives of Dr. Dee to create or contribute to such an exquisite ciphertext for hoaxing purposes.

As suggested above, the Voynich manuscript represents an *elusively complex, inherently multi-disciplinary object.* Concerning the central question whether it encompasses a meaningless or a meaningful hoax, all these findings suggest that it comprises a *meaningful* hoax, an elaborate ciphertext created by a cryptographer genius or genii. Intriguingly, the closing phrase of the Voynich ars poetica, as I decrypted from folio 65v, fully supports this scenario:  – "*confictus ictus infinitus*" (Latin) – a hoax of an infinite blow (in English) [Altrideicktus24-25]. That is, the Voynich manuscript is a hoax *and* not a hoax at the same time.

These insights resolve the long-standing division of the Voynich community and well explain that it occurred not without reason. The invoked elaborate polyphonic cipher (especially in its "self-citing" implementation) substantially distorted the statistical features of the encoded Latin text in diverse ways, such that some of its apparent statistical properties resembled those of natural-language texts while others were reminiscent of those of gibberish. Interestingly, this dichotomous division well reflects the Hermetic duality (toward deception) as the underlying principle behind the creation of the Voynich cipher, according to my proposed decryption of the manuscript's ars poetica encrypted on folio 65v [Altrideicktus24-25].

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Combined_texts:

Latin_combined (continuous sections of):
Vergil – Georgicon: https://www.thelatinlibrary.com/vergil/geo1.shtml
Vergil – Eclogues: https://www.thelatinlibrary.com/vergil/ec10.shtml
Vergil – Aeneid: https://www.thelatinlibrary.com/vergil/aen5.shtml
Ovid – Amatoria: https://www.thelatinlibrary.com/ovid/ovid.artis3.shtml
Alcuin – Rhetorica: https://www.thelatinlibrary.com/alcuin/rhetorica.shtml

English_combined (continuous sections of):
Dickens, Ch. – Bleak House: https://www.gutenberg.org/files/1023/1023-h/1023-h.htm
Shakespeare, W. – Hamlet: https://shakespeare.mit.edu/hamlet/full.html
Shakespeare, W. – Sonnets: https://shakespeares-sonnets.com/Archive/allsonn.htm
Huxley, A. – Brave New World: https://archive.org/stream/ost-english-brave_new_world_aldous_huxley/Brave_New_World_Aldous_Huxley_djvu.txt

German_combined (continuous sections of):
Goethe, J. W. – Die Leiden des jungen Werther: https://www.projekt-gutenberg.org/goethe/werther/werther.html
Rilke, R. M. – Erste Gedichte: https://www.gutenberg.org/files/33821/33821-h/33821-h.htm
Mann, T. – Der Zauberberg: https://www.gutenberg.org/cache/epub/65661/pg65661.txt

Languages_combined (continuous sections of):
Ovid – Amatoria: https://www.thelatinlibrary.com/ovid/ovid.artis3.shtml
Villon, F. – Ballade: https://www.gutenberg.org/files/12246/12246-h/12246-h.htm
Dante – La Divina Commedia: https://www.gutenberg.org/files/1000/1000-0.txt

