



Cheshire, G. (2019). The Language and Writing System of MS408 (Voynich) Explained. *Romance Studies*, 37(1), 30-67.
<https://doi.org/10.1080/02639904.2019.1599566>

Peer reviewed version

License (if available):
Other

Link to published version (if available):
[10.1080/02639904.2019.1599566](https://doi.org/10.1080/02639904.2019.1599566)

[Link to publication record in Explore Bristol Research](#)
PDF-document

This is the accepted author manuscript (AAM). The final published version (version of record) is available online via Taylor & Francis at <https://doi.org/10.1080/02639904.2019.1599566> . Please refer to any applicable terms of use of the publisher.

University of Bristol - Explore Bristol Research

General rights

This document is made available in accordance with publisher policies. Please cite only the published version using the reference above. Full terms of use are available:
<http://www.bristol.ac.uk/red/research-policy/pure/user-guides/ebr-terms/>

Author: Dr Gerard Cheshire.

Title:

The Language and Writing System of MS408 (Voynich) Explained.

Abstract:

Manuscript MS408 (Voynich) is unusual in a number of respects: 1. It uses an extinct language. 2. Its alphabet uses a number of unfamiliar symbols alongside more familiar symbols. 3. It includes no dedicated punctuation marks. 4. Some of the letters have symbol variants to indicate punctuation. 5. Some of the symbol variants indicate phonetic accents. 6. All of the letters are in lowercase. 7. There are no double-consonants. 8. It includes diphthongs, triphthongs, quadriphthongs and even quintiphthongs for the abbreviation of phonetic components. 9. It includes some words and abbreviations in Latin.

As a result, identifying the language and solving the writing system required some ingenuity and lateral thinking, but both were duly revealed. The writing system is rather more singular and less intuitive than modern systems, which may explain why it failed to become culturally ubiquitous and ultimately became obsolete. On the other hand, a significant vestige of the language has survived into the modern era, because its lexicon has been sequestered into the many modern languages of Mediterranean Europe. Here, the language and writing system are explained, so that other scholars can explore the manuscript for its linguistic and informative content.

Introduction.

The manuscript acquired its catalogue code MS408 when it was filed at Beinecke Library, Yale University (Archive, 2018). It is also known as the Voynich Manuscript in some circles, as it was purchased in 1912, from Villa Mondragone, Rome, by a Polish antiquarian book dealer, named Wilfred Voynich (1865-1930). The manuscript was first revealed to the public in 1915 and so began to gain attention and capture imaginations. Wilfred subsequently relocated from Europe to New York and, following his death, the manuscript's custodian became his wife Ethel Voynich (1864-1960). Following her death the manuscript found its way into the hands of another dealer named Hans P. Kraus (1907-88), who eventually donated the manuscript to the library in 1969.

Over the following century the manuscript cemented an impenetrable reputation amongst scholars, entirely based on inability to decipher the writing system and so read the text. As a result, all manner of imagined ideas arose about its authorship, the nature of the codex and the meaning of its contents (Kennedy & Churchill, 2006). These include theories involving famous historical figures (Strong, 1945: Tucker &

Janick, 2018), magic and alchemy, secret codes, political and religious conspiracies, hoaxing and alien messages (Rugg, 2004; Schinner, 2007). Such flights of fancy even led the US National Securities Agency to have a go in collaboration with German code-breaker Erich Hüttenhain (Tordella, 1970), based on the earlier work of British code-breaker John Tiltman. They had the amusing notion that it might contain communist propaganda. Ultimately, a consensus emerged: that the manuscript was either impossible to solve or else written in gibberish, as an elaborate practical joke (Barlow, 1986). One scholar even produced a transcription of the manuscript that is entirely incorrect (Reeds, 1995). There have also been conferences held, with many scholars attempting to solve the writing system by concerted effort (Schmeh, 2013).

