On Computability 1B

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Abstract

In this document we round off and finalize the investigation into the syntax and semantics of the Voynich manuscript (VMS)[1].
Our assumptions about the possible plaintext languages and the most probable substitutions of the prevalent VMS glyphs with plaintext letters are based on syntactical analyses and resulting statistics. Our approach to complement incomplete matchings is to use a heuristic, which we expect will lead us to groups of vords that can be placed into a specific context of meaning. Through this, we hope to obtain initial confirmation for our findings by completing short vords or groups of vords. However, we are aware that we cannot rely on any possible outcomes unless we find further verification through a linguistic and narrative scrutiny of longer text passages.
Please note - we use the term 'vord' to refer to words in the Voynich language, which we assume are one or many words from a plaintext language.

11   Matching complements on the folio 85v and 86r

We will continue our investigation by analysing the fold-out folio 85v and 86r of the VMS. This folio, often referred to as a cosmological folio, contains nine rosettes with many short words scattered throughout and around them. The middle rosette features two groups of vords (one with 12 and the other with 7 vords) arranged in a circular pattern around the center, as well as a few vords at the center of the rosette. Our goal is to complete these vords based on assumptions derived from our statistical analyses.

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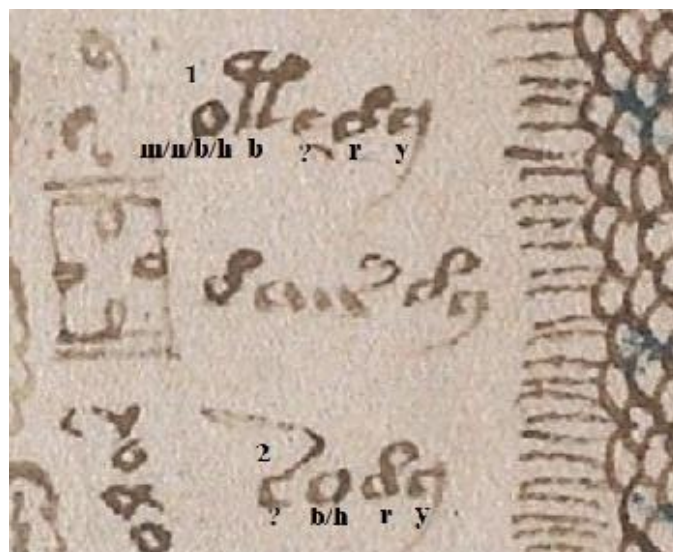
[1] see the document "Syntax of a substitution cipher" (On Computability 1A) for the basic syntactical analysis of the VMS

Based on the statistical choices, we can supplement the word (1) in the above image as:

אֵי 'ay {ah'ee} / רָאָה ra'ah {raw-aw'} / אָבֵי 'abeh {aw-beh'}
"which see/perceive the incomig"

or

אֵי 'ay {ah'ee} / רָאָה ra'ah {raw-aw'} / בָּאָה b@'ah {be-aw'}
"which see/perceive the longed"

Could this be a descriptive designation for the tribe of Reuben? The name "Reuben" is usually translated as "see, a son!" It's possible that the coder avoided a direct name to prevent the code from being too obvious. We're having trouble finding a supplement for vord (2) using 'r' as a substitution for '8', but a possible supplement could be:

YHWH / עָבַט abat {aw-bat'}
"YHWH gives or takes a pledge; causes to give a pledge"