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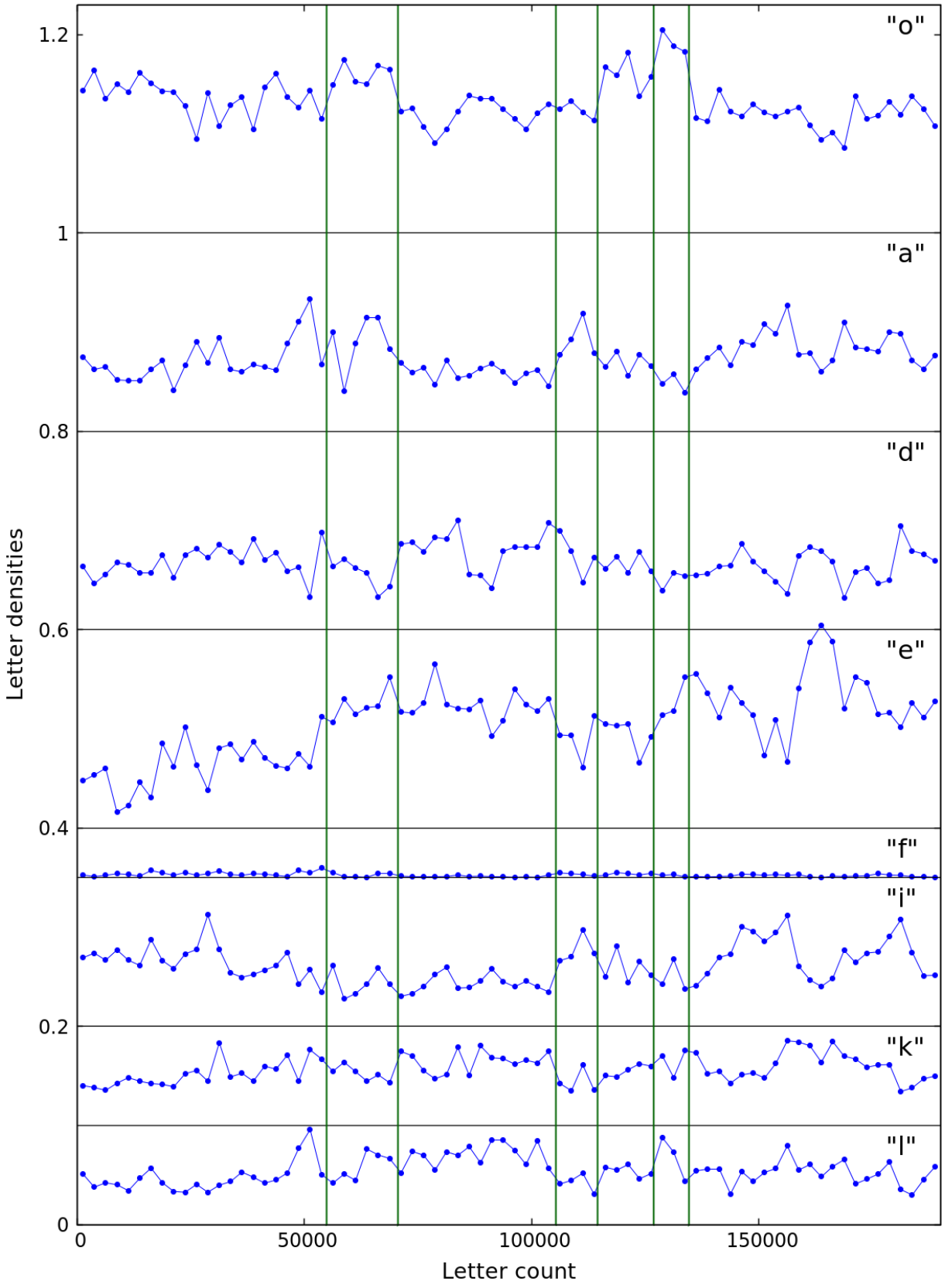
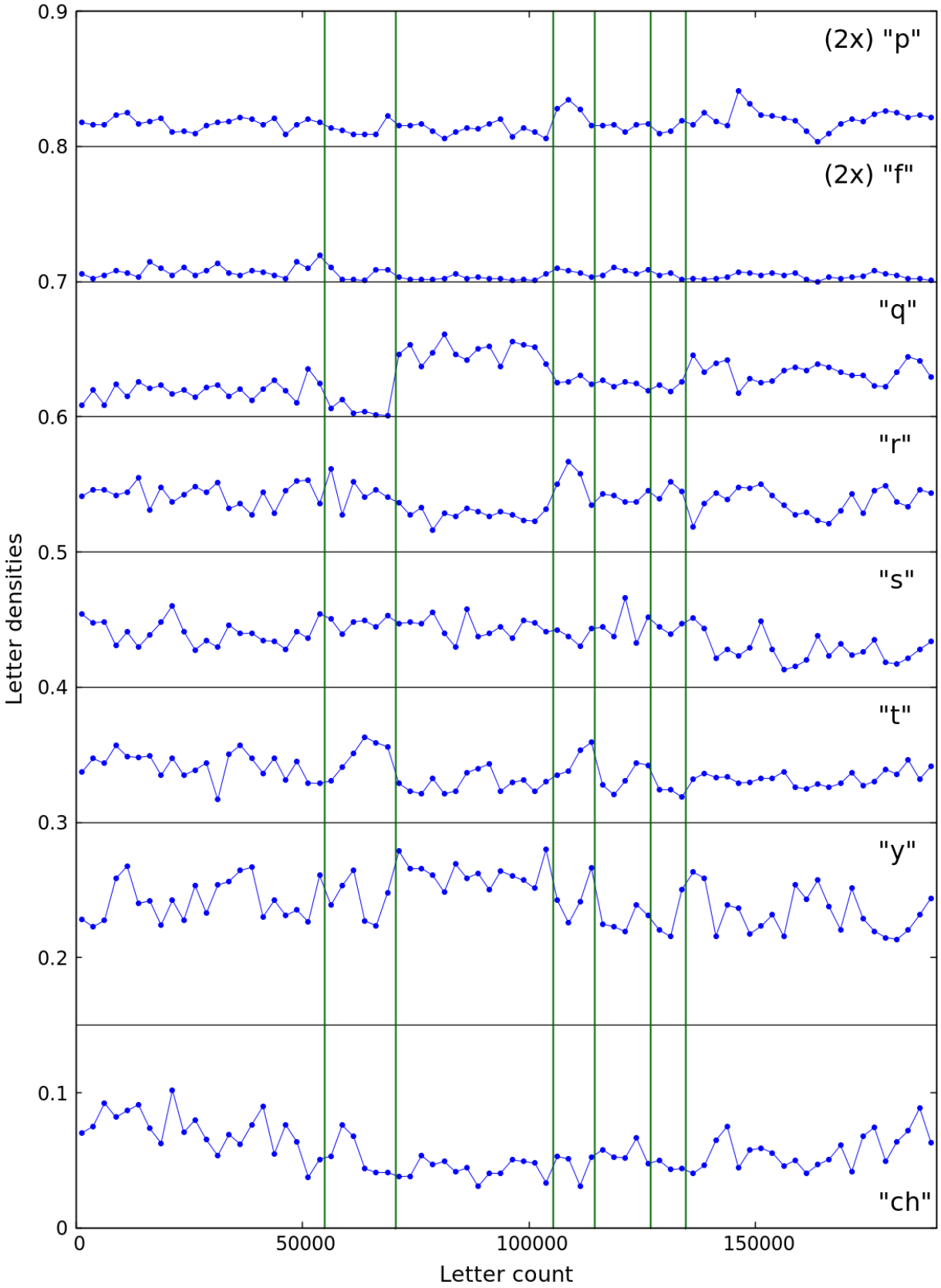
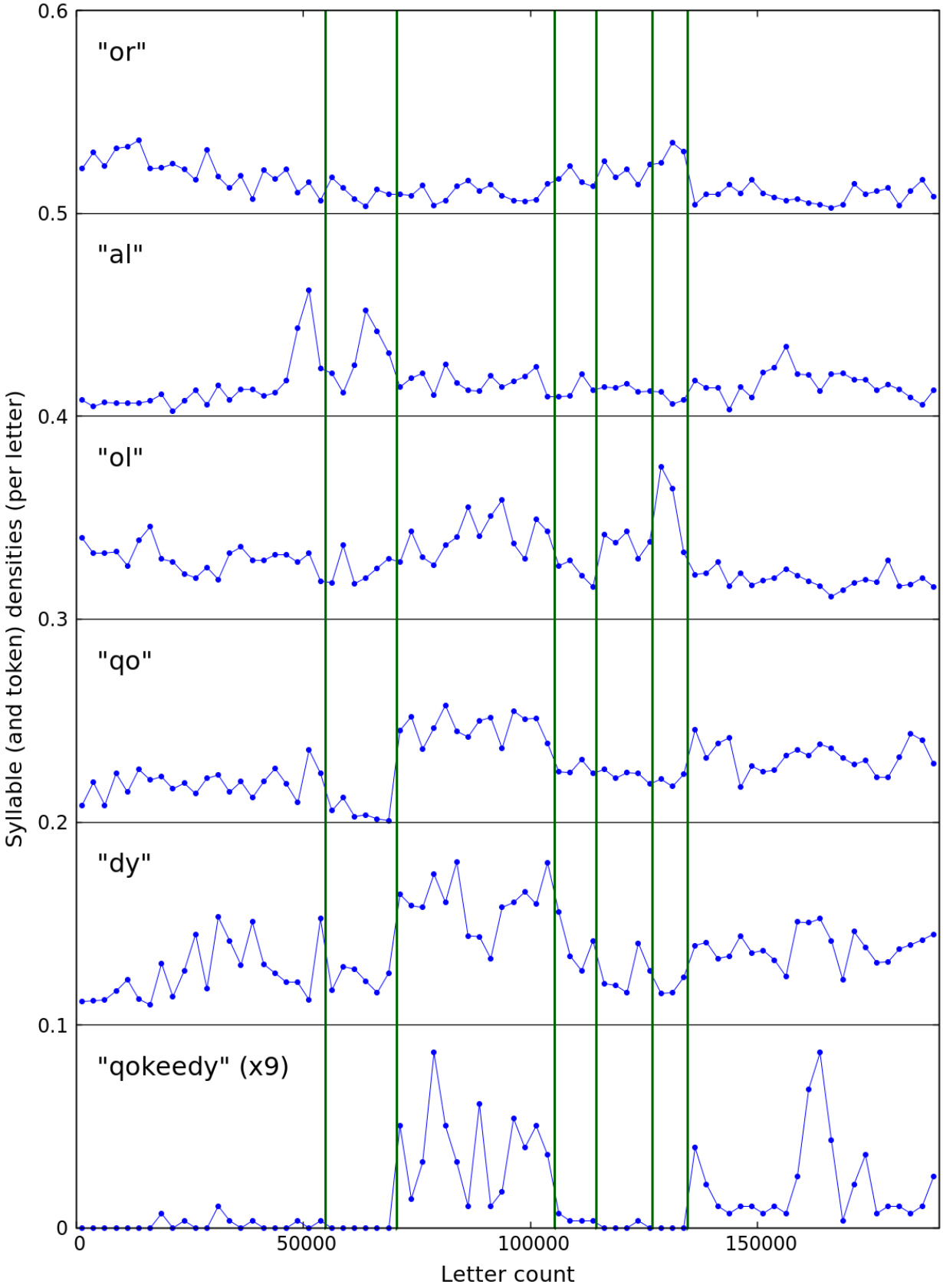
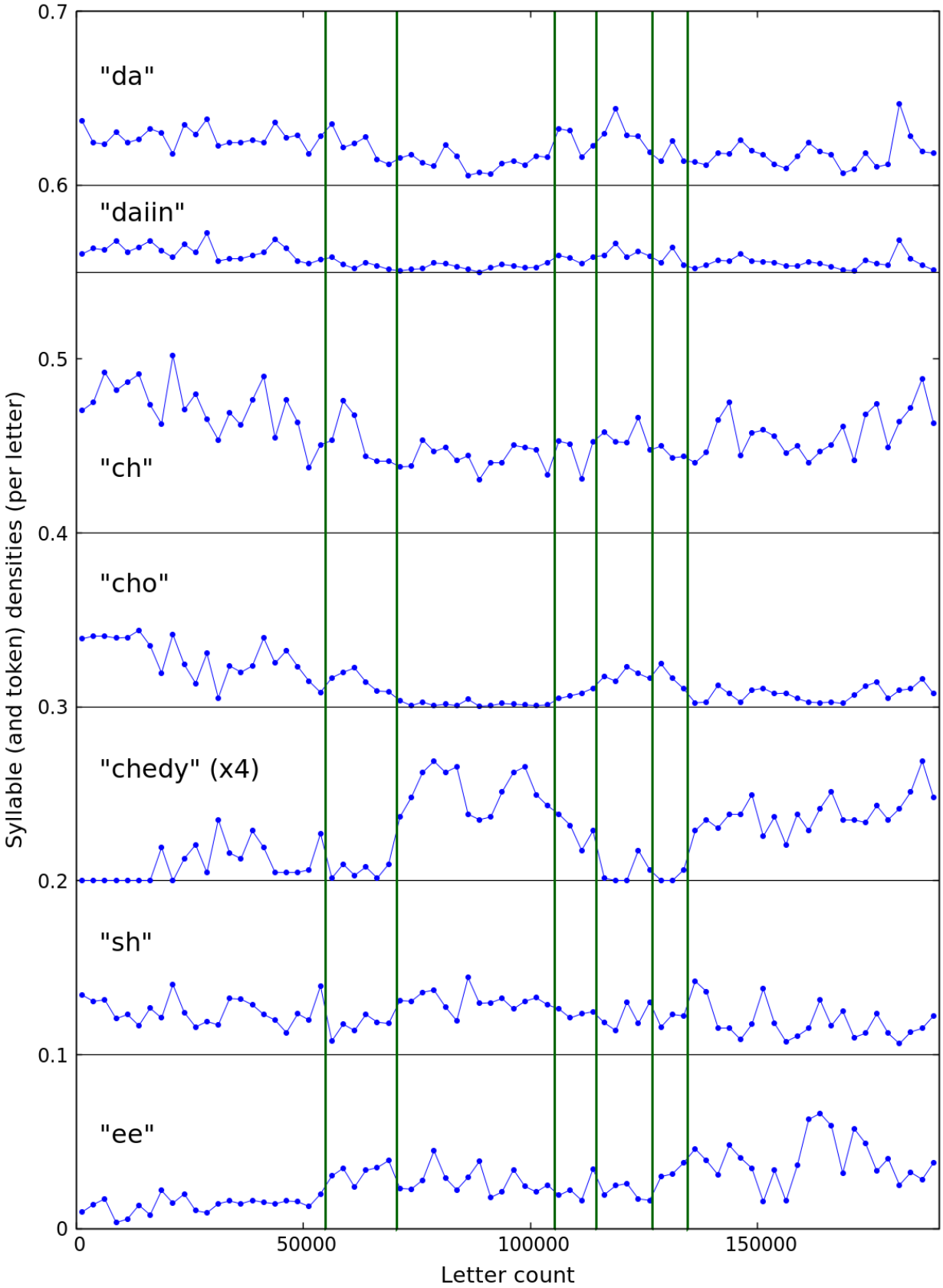
Appendix

1. Letter, syllable, and token densities (per letter) for the Voynich text, based on the original folio order. The vertical dark green lines indicate section boundaries. The pertinent section titles are displayed in Fig. 3.1, and the plots are shifted vertically for better visibility. [Bin size = 2500 letters]