Past scholarly attempts at solving the writing system are far too numerous to mention individually, but none was successful in any way, because every attempt simply used the wrong approach (Brumbaugh, 1975; Levitov, 1987; Bax, 2014; Herman, 2017; Ulyanenko, 2018). Even algorithmic data mining for patterns with computers resulted in abject failure, because the computer scientists lacked a vital piece of information for their programming (Stallings, 1998; Landini, 2001; Montemurro & Zanette, 2013; Amancio et al, 2013; Balandin & Averyanov, 2014).

Unbeknown to the scholarly community, the manuscript was written in an extinct and hitherto unrecorded language as well as using an unknown writing system and with no punctuation marks, thereby making the problem triply difficult to solve. Furthermore, some of the manuscript text uses standard Latin phrasing and abbreviations, only adding a fourth dimension of difficulty.

Thus, without knowledge of this information it was quite impossible for anyone to even begin to fathom the meaning of the symbols and apprehend the words, the phrases and the sentences they spelled out. When a connection between the lost language and the writing system was explored, in May 2017, the solution duly emerged by elucidating both the language and the writing system in unison: i.e. both revealed themselves in the process, rather like patiently unravelling a tangle of chains. Thus, the solution was found by employing an innovative and independent technique of thought experiment.

Perhaps inevitably, and certainly ironically, the manuscript has revealed itself to be far more interesting and informative than imagined by the aforementioned scholars. It was written by an entirely unknown and ordinary figure from the past, and without any deliberate code but a language and writing system that were in normal and everyday use for their time and place, yet the linguistic and historic information it holds are of unparalleled importance. So it turns out that the manuscript is remarkable after all, but in academic ways rather than sensationalistic and fantastical ways.

Translations reveal that the manuscript is a compendium of information on herbal remedies, therapeutic bathing and astrological readings concerning matters of the female mind, of the body, of reproduction, of parenting and of the heart in accordance with the Catholic and Roman pagan religious beliefs of Mediterranean Europeans during the late Medieval period (Cheshire, 2017a; Cheshire, 2017b). More specifically, the manuscript was compiled by a Dominican nun as a source of reference for the female royal court to which her monastery was affiliated.

Within the manuscript there is a foldout pictorial map that provides the necessary information to date and locate the origin of the manuscript. It tells the adventurous, and rather inspiring, story of a rescue mission, by ship, to save the victims of a volcanic eruption in the Tyrrhenian Sea that began on the evening of the 4th February 1444 (Wilson, 1810; Ward, 1971). The manuscript originates from Castello Aragonese, an island castle and citadel off Ischia, and was compiled for Maria of Castile, Queen of Aragon, (1401-58) who led the rescue mission as regent during the absence of her husband, King Alfonso V of Aragon (1396-1458) who was otherwise occupied, having only recently conquered and then taken control of Naples in February 1443. Incidentally, Maria was great-aunt to Catherine of Aragon (1485-1536), first wife of King Henry VIII (1491-1547) and mother of Queen Mary Tudor (1516-58).

The island of Ischia is historically famous for its hot volcanic spas, which exist to this day. The manuscript has many images of naked women bathing in them, both recreationally and therapeutically. There are also images of Queen Maria and her court conducting trade negotiations whilst bathing. Clearly the spa lifestyle was highly regarded as a form of physical cleansing and spiritual communion, as well as a general means of relaxation and leisure. In many respects it would have been preferable to living in nearby Naples, which was the most important and cosmopolitan of cities in the Mediterranean at the time, but was still potentially dangerous for the spouse of an invading king. For example, in 1448 the barons of Naples launched a failed rebellion against Alfonso to reclaim their city.

The manuscript velum has been carbon dated to 1404-38 (Reddy & Knight, 2011), indicating that the velum used for the manuscript was already a few years old when used. It may also be the case that some of the manuscript was written and illustrated before the map was created c. 1444-45. By that period the language of neighbouring Naples was already well on its way to becoming early Italian, and the writing system was early Italic. So the language and writing system of Ischia were evidently localized and anachronistic due to the sociocultural, political and religious isolation of island life.