This could be an accurate description for the Levi tribe, whose members were the designated priestly class. While the usage of '89' as an abbreviation for YHWH needs further confirmation, other tribes like Judah (3) or Ytsacharr/Yissakhar (4) could be named more directly (see below).
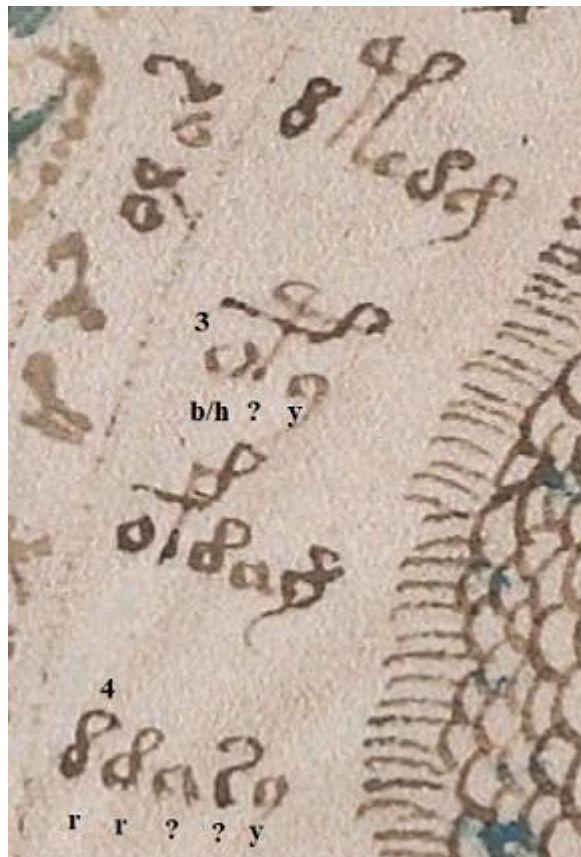
We will revisit these names later when we have more information about the surrounding glyphs. Similarly, we can attempt to supplement the vords located at the center of the rosette.
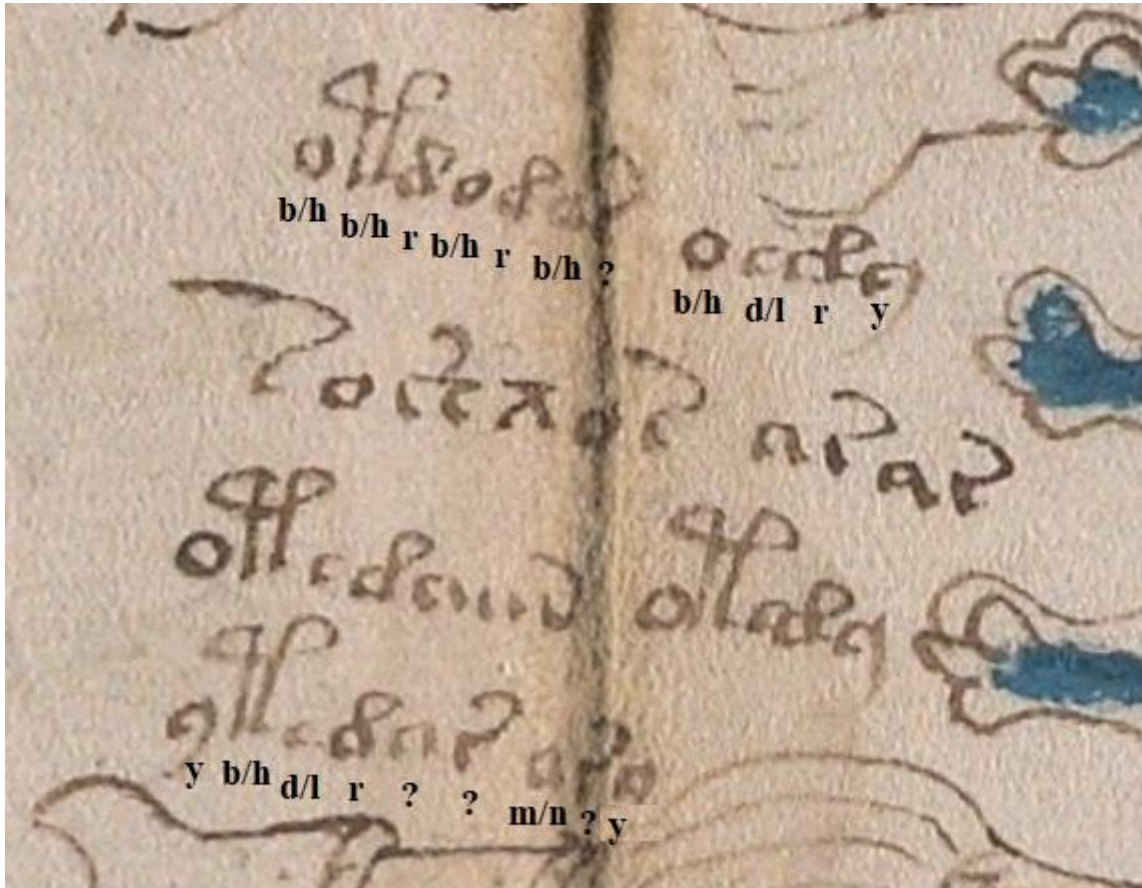
Interpreting '89' as an abbreviation for YHWH a good choice for the first line would be:

YHWH / אֱלָהּ 'elahh (Aramaic) {el-aw'}
"YHWH God (of Israel)"

and further:

טָב tab {tawb}; טוֹב towb {tobe} / רֵו rev {rave} / רְבַב rabab {raw-bab'}; רָבָה rabah {raw-baw'}
"good, right (ethical) or goodness (of God), appearance of greatness (manifold)"

The last line is consistent with the following interpretation:

יָעַז ya'az {yaw-az'} / עָם im {eem} / עַז az {az} / עֵקֶר eqer {ay'-ker} or גּוּר guwr {goor} /
לָבִיא labiy' {law-bee'}
"the strong (those being strong) together with the mighty, young (offspring) lion (of Judah)"

The lion of Judah is considered the symbol of the tribe of Judah and the protector of Israel and Jerusalem. It is also associated with the concept of the 'Second Coming'.