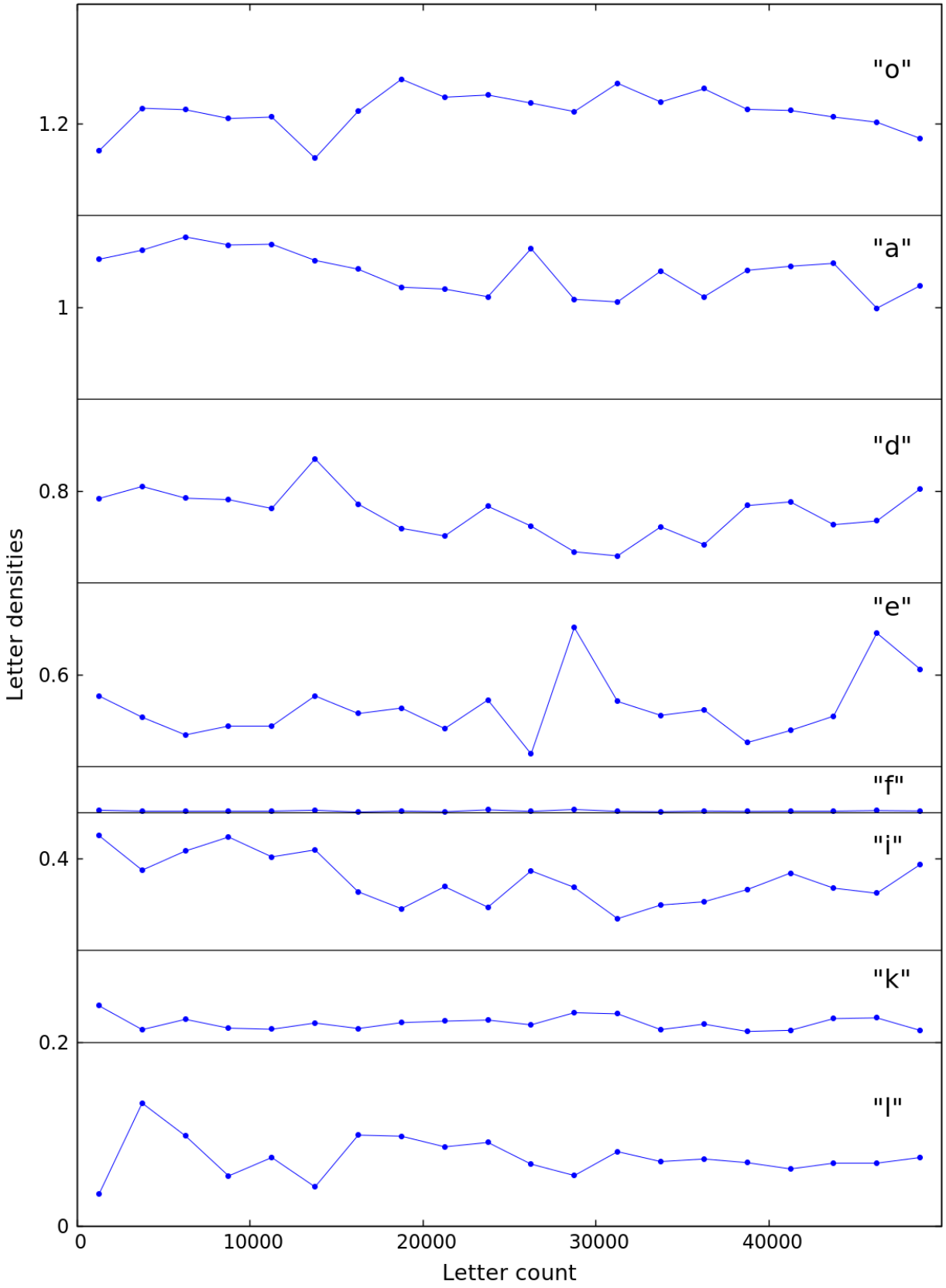


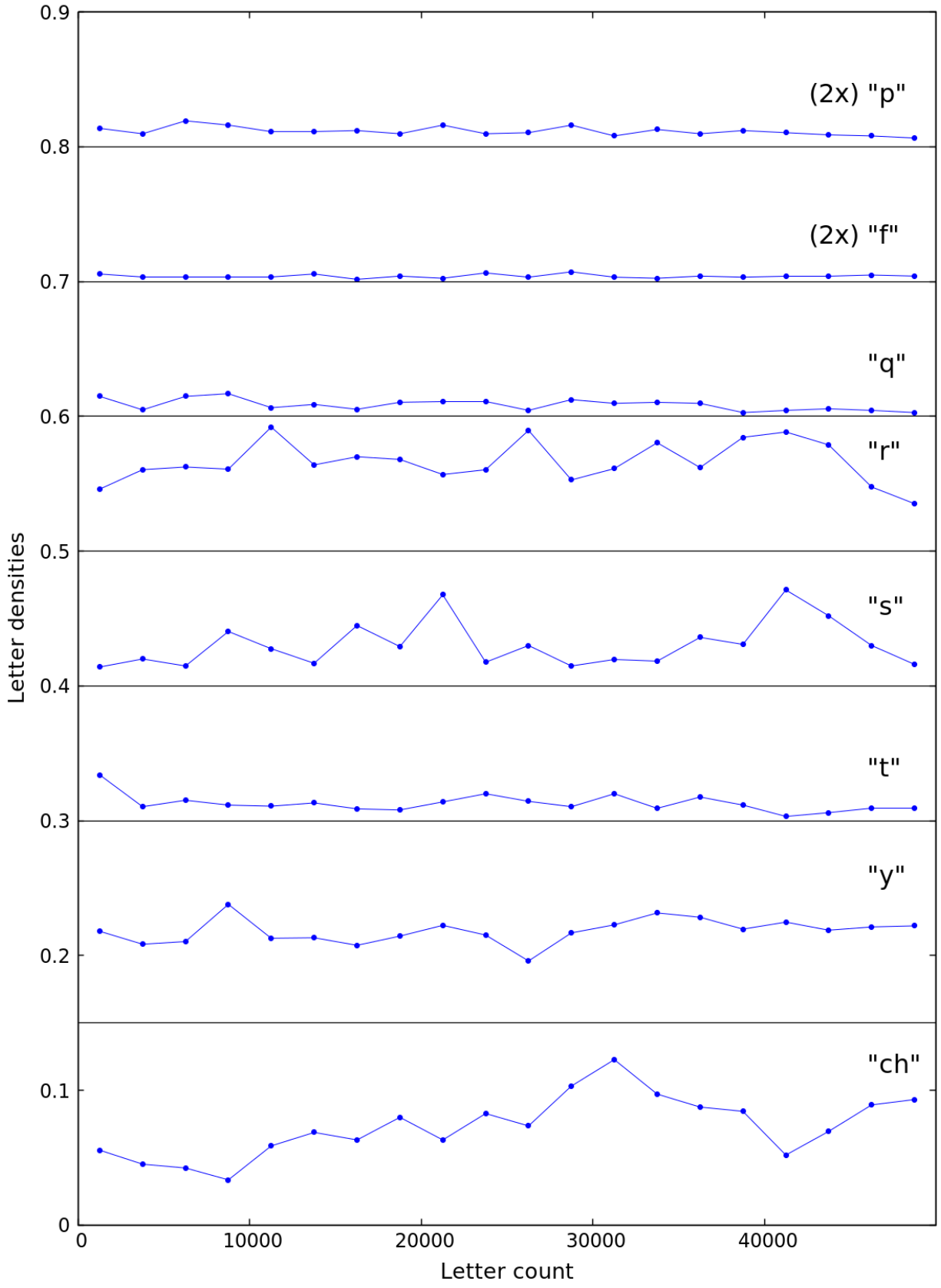


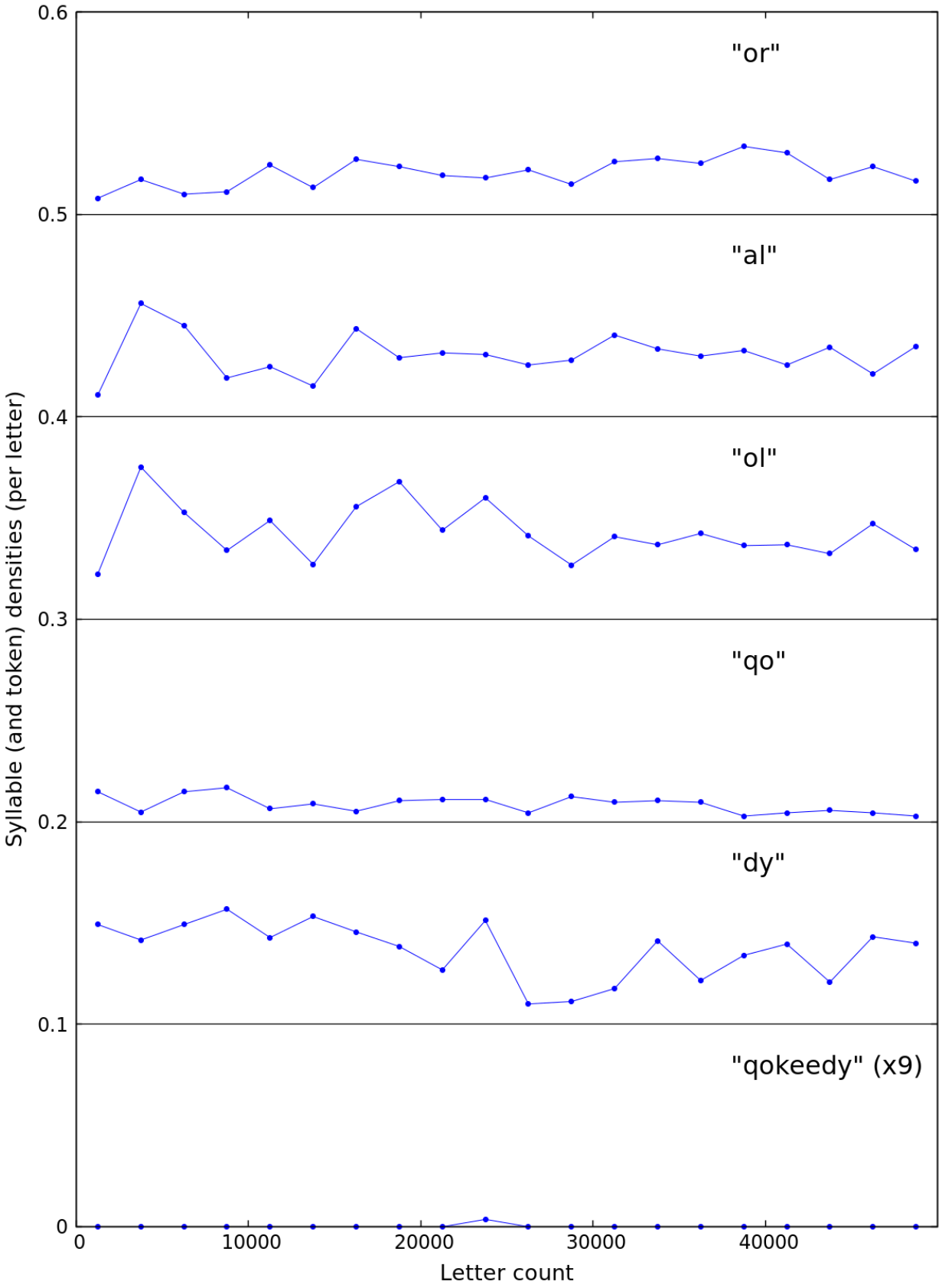


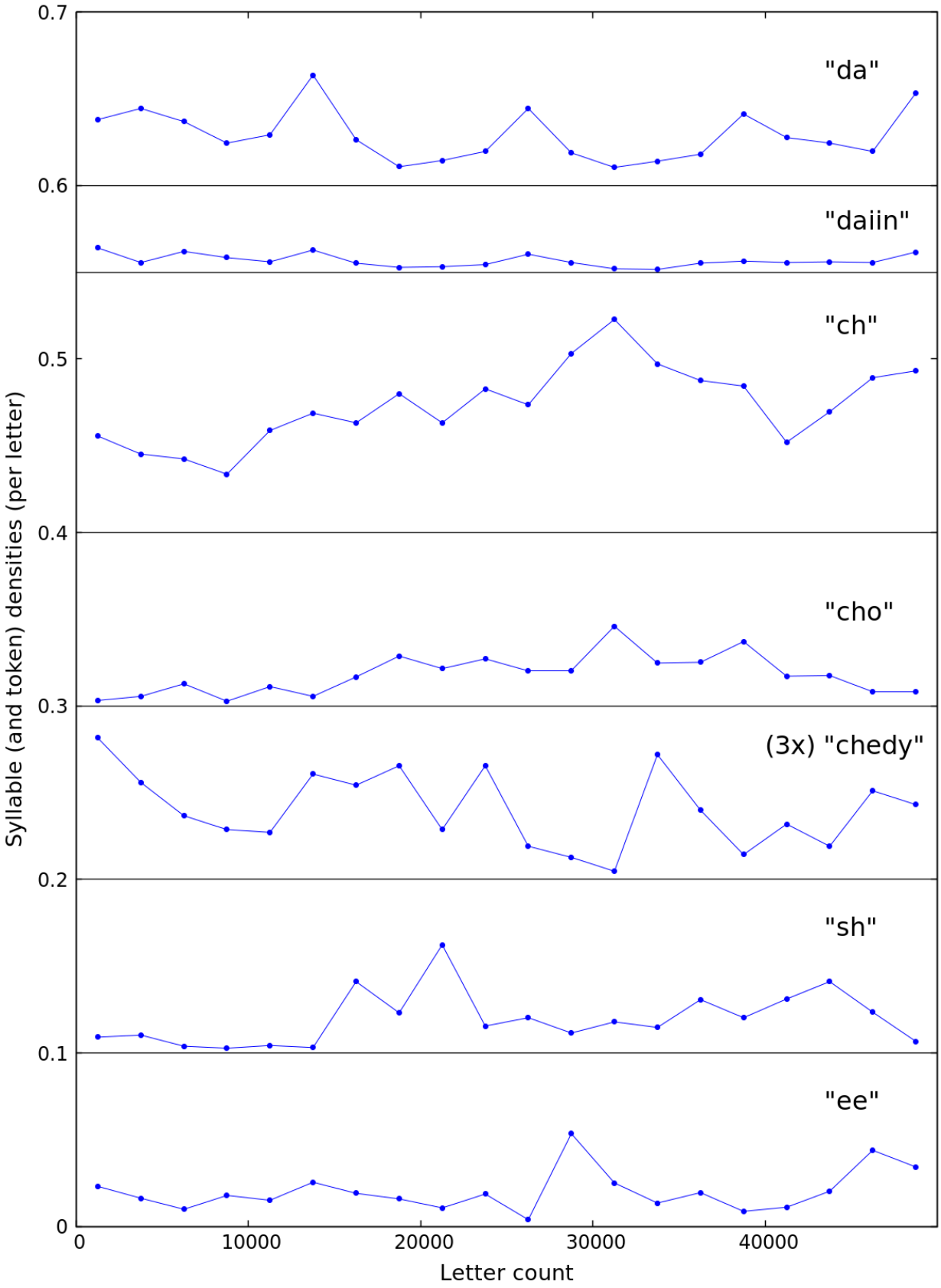


2. Letter, syllable, and token densities (per letter) for the meaningless text generated by Timm and Schinner (2020) [https://raw.githubusercontent.com/TorstenTimm/SelfCitationTextgenerator/refs/heads/master/graphs/GeneratedText/generated_text.txt]. The plots are shifted vertically for better visibility. [Bin size = 2500 letters]