The Language.

The manuscript uses a language that arose from a blend of spoken Latin, or Vulgar Latin, and other languages across the Mediterranean during the early Medieval period following the collapse of the Roman Empire and subsequently evolved into the many Romance languages, including Italian. For that reason it is known as proto-Romance (prototype-Romance). It had long been hypothesized as the logical link between spoken Latin and the Romance languages, but no documented evidence had ever been found before (Hall, 1950; Hall, 1983; Steriade, 1988). On the other hand, the writing system of the manuscript was evidently unique to Ischia, as it has insufficient similarity with Italics to be described as proto-Italic. The vowel symbols are similar but the consonant symbols are dissimilar.

Queen Maria and King Alfonso were raised and educated in Castile, Spain and would have been familiar with the separate languages and writing systems of their homeland, of Ischia and of Naples, which were all linguistically related, but distinctly different too. They were also well versed in Latin, as it was the written language of royalty across Europe. As monarchs of the Crown of Aragon, their kingdom

extended from the Iberian peninsula and southernmost France in the west, to the Italian peninsula in the east, with many islands in between, including the Balearics, Corsica, Sardinia, the Phlegreans, the Aeolians and Sicily. Their kingdom would therefore have encompassed numerous early Romance language variants due to the many peoples under their rule, and with varying levels of linguistic meme flow between populations. In truth, proto-Romance would always have been a spectrum of language variants across the entire Mediterranean, always in flux and evolving at different rates, depending on geographic contexts. By the 15th century, some variants had evolved dynamically whilst others had remained in relative evolutionary stasis, which is why we see the difference between the languages of Ischia and Naples. Even though they were only a few miles apart physically, their linguistic distance had become marked by the difference in their levels of contact and interaction with the outside world: Ischia had only low passing traffic whilst Naples was the hub of activity for traders, slavers, travellers, invaders and economic migrants.

The Writing System.

The alphabet of manuscript MS408 runs from a to z, just as our modern Italic alphabet does, but a number of the symbols are unfamiliar, either because they have different graphic origins or because they are linear variants to indicate particular uses and phonetic accents. Also, a few of the familiar modern letter symbols are absent from the manuscript alphabet, either because they were silent in speech or because their pronunciation had overlap with other letter symbols that are used in their place. In addition, there are various combined letter symbols – diphthongs, triphthongs and so on – used to represent specific phonetic sounds or to abbreviate frequently used phonetic components. Furthermore, there are instances where Latin stock-phrases are used and abbreviated by initial letters, because they were familiar to the contemporaneous reader. Incidentally, it was also standard practice to write with single consonants during the Medieval as a vestige of Vulgar Latin. Double consonants returned with the Renaissance when more sophisticated linguistic nuances became desirable.

Thus, the writing system of the manuscript can be apprehended once the grammatical rules are understood. Like all natural writing systems, it evolved by cultural selection and was, therefore, designed by the process of social use to be linguistically economical and efficient. Despite this, it had a number of flaws that prevented it from evolving into a popular form.

A series of tables is shown below, listing and describing the key symbols used for the writing system of manuscript MS408. In addition to the alphabet symbols, a number of combined symbols is shown and explained. The manuscript uses only lowercase letters and there are no punctuation marks either, so punctuation is indicated by the use of symbol variants and spacing.


| |
|--|
| Voynich symbol:  |
| Symbol name: trapped a |
| Corresponds with the modern letter <i>a</i> , but this form is typically used between other letters in the same word (- <i>a</i> -). If the <i>a</i> falls at the start or end of a word, or it is a single-letter word, then the Voynich symbol <i>free a</i> is often used instead. It can be confused with the Voynich <i>letter o</i> , but it is calligraphically begun and completed lower right, rather than above. |

Fig. 1.


| |
|---|
| Voynich symbol:  |
| Symbol name: free a |
| Corresponds with the modern letter <i>a</i> , but this form is typically used at the start or end of a word (<i>a</i> -, - <i>a</i>), or as a single-letter word (<i>a</i>). It looks similar to the Voynich <i>letter d</i> , but it is less angular and has a curved tail, instead of straight. It is also similar to the modern letter <i>g</i> , but that particular phoneme is absent, or silent, in the manuscript. |

Fig. 2.