We realize that while some glyphs seem to always represent the same plaintext letter (such as **8** and **9**, provided we take abbreviations out of consideration), others can represent more than one letter (such as **o** and $\mathcal{H}$). Here, we need to differentiate between the dedication of one glyph to many plaintext letters and the dedication of one glyph to many transliteration letters. For instance, the Hebrew/Aramaic letter 'beth' (ב) represents two different phonemes: a 'b'

sound (/b/) (bet) and a 'v' sound (/v/) (vet), which are distinguished by a dot called a dagesh. In biblical 'ketiv', this difference would not occur, so the coder would use one glyph for both. We perform our statistical analysis based on the transliteration into Latin letters, so for us, this glyph would represent two or more different letters. Henceforth, we assume that a glyph representing 'beth' is a glyph of this kind, representing both v (vet ב) and b (bet בּ), and additionally w (waw ו).

Folio 57v will provide more insight into the glyph representation of 'beth'. This special folio contains the whole palette of glyphs, including many rare used glyphs or glyphs that have not been used elsewhere in the script. However, we will not provide a detailed analysis of every glyph as it goes beyond the scope of this document, which aims to demonstrate our approach of complementation rather than to claim to cover the entire glyph alphabet.

12   Supplementing vords on the folio 57v

Folio 57v is widely believed to be a 'technical' page, based on the observation of numerous isolated glyphs and the presence of a 4x17 circular text that lists the glyphs in the same order four times over.
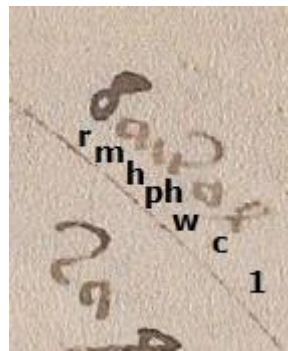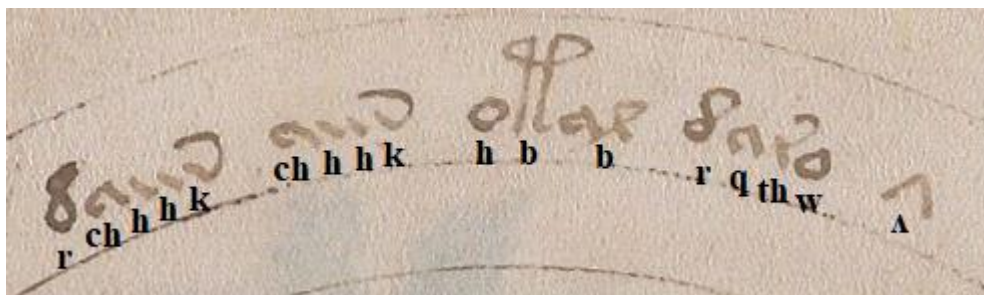

Above the circular text we can find a separate vord (1), which can be supplemented to:

סוֹף cowph {sofe} / הוּא huw' {hoo} / אָמַר 'amar {aw-mar'}

"conclusion that to speak/to spell"

Understanding 'that' here as a demonstrative pronoun, as in 'in that way' or 'so', we are drawn to investigate the inner circular text that starts with the rarely used glyph '∧'.
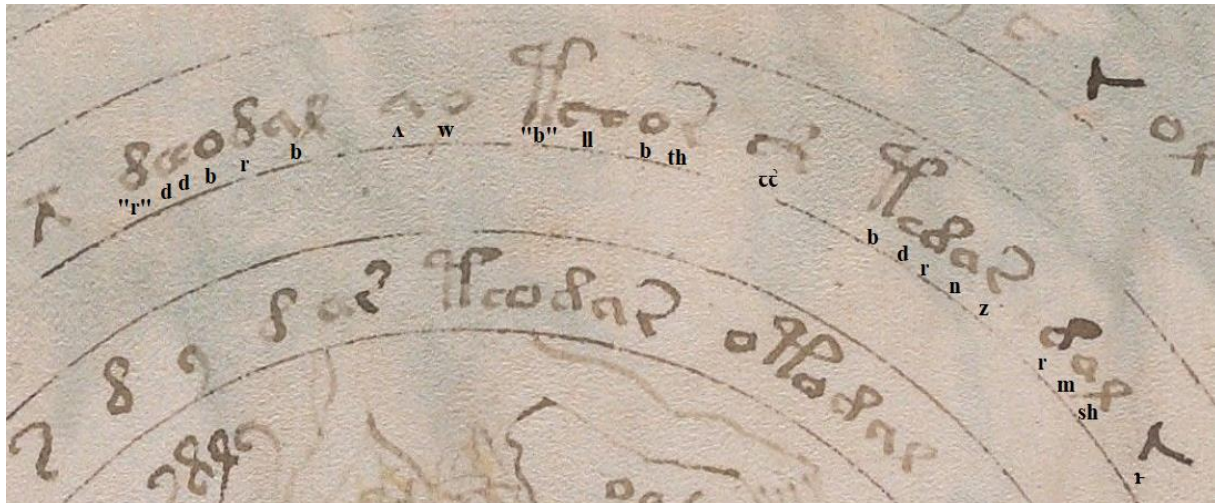