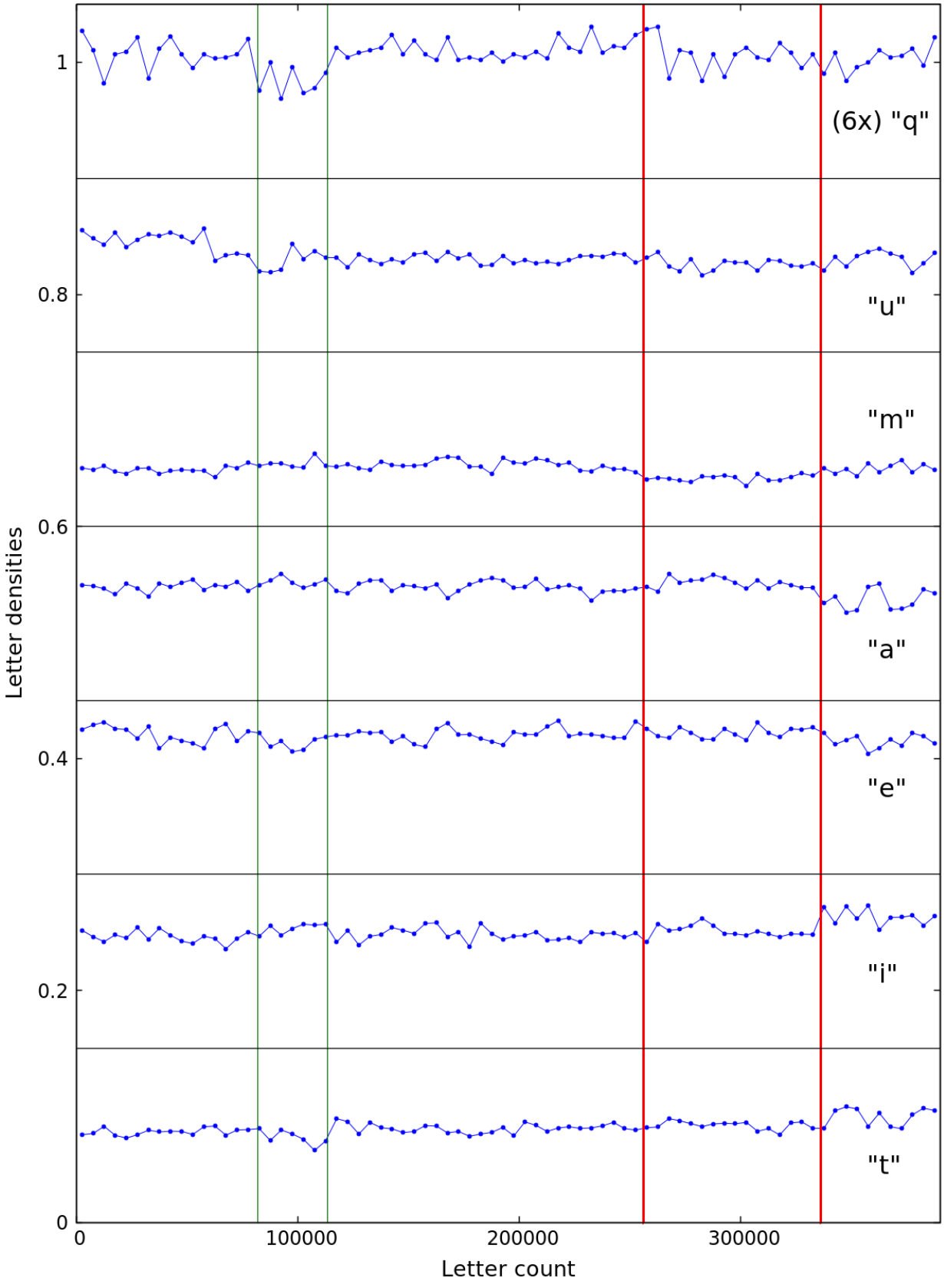


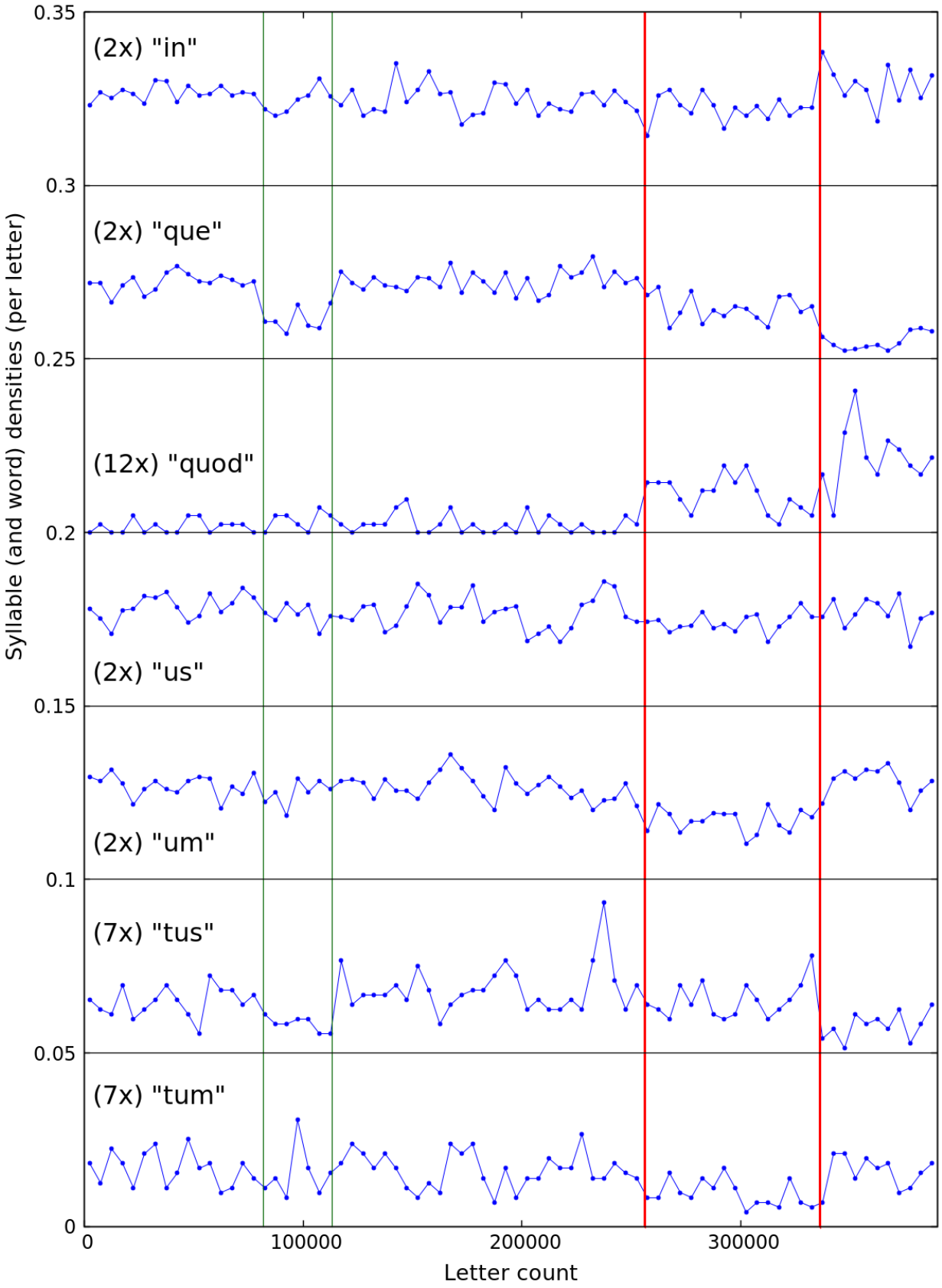




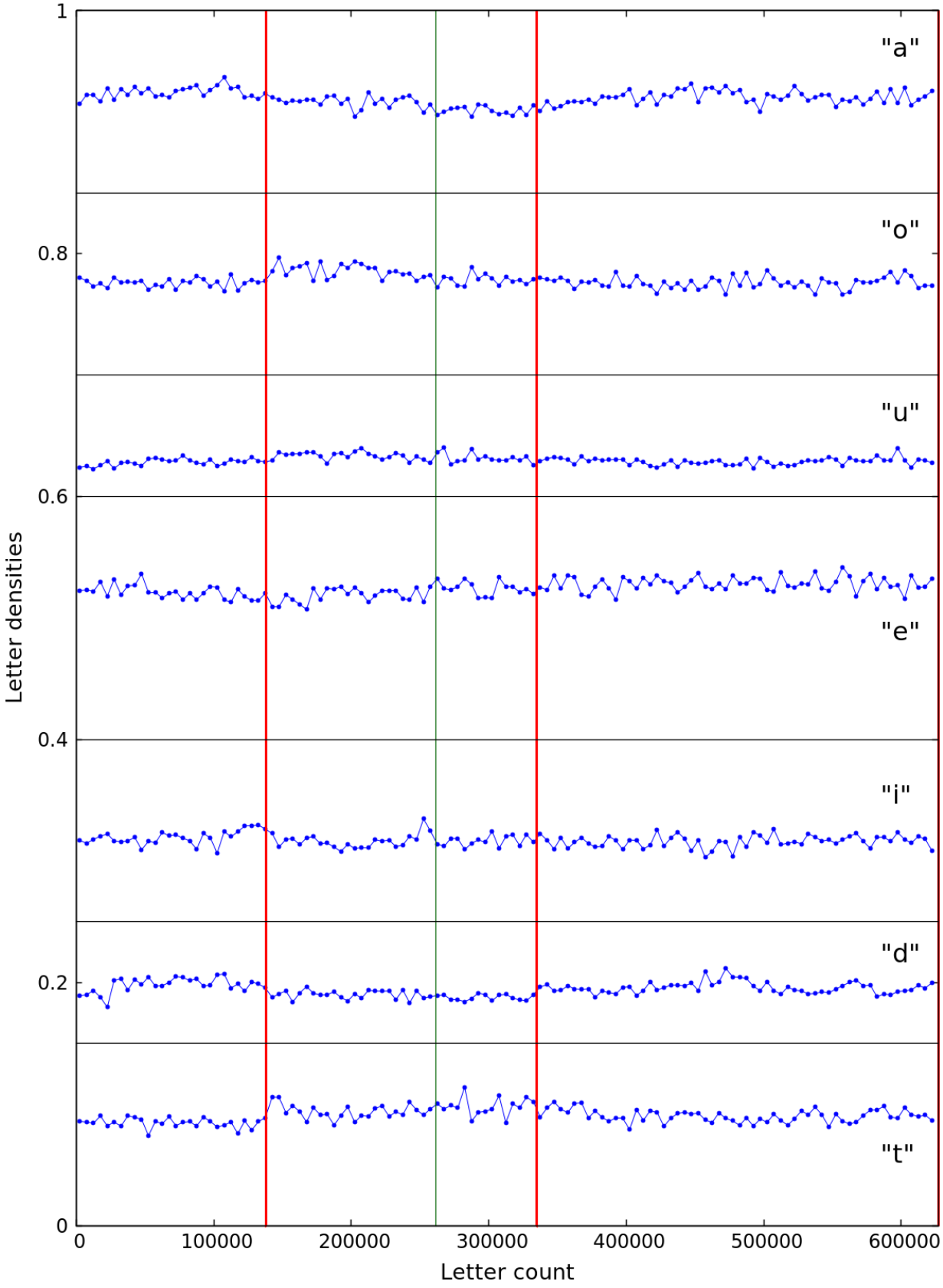


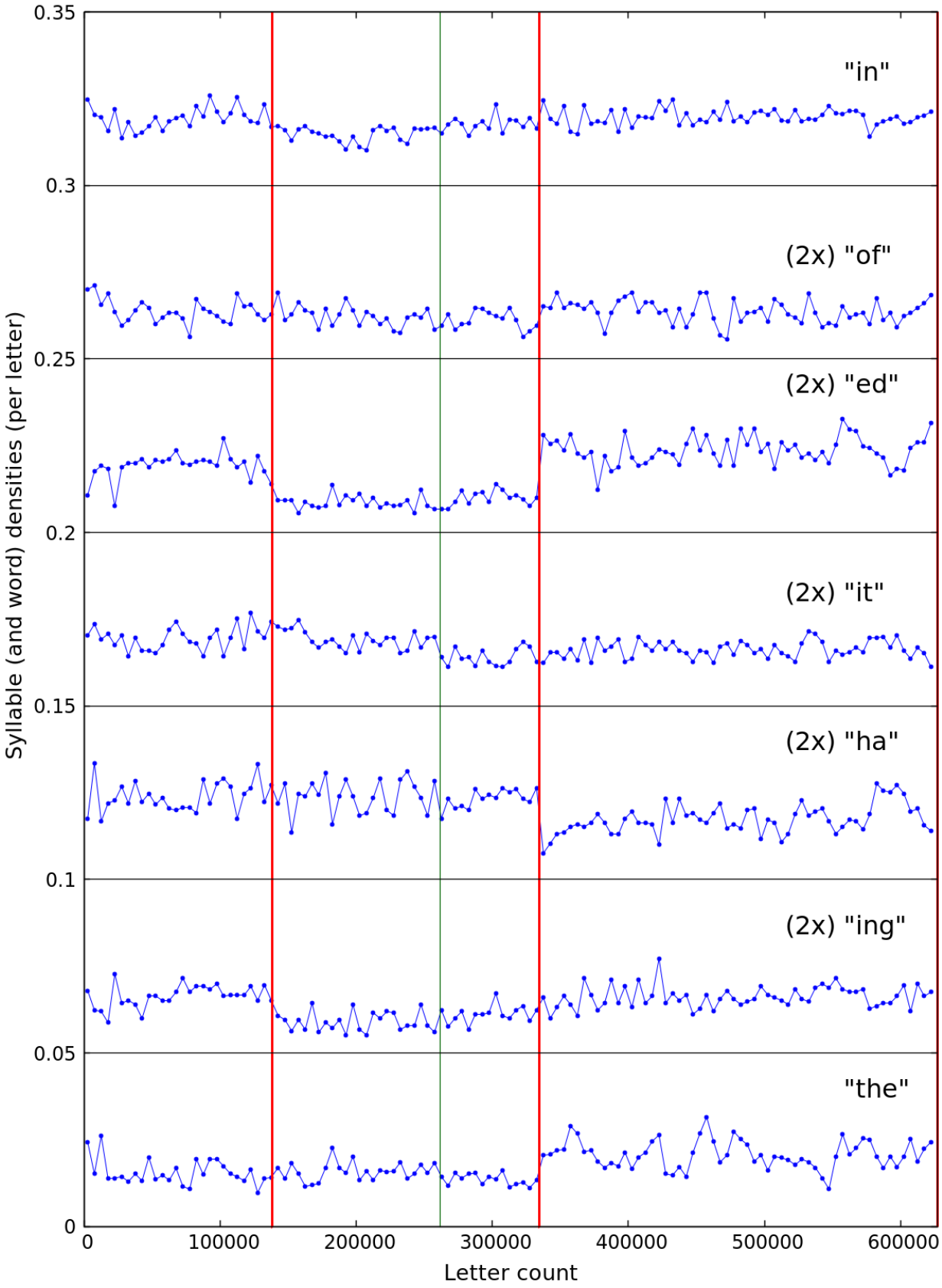
3. Letter, syllable, and word densities (per letter) for a combined (collated) Latin text (Vergil – Georgicon, Vergil – Eclogues, Vergil – Aeneid, Ovid – Amatoria, and Alcuin – Rhetotica) [Combined_texts]. The thick red lines separate works of different authors, and the dark green lines separate different works of the same author. Furthermore, the plots are shifted vertically for better visibility. [Bin size = 5000 letters]