Figures 1 & 2 show the two variants of the letter ‘a’ used in the manuscript. The variant described as ‘trapped a’ is usually seen when used between other letters comprising the same word. The variant described as ‘free a’ is usually seen when used at the start or end of a word, or as a single-letter word ‘a’. It is also used within words when following the letter ‘p’. This duality facilitates a rudimentary form of punctuation as conjoined, or portmanteau, phrases can be visually divided into their component words.


| |
|--|
| Voynich symbol:  |
| Symbol name: component ais |
| This symbol is used as the suffix component for many words, combining the <i>trapped a</i> , the <i>letter i</i> and the <i>sitting s</i> (- <i>ais</i>). Where the three-letter word is intended (<i>ais</i>) the <i>free a</i> rule is broken, as the <i>trapped a</i> is used instead, due to the calligraphic habit. When the <i>trapped a</i> is absent the two-letter suffix - <i>is</i> results. |

Fig. 3.


| |
|---|
| Voynich symbol:  |
| Symbol name: component aus |
| This symbol is used as the suffix component for many words, combining the <i>trapped a</i> , the <i>letter u</i> and the <i>sitting s</i> . Where the three-letter word is intended (aus) the <i>free a</i> rule is broken, as the <i>trapped a</i> is used instead, due to the calligraphic habit. When the <i>trapped a</i> is absent the two-letter suffix <i>-us</i> results. |

Fig. 4.

Figures 3 & 4 show two frequently used phonetic components from the manuscript, 'ais' and 'aus'. They usually form the endings of words, but they are sometimes used as standalone three-letter words, in which case they break the 'trapped a' rule. This is simply because it was calligraphically convenient for the pen nib to remain on the page in one flowing action.


| |
|---|
| Voynich symbol:  |
| Symbol name: diphthong æ |
| Corresponds with the modern letter pairing <i>æ</i> , but has also transformed into the singular <i>a</i> or <i>e</i> in some modern words. In a few instances <i>æ</i> persists in modern words. Many examples in the manuscript show the crest detached from the body of the symbol, so that it appears to be a <i>long e</i> with a mark or loop floating above. |

Fig. 5.

Figure 5 shows the diphthong 'æ', which was once commonplace in Latin derived words and is seen frequently in the manuscript. It is sometimes known by the name *æsc* (pronounced ash). It has often become 'ae', 'a' or 'e' in modern word forms in approximation of its original phonetic sound. The manuscript symbol combines the 'free a' with the 'long e' to create the diphthong.


| |
|--|
| Voynich symbol:  |
| Symbol name: letter d |
| Corresponds with the modern letter <i>d</i> . In the manuscript it is typically used to prefix words (<i>d-</i>), rather than being incorporated within words. It can resemble the Voynich <i>free a</i> , but it comprises three straight lines, rather than having curvature. It is nearly always followed by the <i>letter o</i> (<i>do-</i>). It derives from the Greek <i>delta</i> (<i>d</i>) and the Phoenician <i>daleth</i> (<i>d</i>) symbols: Δ ◀ |

Fig. 6.