We supplement the vords to:

∧ wth qr' b bh kh hch khh chr

∧ אוֹת 'owth {oth} / קָרָא qara' {kaw-raw'} / בְּעָא b@'a' {beh-aw'} / עָבָה abah {aw-baw'}
כֹּה koh {ko} / הֵאָח heach {heh-awkh'} / כֵּהָה kehah {kay-haw'} / אַחַר 'achar {akh-ar'}

"the ∧-sign being called/being read aloud requests to be thick/fat
so 'aha' dulls the following part/subsequent part"

This sentence suggests using '∧' as 'a' (aleph א), which renders the subsequent phoneme unvoiced. Further investigations reveal that the following consonant in the transliterations is mostly 'r'. This 'r' is then nonvocal, and together with the preceding 'a' or 'o' it would probably sound like 'aah:' or 'ooh:'.


As next we examine the very rare glyph 'ϯ'. The following vords we supplement to:

ϯ shmr zn rd bw'

ϯ שָׁמַר shamar {shaw-mar'} / אָזַן 'azan {aw-zan'} (or אֹזֶן 'ozen {o'-zen}) / רָעַד ra'ad {raw-ad'}
(or רַעַד ra'ad {rah'-ad}) / בּוֹא bow' {bo}

"ϯ gives heed/watches for to listen/give ear to the trembling coming in (or to attain the trembling)"

The symbol 'ϯ' is then associated with listening carefully or giving ear to the trembling that follows. Therefore, the most likely interpretation of this sign is an exclamation mark, which almost certainly precedes the exclamatory sentence indicated by the following bold and singular glyphs on the place where it was used on folio 85v and 86r (see image below).
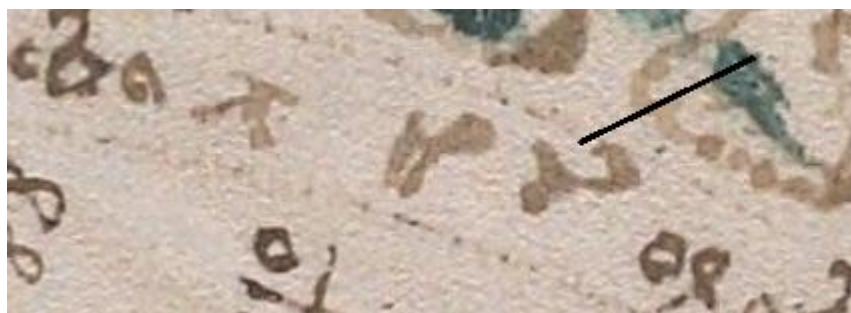
The next glyph features two connected 'c's with a curl above one:

<p style="text-align:center">c̈c th b ll' 'b'</p>

<p style="text-align:center">c̈c אֵת 'ath {awth} / עָב ab {awb} / עֵלָּא ella' {ale-law'} 'b'</p>