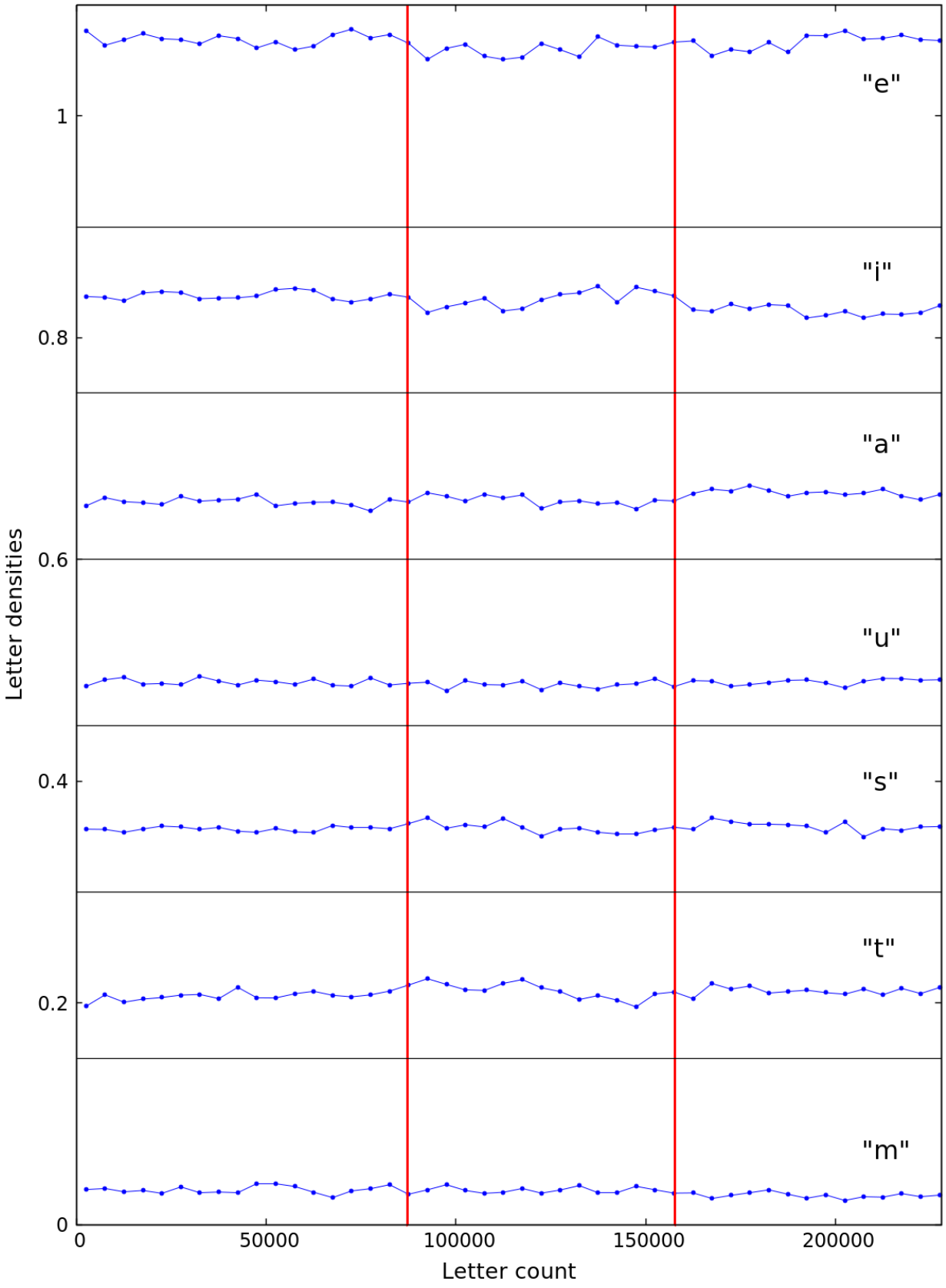


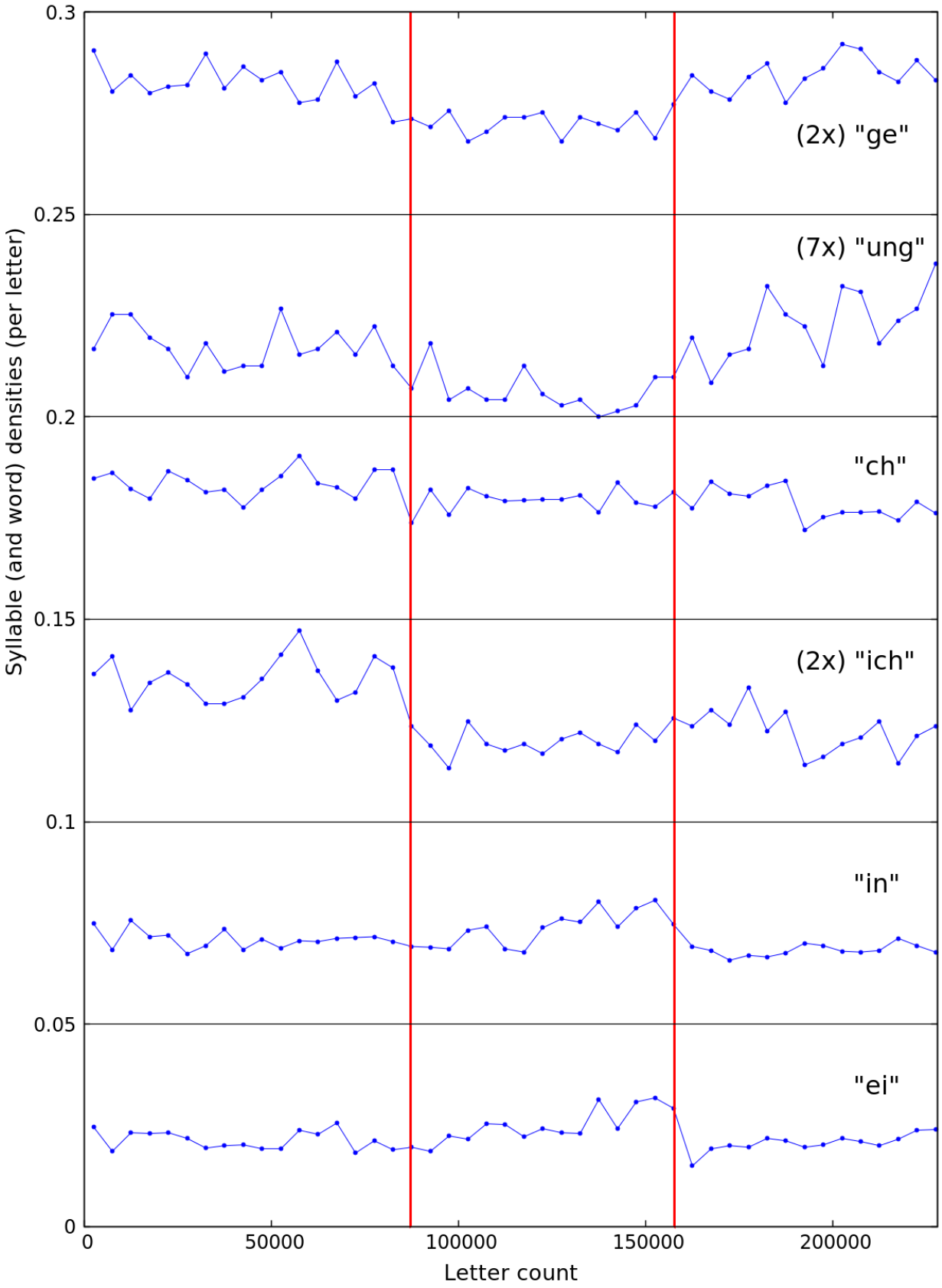
4. Letter, syllable, and word densities (per letter) for a combined (collated) English text (Dickens – Bleak House, Shakespeare – Hamlet, Shakespeare – Sonnets, and Huxley – Brave New World) [Combined_texts]. The thick red lines separate works of different authors, and the dark green line separates different works of the same author. Furthermore, the plots are shifted vertically for better visibility. [Bin size = 5000 letters]