Figure 6 shows the letter ‘d’ from the manuscript. It is derived from the Greek delta triangle, which is why it comprises three straight lines, making it distinct from the ‘free a’ symbol, which has a similar form but uses curves instead. It is used to begin many words in the manuscript.


| |
|---|
| Voynich symbol:  |
| Symbol name: short e |
| Corresponds with the modern letter <i>e</i> . Used frequently in the manuscript, but is almost indistinguishable from the Voynich <i>letter i</i> . The reason seems to be that the phonemes had become so similar in the spoken language that their representation and distinction in writing had often become rather vague. Pairing combinations <i>e'e</i> , <i>ei</i> , <i>ie</i> , <i>ii</i> are also difficult to separate for this reason. |

Fig. 7.


| |
|--|
| Voynich symbol:  |
| Symbol name: double short e |
| Corresponds with doubling of the modern <i>e</i> , with intonation (<i>e'e</i>). Conjoined at the bottom, whereas the <i>long e</i> (<i>ee</i>) is conjoined by a bar at the top. Often difficult to separate visually from pairing combination <i>ei</i> , <i>ie</i> , <i>ii</i> . Knowledge of vocabulary and context would have meant that the contemporaneous reader was able to understand intention in the author. |

Fig. 8.


| |
|--|
| Voynich symbol:  |
| Symbol name: long e |
| Corresponds with the modern double <i>e</i> (<i>ee</i>). Separated from <i>e'e</i> , <i>ei</i> , <i>ie</i> , <i>ii</i> , by the conjoining crossbar above. Used frequently in the manuscript, both as a separate symbol and as a framing component of various triphthongs and quadraphthongs (<i>e-e</i> , <i>e--e</i>). Can be confused with <i>diphthong æ</i> , when not clearly written or deteriorated. |

Fig. 9.

Figures 7, 8 & 9 show three variants of the letter ‘e’ used in the manuscript. They are used to denote phonetic differences that roughly correspond with the use of the single and double ‘e’ in modern language, and with the accented form ‘é’ in modern language.


| |
|---|
| <p>Voynich symbols: </p> |
| <p>Symbol names: letter i</p> |
| <p>Corresponds with modern letter <i>i</i>. Sometimes doubled (<i>ii</i>) to extend the sound. Used frequently in the manuscript, although the Voynich letters <i>e</i> and <i>i</i>, and the combinations <i>ii</i>, <i>ei</i>, <i>ie</i>, <i>e'e</i>, can result in some confusion. Vocabulary and context would have informed the reader as to the author's intention. The <i>letter i</i> symbol sometimes leans backwards instead of forwards.</p> |

Fig 10.

Figure 10 shows the letter ‘i’ which is akin to the ‘short e’ in the manuscript, as it denotes a very similar phonetic sound. It is often rather difficult to tell them apart in the manuscript, and therefore requires educated judgement.


| |
|--|
| <p>Voynich symbol: </p> |
| <p>Symbol name: letter l</p> |
| <p>Corresponds with modern letter <i>l</i>. Identifiable by having both legs reaching the ground, and by having only one loop, top right, while the <i>letter m</i> has two loops. It is only used singly, as double consonants were abandoned when Classical Latin evolved into Vulgar Latin, and only reintroduced following the Mediaeval, as an aid to pronunciation, along with punctuation. Shares model with <i>m</i>, <i>p</i>, <i>qu</i>.</p> |

Fig. 11.


| |
|--|
| <p>Voynich symbol: </p> |
| <p>Symbol name: letter m</p> |
| <p>Corresponds with the modern letter <i>m</i>. Identifiable by having both legs reaching the ground and by having two loops, while the <i>letter l</i> has only one loop. It is only used singly as double consonants were abandoned when Classical Latin evolved into Vulgar Latin, and only reintroduced following the Mediaeval as an aid to pronunciation, along with punctuation. Shares model with <i>l</i>, <i>p</i>, <i>qu</i>.</p> |

Fig. 12.