<p style="text-align:center">"c̈c sign landing above the 'b'"</p>

If we interpret '𝓗' as beth, vet or waw this sentence indicates another possibility for how these letters can be represented. The curl above a 'c' seems to change the typical meaning of this glyph to 'b'.
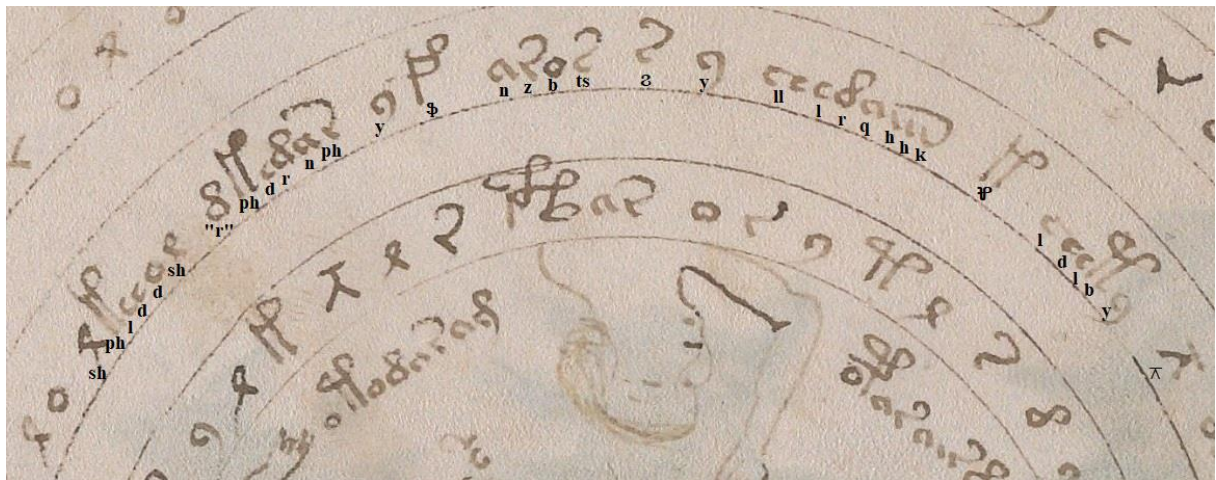
The further sentence states:

<p style="text-align:center">w ∧ br' bdd 'r'</p>

<p style="text-align:center">אוֹ 'ow {o} ∧ / ברא bara' {baw-raw'} / בָּדָד badad {baw-dawd'} 'r'</p>

<p style="text-align:center">"also ∧ creates/forms a separation (of) 'r'"</p>

'∧' seemingly also determines the syllable division like in אֲרֻבָּה *arubbah* {ar-oob-baw'}[2]

We supplement the passage beginning with '⊼' by adding the following glyph mapping:

<p style="text-align:center">⊼ ybl dl</p>

<p style="text-align:center">⊼ יבל yabal {yaw-bal'} / דַּל dal {dal}</p>

<p style="text-align:center">"⊼ being conducted/born low"</p>

And further:

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[2] an alternative way to pronounce '∧' would be then to produce an 'ah' sound combined with a non-rolling 'r' sound (ahr:)

<p style="text-align:center">ꟼ khh qr' l l l'</p>

כָּהָה ꟼ kahah {kaw-haw'} / קָרָא qara' {kaw-raw'} / אַל 'al {al} / אַל 'al {al} / לֹעַ loa' {lo'ah}

<p style="text-align:center">"ꟼ being faint to be called/read aloud not over throat"</p>

The last sentence suggests that 'ꟼ' represents a voiceless consonant, such as 's' (as in "sit"), 'sh' (as in "shoe"), 'f' (as in "fish"), 'th' (as in "thin") or 'ch' (as in "chat"). We can supplement the sentence with 'Ƨ' to:

<p style="text-align:center">y Ƨ tsb' zn</p>

אִי 'ay {ah'ee} Ƨ / צְבָא ts@ba' {tseb-aw'} / אָזַן 'azan {aw-zan'}

<p style="text-align:center">"where Ƨ is pleased/is inclined to be heard"</p>

So, this glyph appears to represent a voiced consonant (which we will assign to 't', as it is usually aspirated). The following sentences pertain to the handwriting and its execution:

<p style="text-align:center">ф y phn rdph 'r'</p>

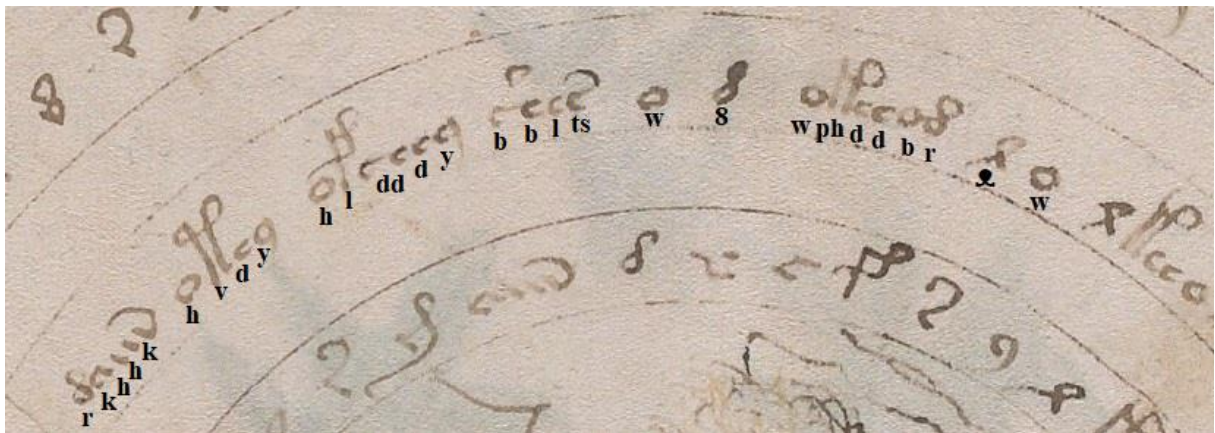אִי 'ay {ah'ee} / אֹפֶן 'ophen {o'-fen} / רָדַף radaph {raw-daf'} 'r' ф