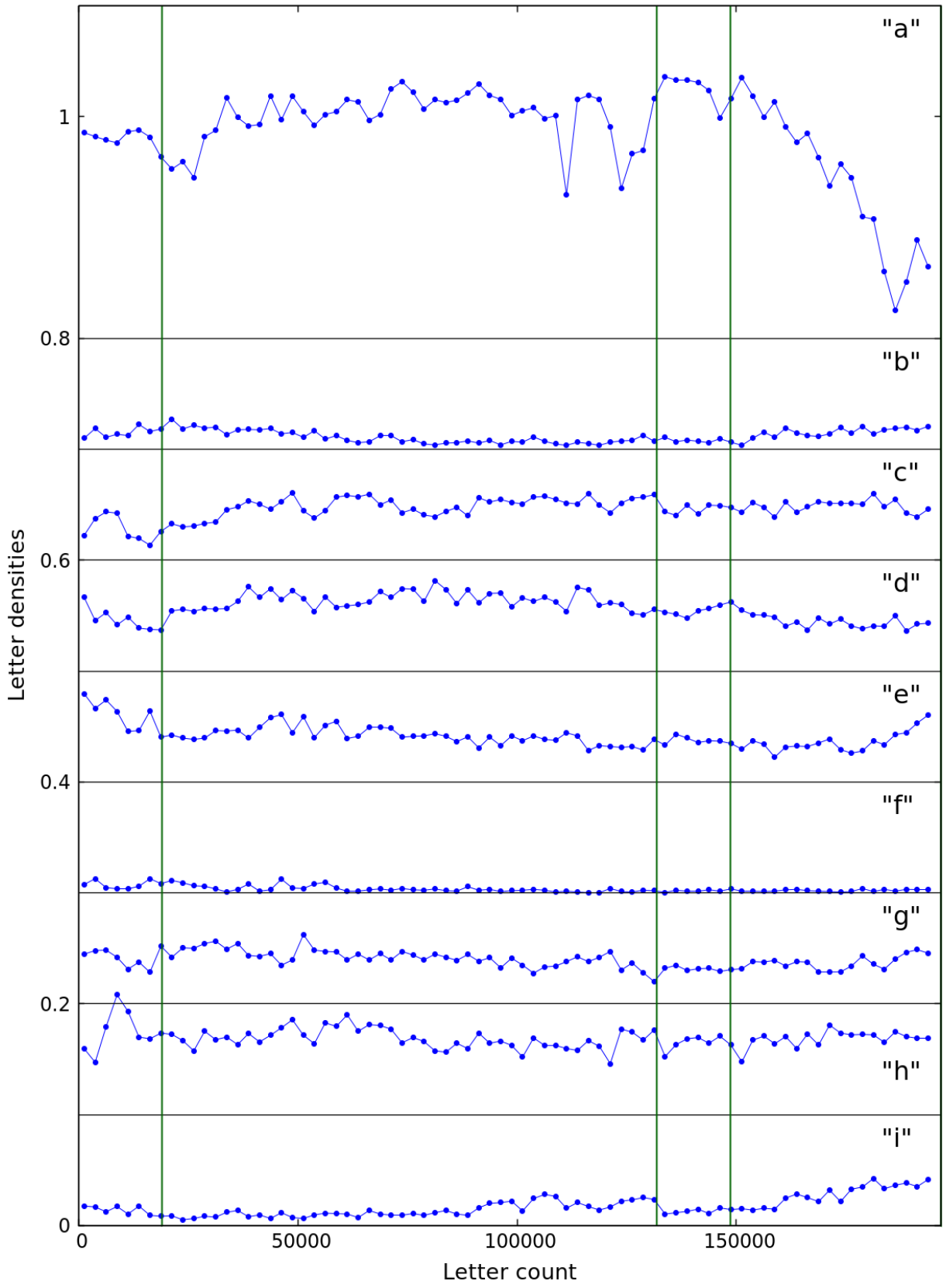


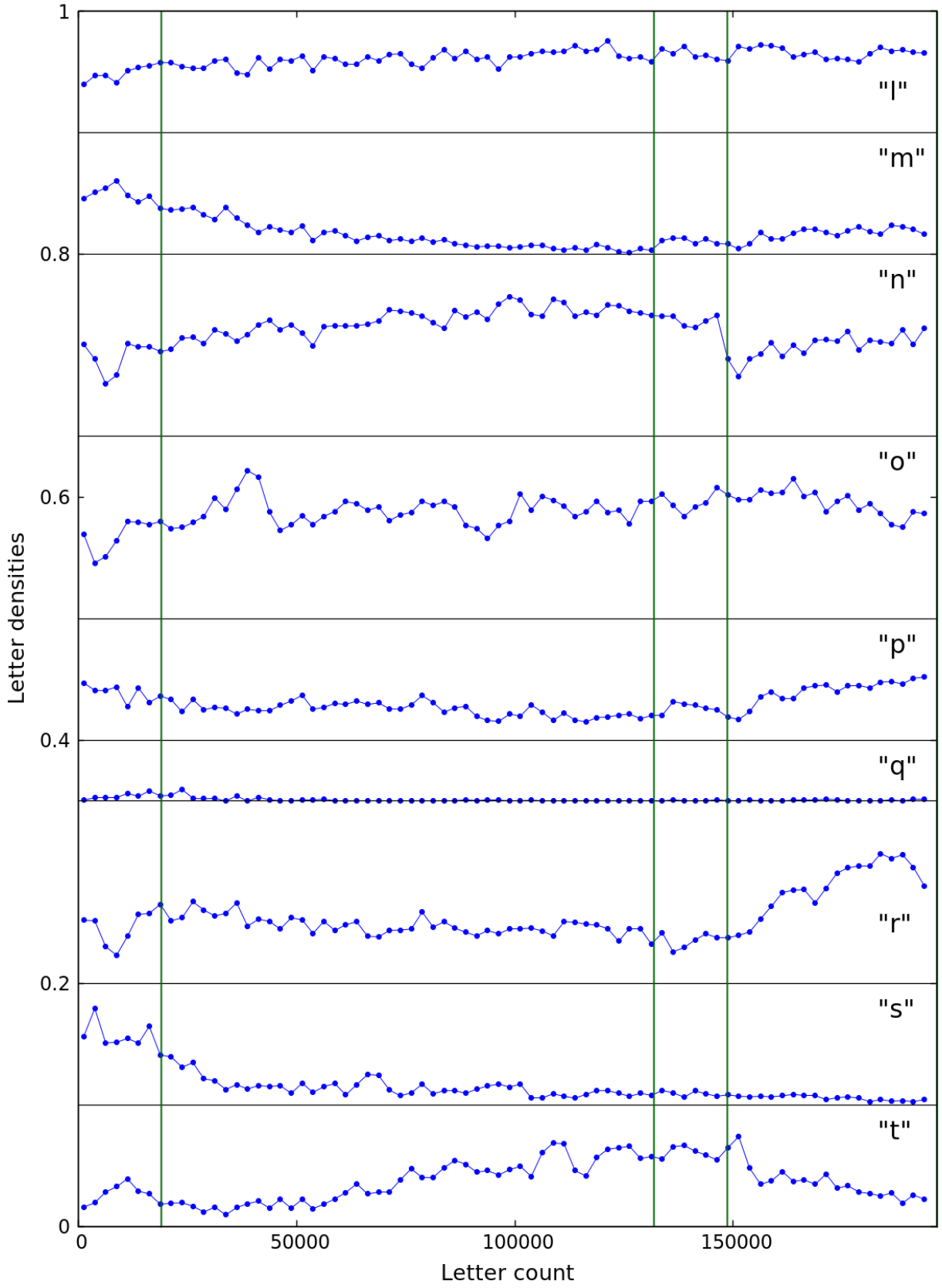
5. Letter, syllable, and word densities (per letter) for a combined (collated) German text (Goethe – Werther, Rilke – Poems, and Mann – Zauberberg) [Combined_texts]. The thick red lines separate works of different authors, and the plots are shifted vertically for better visibility. [Bin size = 5000 letters]