Figures 11 & 12 show the letters ‘l’ and ‘m’. They are very similar, so require careful identification. Both have two legs reaching the ground, but the symbol for ‘l’ has just one loop at the top (right), while the symbol for letter ‘m’ has two loops at the top (left and right).


| |
|--|
| Voynich symbol:  |
| Symbol name: triphthong ele |
| Corresponds with modern <i>e-l-e</i> . Used frequently in the manuscript, either as a standalone word, or as part of a phrase. Sometimes the phrase has since become a portmanteau word. Also, can mean both <i>ele</i> and <i>elle</i> in modern language, since the reintroduction of double consonants following the Mediaeval. |

Fig. 13.


| |
|---|
| Voynich symbol:  |
| Symbol name: triphthong eme |
| Corresponds with the modern <i>e-m-e</i> . Used frequently in the manuscript, as a standalone word and part of a phrase. Sometimes the phrase has since become a portmanteau word. Can mean both <i>eme</i> and <i>emme</i> in modern language, due to the reintroduction of double consonants following the Mediaeval, as Vulgar Latin became proto-Romance. |

Fig. 14.

Figures 13 and 14 show the letters ‘l’ and ‘m’ in combination with the ‘long e’ to create the triphthongs ‘ele’ and ‘eme’ respectively. Both are used as phonetic components and as standalone three-letter words throughout the manuscript. It is important to identify the consonants carefully to distinguish between the two.




| |
|---|
| Voynich symbol:  |
| Symbol name: letter n |
| Corresponds with the modern letter <i>n</i> . Used frequently, but only singly, as with other consonants. Can be confused with the Voynich letter <i>r</i> , but has a closed base, much like the numeral 8. It was modelled on the Arabic <i>nuun</i> symbol:  (<i>n</i>). In the modern Osmanya (Somali) and Kaddare conversion alphabets the letter <i>n</i> is modeled on the <i>nuun</i> in much the same linear way:  |

Fig. 15.

Figure 15 shows the letter ‘n’ from the manuscript. It is an unfamiliar symbol to the Latin eye, as it has North African origins in the *nuun* symbol. The Arabic influence on the Romance languages is often neglected due to the Eurocentric historic view of linguistics. In reality, the Mediterranean was a culturally diverse environment during the Medieval period.


| |
|--|
| <div>Voynich symbol:</div> <div>  </div> |
| <div>Symbol name:</div> <div>letter o</div> |
| <div>Corresponds with the modern letter o. Used frequently in the manuscript, often in combination with the other vowels a, æ, e, i, u, and occasionally as a double o (oo). Can be confused with the Voynich letter a, but is calligraphically begun and completed at the top, rather than at the bottom right-hand side.</div> |

Fig. 16.

Figure 16 shows the letter ‘o’ which is a familiar Latin symbol. It simply imitates the shape of the mouth when the phonetic sound is made.


| |
|---|
| <div>Voynich symbol:</div> <div>  </div> |
| <div>Symbol name:</div> <div>letter p</div> |
| <div>Corresponds with the modern letter p. Used frequently in the manuscript and identified by crossed legs and two loops, top left and top right. Only used singly, as double consonants were abandoned when Classical Latin evolved into Vulgar Latin. Sometimes extended left or right (as shown) to indicate possession of other letters in a word. May be silent: pt-, ps-, pn-. Shares model with l, m, qu.</div> |

Fig. 17.


| |
|---|
| <div>Voynich symbol:</div> <div>  </div> |
| <div>Symbol name:</div> <div>diphthong qu</div> |
| <div>Corresponds with the phoneme combining modern letters q and u (pronounced ‘ku’, ‘kw’ or ‘ky’). Used frequently in the manuscript and identifiable by having crossed legs and only one loop, while letter p has two loops. Unusual in combining two modern letters as one, rather than being presented as a diphthong. Sometimes extended (as shown) to indicate possession. Shares model with l, m, p.</div> |

Fig. 18.