<p style="text-align:center">"ф which (under) the circumstances/timely follows 'r'"</p>

<p style="text-align:center">shd dlph sh</p>

אֶשֶׁד 'eshed {eh'-shed} / דָּלַף dalaph {daw-laf'} / שָׁעַע sha'a' {shaw-ah'}

<p style="text-align:center">"the lower part/bottom leak be smeared over"</p>

And further (see next image):

<p style="text-align:center">w ☿ rbd d phw</p>

אוֹ 'ow {o} / ⬥ / רָבַד rabad {raw-bad'} / עַד ad {ad} / אֵפוֹ 'ephow {ay-fo'}

"and ⬥ bespread/deck even to (it) then"

The last three lines describe a requirement to build a roof above the small glyphs that follow. It is clear that the scribes occasionally followed this requirement, as seen on folios 103r and higher. If this rule was not followed on other folios, it could suggest that these were the earliest folios in the manuscript. Examples of how this rule was executed can be seen below e. g. on folios 106v and 115v:
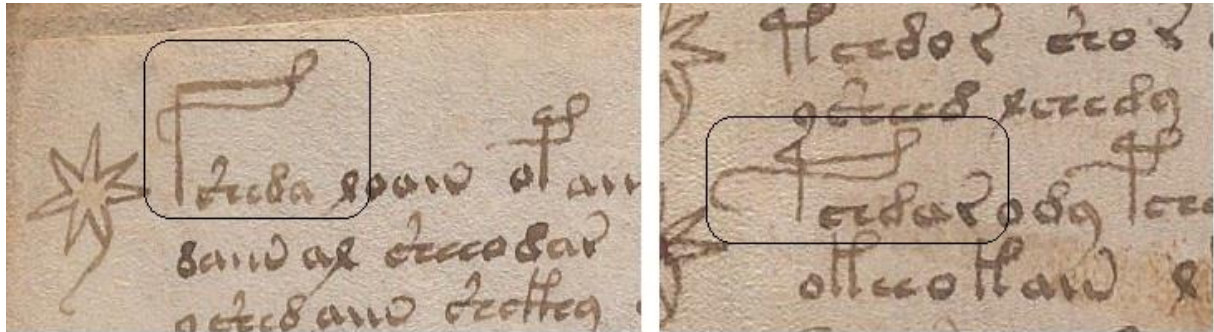
8 w tsl b bw'

8 אוֹ 'ow {o} / אָצַל 'atsal {aw-tsal'} / אָב 'ab {awb} / בּוֹא bow' {bo}

"8 rather withhold/reserve to be a head leading-in"

ydd dlh

יָדַד yadad {yaw-dad'} / דָּלָה dalah {daw-law'}

"loving the drawing advice"

yd vh

יָד yad {yawd} / עָוָה avah {aw-vaw'}

"to bent/bow down the hand"

kh hw' kr'

כֹּה koh {ko} / הוּא huw' {hoo} / כָּרַע kara' {kaw-rah'}

"so/in this manner to tilt it"

According to the above rule, '8' preferably shouldn't be used as the first letter of a vord. The last requirement addressed to the scribes leads to the intimate tilt shape of '8' in the VMS. As for the present, we only translate the following passage from the outer circular text[3]:

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[3] we will provide the complete translation of the folio 57v in a separate document
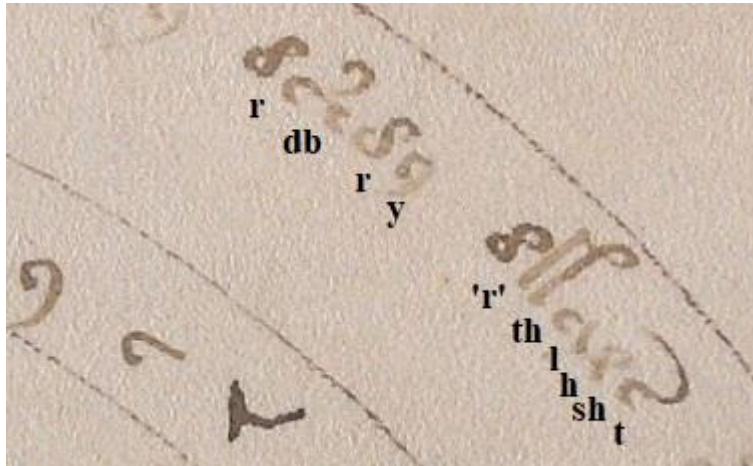
tsh' h' l' th 'r'