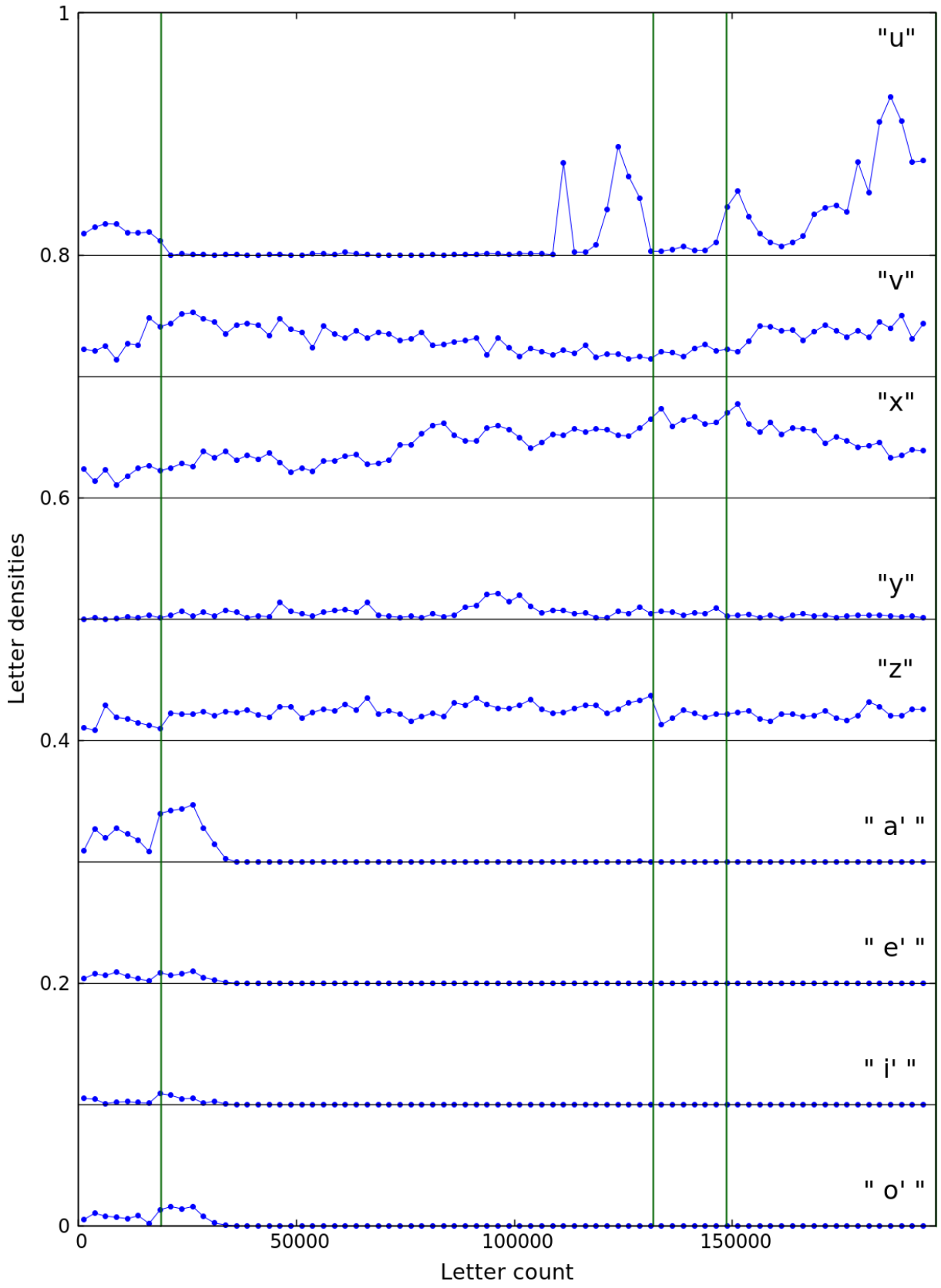


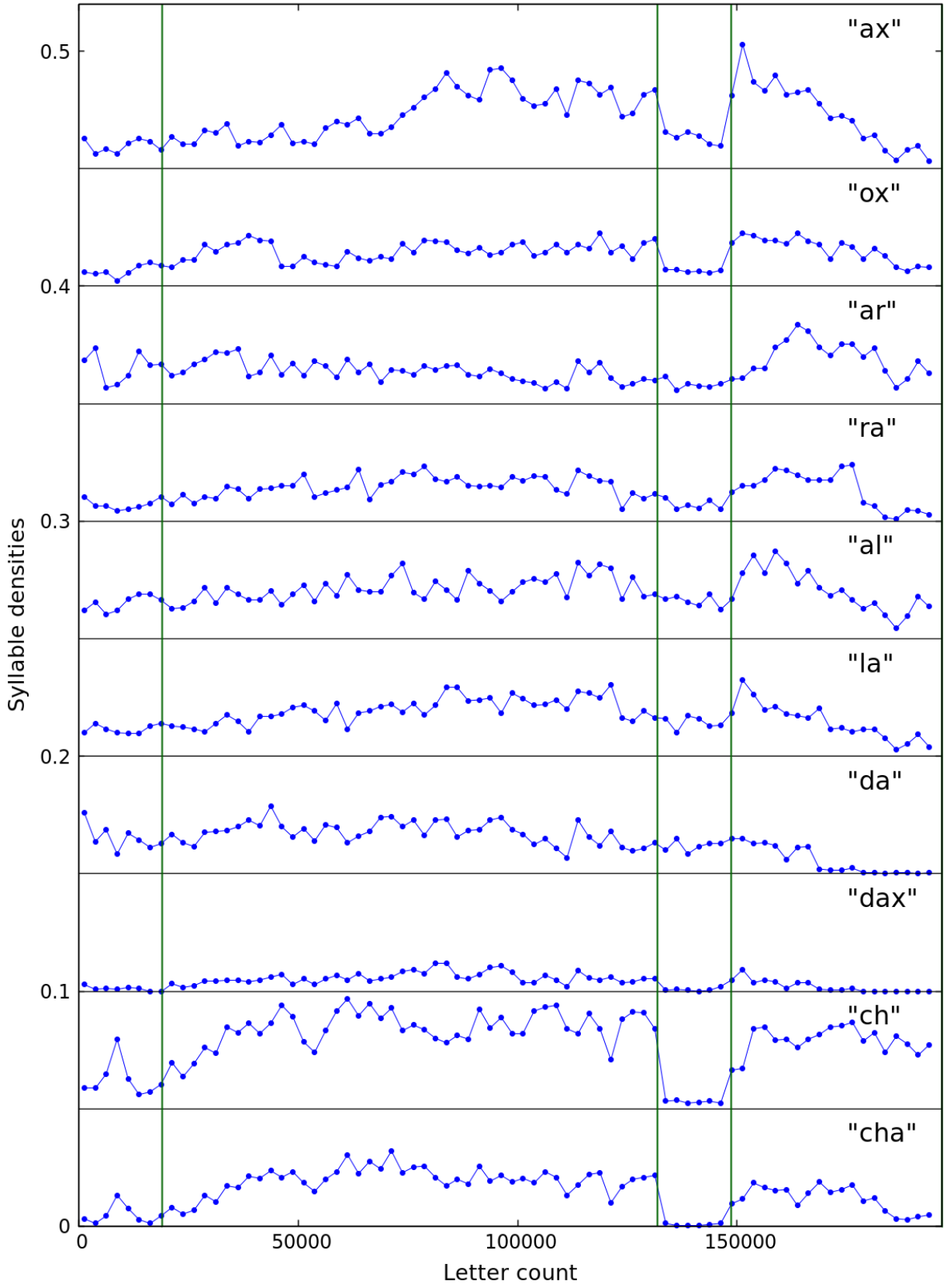


6. Letter and syllable densities (per letter) for John Dee's Liber Loagaeth tables [Dee_LL]. The dark green lines separate sectional units of the tables, and the plots are shifted vertically for better visibility. [Bin size = 2500 letters]









7. Concise, section-wise selected text samples from the currently proposed transcription of the Voynich text (based on Takahashi's original transliteration (https://www.voynich.com/pages/) and on a compact subset of my suggested polyphonic cipher key [Altrideicktus24-25]). The full text of this novel transcription can be found at https://www.voynichcode.org/Altrideicktus_transcription.

HERBAL1:

<f16v.P.1;H> PIRUM.AMIATUR.IPIALIS.IPICUS.EST.PCACMUS

<f16v.P.2;H> CONMIATUR.CUM.NUS.IANIS.VANINAMINIATUR.INORUS

<f16v.P.3;H> CONNIS.ACTUS.IAS.VAMUS.IS.NIS.NOINIM

<f16v.P.4;H> SIALIS.IMINIATUS.PINCAS.IAMALIS.SALIS

<f16v.P.5;H> CONMIS.ICAMUS.IATUR.IALIS.CONMIS.SAD

<f16v.P.6;H> SATUR.INATER.AMUS.INATER.IALIS.SALN

<f16v.P.7;H> PINAMINIS.ICAPIS.VAMIS.IPINITUS.SUS

<f16v.P.8;H> SAM.IALIS.CUM.SAM.IMINIS.VAMIATER.IATUR.INOTO

<f16v.P.9;H> SINUS.ANUM.ANUM.IALIS.IATUR.MINIATUR.MUS.IATUS

<f16v.P.10;H> VANIS.ICATUS.CONNIS.IFINIS.AMAN.MINIATUR.MINIS

ASTRO:

<f68v2.P.1;H> MICATUS.INMINICUS.PINCATUS.INAMINIS.CONNCATUS.
INTUS.INAM.CONMIS

<f68v2.P.2;H> SICAM.INCUS.SICETUS.VANCES.ININCES.SALIS.ACTUS.
INECMCUS.SATTUS

<f68v2.P.3;H> VAICES.ININCES.INNCES.EST.ATICUS.MINIS.INMCATUS.
VAMICATUS.SARIS

<f68v2.P.4;H> ANCES.INCAS.NCALIS.CONICEMUS.ANCATUS.INCUS.
VANCUS.IALIS.ICNATUS

<f68v2.P.5;H> SICAS.SCENCUS.ANCUS.IATUSANCAS.ICA.SATATER.OCATISRIS

BALNEO:

<f80v.P.1;H> PICETUS.SATPICTUS.VANECTUS.VAMITUS.VAMALIS.PICTUS.RARUM

<f80v.P.2;H> MINITUS.VAMITUS.ALINUN.AMALIS.IFINIS.VANUS.SAM.SATUS

<f80v.P.3;H> SICTUS.VATICTUS.VANUM.IMINIS.AMUM.INECNUS.VALIS

<f80v.P.4;H> VANITUS.VANATER.VANUN.ICTUS.VALIS.VALIS.INICMCATUS.VARUM

<f80v.P.5;H> ANECTUS.ICTUS.ALINECTUS.ONMTUS.VANUM.INFINIS.VAMAN.ALIS

<f80v.P.6;H> MICALIS.NITUS.PICALIS.NUN.INITUS.VANUM.AMCUS.VANITUS.ICTUS

<f80v.P.7;H> POTINALIS.MICUS.VANALIS.INITUS.VAMINCUS.SATUS.NICUS.SMOTPIS

MAP:

<f86v6.P.1;H> PICUS.PISATER.APATUR.PINIS.ICR.UM.APUS.ICTUS.AMITUTALIS.
ORALATUS.VAMITUN.VAPUS4

<f86v6.P.2;H> OIATUS.IALIS.ICUS.VAMITUS.NITUS.VAPIS.IPIS.VAPIS.VANUS.
ICTUS.VANALIS.ALRARIS

<f86v6.P.3;H> VATIS.ALINECTUS.ITULIS.ICTUS.IATUR.ATER.ARATUS.
VANITUS.ITULIS.ANATER.ITUS.AMUM

<f86v6.P.4;H> SINATUR.INTUS.INATUR.ALIS.UM.ALINECTUS.INTULIS.
AMCATUR.ISATER.ALNURICES.ALINATER.SATARIS

<f86v6.P.5;H> MATER.ARALIS.IALIS.ALINATER.SAM.ICATER.ATUR.
AMINCUS.VANATER.APICUS.MANNUS.VANATER

<f86v6.P.6;H> SAM.INCALIS.NICATER.ATUR.ICTUS.ORINECED.VAMAN.
ATUM.ALINIINATER.VANATER.ATER

<f86v6.P.7;H> VANUM.CONTICSATUR.ATUR.UM.ALIS.ATUR.ALINULIS.
ATUR.INITUS.VANULIS.SATER.ORICUS.ACTUS

RECIPES/TEXT ONLY:

<f113v.P.42;H> PALIS.NECO.ACTUS.VAECES.UM.ORUM.AMCALIS.PICTUS.
AMICES.SATUR.AMANCALIS.ALIS

<f113v.P.43;H> CONICALIS.NCES.ALNECES.ATUR.UM.AMUM.INUN.
ALIATER.ALCICTUS.VAN.UM.OS

<f113v.P.44;H> SAM.ICALIS.AMAN.ANATER.AMUM.ALIAM

<f113v.P.45;H> POTUM.ARALIS.INCATER.ANECCATUS.ALSATER.
ALNCES.APICTUS.VANITUS.AMA.ARARIS

<f113v.P.46;H> ALINUM.ICES.ALAN.ALIS.ICES

<f113v.P.47;H> POTUM.NINICALIS.ALNUM.MAL.INCUS.VAMAN.ATER.ANULIS.
INCUS.VAPICTUS.ALTUS

<f113v.P.48;H> CONICALIS.ICES.VALIS.ALINECTUS.VANUM.ICTUS.
NUN.VANECETUS.ALNUM.ANULIS.ACTUS

<f113v.P.49;H> CONINCUS.MCEO.AMECTUS.VANCES.AMUM.ALIUM.
ICANUN.ALNCES.ALMALIS.NECTUS