Figures 17 & 18 show the letter ‘p’ and the phoneme ‘qu’. The symbols are very similar, so require careful identification. They both have a single leg reaching the ground, but the symbol for ‘p’ has two loops at the top (left and right), while the symbol for ‘qu’ has just one loop at the top (right).


| |
|--|
| <div>Voynich symbol:</div>  |
| <div>Symbol name:</div> <div><i>triphthong epe</i></div> |
| <div>Corresponds with modern <i>e-p-e</i>. Used frequently in the manuscript as a standalone word or as part of a phrase. Sometimes the phrase has since become a portmanteau word in modern language. Can mean both <i>epe</i> and <i>eppe</i>, as double consonants were reintroduced following the Mediaeval. Can be visually confused with <i>eque</i> without due care and attention.</div> |

Fig. 19.


| |
|---|
| <div>Voynich symbol:</div>  |
| <div>Symbol name:</div> <div><i>triphthong eque</i></div> |
| <div>Corresponds with the modern <i>e-qu-e</i>. Used fairly frequently in the manuscript, as a standalone word or as part of a phrase. Sometimes the phrase has since become a portmanteau word in modern language. Can be visually confused with <i>epe</i> and <i>ele</i> without due care and attention. Described as a triphthong rather than a quadraphthong, as <i>qu</i> is a single symbol.</div> |

Fig. 20.

Figures 19 & 20 show the symbols for ‘p’ and ‘qu’ in combination with the ‘long e’ to form the phonetic components ‘epe’ and ‘eque’, which are both used frequently throughout the manuscript. It is important to identify the consonants carefully to distinguish between the two. The phoneme ‘p’ also has overlap with the phoneme ‘b’, which is why there is no letter ‘b’ in the manuscript alphabet.

In the manuscript, the symbols for *l*, *m*, *p* and *qu* are all based on the same linear calligraphic model, because the proto-Romance language happened to include words whereby it was convenient and useful to frame those symbols with vowels – usually the *long e* (*e-e*): thus we have the standalone/component words *ele* (*elle*), *eme* (*emme*), *epe* (*eppe*) and *eque*, which are variously described as triphthongs and quadriphthongs.

Furthermore, this shared linear calligraphic model for *l*, *m*, *p* and *qu* is designed to prevent the crossbar of the *long e* from obscuring the informative parts of the four symbols, as they are all suitably elevated by their legs or leg.

Although some Romance languages now contain *ene* and *enne* phrasing, there is no Latin root for those terms, which is why *letter l* was symbolically partnered with *m*, *p*, and *qu*, instead of *letter n* in the manuscript. It was a matter of logic borne by linguistic convenience in projecting spoken proto-Romance on to the written page. As the Italian peninsula is proximate with North Africa it meant that the Arabic symbol for *n* would have been familiar at that time anyway, so its adoption also made practical sense for a working alphabet.



| |
|---|
| Voynich symbol:  |
| Symbol name: <i>letter r</i> |
| Corresponds with modern letter <i>r</i> . Used frequently in the manuscript, but only singly, as double consonants had been abandoned. Can be confused with the Voynich <i>letter n</i> , but has an open base, usually with unequal tails. Sometime the left tail is not clear. It derives from the Phoenician/Semitic <i>resh</i> (<i>r</i>) symbol:  |

Fig. 21.

Figure 21 shows the symbol for the letter 'r'. It is familiar to the Latin eye as the capital 'R' but it is used only for the lowercase in the manuscript alphabet, as it includes no uppercase symbols.



| |
|---|
| Voynich symbol:  |
| Symbol name: <i>standing s</i> |
| Corresponds with the modern letter <i>s</i> and letter <i>z</i> in some instances with modern languages. The <i>standing s</i> is typically used as a prefix (<i>s-</i>) and mid-word (<i>-s-</i>) as distinct from the <i>sitting s</i> , which is typically used as a suffix (<i>-s</i>). Only used singly, due to the double consonant abandonment, Can be confused with the Voynich <i>letter t</i> , but has angular heel. Derived from the Ancient Latin <i>s</i> :  |