תֵּשַׁע tesha' {tay'-shah} / הֵא he' {hay} / לֹא lo' {lo} / אֵת 'eth {ayth} 'r'

"nine even as not near/together with 'r'(8)"

yr' b dr'

יָרֵא yare' {yaw-ray'} / אָב 'ab {awb} / דְּרָע d@ra' {der-aw'}

"honours Father's arm/power/might"

It confirms that '8₉' can stand as an abbreviation for YHWH. Building on these additional findings, we can now return to the names on the fold-out 85v and 86r.

13 Further complements

In our opinion, the code of the VMS, although apparently a substitution code, is in no way a simple one. It appears that alongside glyphs that can be exclusively mapped to one specific plaintext letter, such as '8' → ר (resh) and '9' → י (yodh) (provided we exclude the abbreviation '8₉' for YHWH), we can find groups of glyphs that can be mapped to groups of plaintext letters. One such group is the position-dependent glyphs:

which all map to ב (beth/vet) or ו (waw). Additionally, as suggested above, a 'c' in a connected version can transmute the meaning to ב (beth/vet) or ו (waw) when a curl is drawn above it or centrally above the connection line (then for both 'c's). This substitution into the letters ב (beth/vet) or ו (waw) appears to be the most complex among those non-trivial substitutions/mappings. However, we believe that there are further glyph groups with a position-dependent appearance.

From our perspective, the substitution rules are clear and uniform throughout the entire manuscript. The only conspicuous different code we can identify is on page 116v of the manuscript.

With the assumed mappings we can try to complement further vords. We identify following names inside the central rosette on folio 85v and 86r:

Tshb (1)

תִּשְׁבֵּ Tishbe {tish-be'}

"Tishbe or Tishbi or Tesheb"

Tishbe (Hazor) – tribe described by the name of a biblical city on its territory: tribe Naphtali

Gdy (2)

גָּדִי Gadiy {gaw-dee'}

"the Gadites"

Tribe Gad

l brth ydh (3)

אֶל בְּרִית El-Berothiy {bay-ro-thee'} / יהודה Y@huwdah {ye-hoo-daw'}

"El Berith / El Beeroth Judah"

Jews from Beeroth which covenanted partly to God Baal (the covenants): tribe Benjamin

ybl t (4)

יָבָל yabal {yaw-bawl'} / אַט 'at {at}

"flowing stream of water/watercourse"

A tribe known for its shipping and trade skills. Their territory was situated between the Mediterranean Sea and the Sea of Galilee: tribe Zebulon
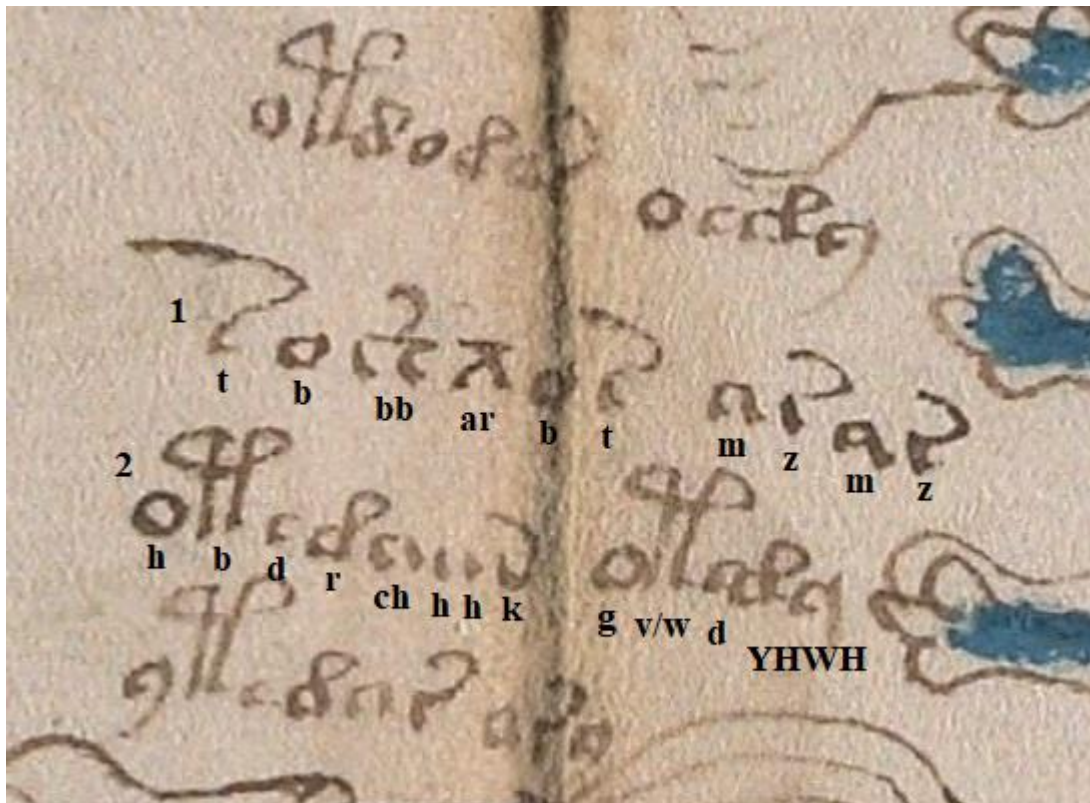
Shrr (5)

אָשֵׁר 'Asher {aw-share'}

"Asher"

Tribe Asher

The scribes opted for a more descriptive notation and deliberately included minor misspellings in the names to obscure their meaning. It seems they were rightfully concerned that short proper names could become a target for decoding attempts.

Further vords from the central rosette can be complemented as follows:

zmzm (1)

זַמְזֹם Zamzom {zam-zome'}

Zamzummim who by others were called Rephaim, the ancient giants sometimes considered as the forefathers of the Israelites.

tb arbbh b t

טָב tab {tawb} / אֲרֻבָּה 'arubbah {ar-oob-baw'} / עָב ab {awb} / עֵטָא eta' {ay-taw '}

"good, right (ethical) windows (of heaven); the dark cloud's counsel"

The "windows of heaven" as referred to in Genesis 7:11 "on the same day were all the fountains of the great deep broken up, and the windows of heaven were opened" and the dark cloud referred to in Kings 8:12 "then Solomon said, 'The LORD has said that he would dwell in a dark cloud'".

YHWH dvg

דַּיָּג davag {da-vawg'}

"YHWH's fisherman/fisher"

khh chr d bh

כָּהָה kahah {kaw-haw'} / אָחַר 'achar {aw-khar'} / עַד ad {ad} / בָּאָה b@'ah {be-aw'}

"further/hind part alleviated everlasting/perpetual entrance"

Described here is an alleviated entrance for saints and those who came immediate into heaven.

14 Conclusion

After conducting a syntactical analysis of Voynichese together with a statistical evaluation, we were able to extract possible glyph mappings for the most frequently used glyphs into plaintext letters. Using this initial mapping, we attempted to complement vords based on the choice of glyphs and attained so to meaningful names and statements. We found that some glyphs could be substituted with the same plaintext letter consistently, resulting in a simple substitution, while others required a more complex rule for substitution. To perform this substitution leading to reasonable words, we used a transliteration convention commonly found in biblical Hebrew-Aramaic dictionaries[4].

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[4] mainly Hebrew Dictionary of the Old Testament Online Bible with Strong's Exhaustive Concordance, Brown Driver Briggs Lexicon, Etymology, Translations Definitions Meanings & Key Word Studies - Lexiconcordance.com

However, we noted a few differences between the Voynichese representation and the transliteration, such as the absence of the letter 'w' in some short words like שׁוֹא show' {sho}, קוֹא qow' {ko}, צוֹא tsow' {tso}. These words were surprisingly pronounced in the Voynichese way with a closing vowel instead of 'w' as the transliteration would suggest. Another difference occurred at the end of words with the ending Voynichese glyph 'o', which was transliterated as 'h' but pronounced mostly in the Voynichese way as 'w', such as in עָבָה abah {aw-baw'}.

Overall, our substitution process yielded meaningful complementation results, indicating that our approach has promise for further analysis and translation. The small number of differences to the common transliterations of Aramaic and the extremely rare usage of possible abbreviations suggest a remarkable degree of coincidence between the Aramaic 'ketiv' plaintext and the Voynichese representation. In words where this is not the case, such as with short proper names, we can presume an additional intention to conceal the meaning.

Our analysis primarily focused on folio 57v, which provides a technical description of the code, handwriting, and pronunciation of the plaintext words, rather than a coded autography. In a separate document, we will provide a translation of the remaining passages on this folio.