Fig. 22.



| |
|--|
| Voynich symbol:  |
| Symbol name: <i>sitting s</i> |
| Corresponds with the modern letter <i>s</i> . Has also become modern letter <i>z</i> in some instances with modern languages. The <i>sitting s</i> is typically used as a suffix (<i>-s</i>). The different forms are used depending on the calligraphic shape of the preceding letter. A variant of the <i>sitting s</i> can still be seen in the handwritten <i>s</i> as a suffix in modern languages. Derived from Ancient Latin <i>s</i> :  |

Fig. 23.

Figures 22 & 23 show the manuscript symbols for the letter ‘s’ and ‘z’ depending on pronunciation. The ‘standing s’ is used at the start of words or within words, while the ‘sitting s’ is used at the end of words. The two versions therefore serve as a form of punctuation.



| |
|--|
| Voynich symbol:  |
| Symbol name: letter t |
| Corresponds with the modern letter <i>t</i> . Used frequently in the manuscript, but only singly, due to the abandonment of double consonants in Vulgar Latin. Easily confused with the Voynich <i>letter s</i> , but always has a curved foot, instead of the angular heel. When used in isolation it stands for <i>terminus</i> , to indicate the end of a sentence: i.e. a full-stop or period. Derives from the Greek <i>tau</i> (<i>t</i>):  |

Fig. 24.

Figure 24 shows the symbol for the letter ‘t’. It is very similar to the ‘standing s’ symbol, so careful identification is required. The symbol for ‘t’ has a curved foot, while the symbol for ‘s’ has an angled foot.


| |
|---|
| Voynich symbol:  |
| Symbol name: diphthong sa |
| Corresponds with the modern letters <i>s-a</i> . Has also become <i>z-a</i> in some modern words. Usually used as a suffix (<i>-sa</i>) except when followed by <i>diphthong ta</i> (<i>-sata</i>). Combines the <i>letter s</i> with the <i>free a</i> form. Can be confused with <i>diphthong ta</i> , but has the angular heel of the <i>s</i> . It can also look like the <i>phoneme qu</i> , but with no downward leg. |

Fig. 25.


| |
|--|
| Voynich symbol:  |
| Symbol name: diphthong ta |
| Corresponds with the modern letters <i>t-a</i> . Used as a suffix (<i>-ta</i>), it combines the <i>letter t</i> with the <i>free a</i> . Easily confused with <i>diphthong sa</i> , but always has the curved foot of the <i>t</i> , rather than the angular heel of the <i>s</i> . Can look like a <i>free a</i> with a loop above. Can also be confused with the <i>letter r</i> and the <i>letter n</i> , as all three are quite similar. |

Fig. 26.

Figures 25 & 26 show the suffixes ‘sa’ and ‘ta’ respectively, which are both used frequently to end words in the manuscript. They combine the symbols ‘s + free a’ and ‘t + free a’. Careful identification is required to distinguish the consonants.


| |
|--|
| Voynich symbol:  |
| Symbol name: letter u |
| Corresponds with the modern letter <i>u</i> . Usually used in conjunction with other vowels: with <i>trapped a</i> (<i>au</i>), with <i>letter o</i> (<i>ou</i>), with <i>short e</i> (<i>eu</i>), with <i>letter i</i> (<i>iu</i>). Also used without other vowels: e.g. <i>um</i> , <i>un</i> , <i>ur</i> , <i>us</i> . Can sometimes be missed entirely, when it looks like a connective between other letters, or else be mistaken for a <i>letter i</i> . |

Fig. 27.

Figure 27 shows the symbol for the letter ‘u’ which is familiar to the Latin eye.



| |
|--|
| Voynich symbol:  |
| Symbol name: letter v |
| Corresponds with the letter <i>v</i> , but phonetically corresponds with <i>v</i> , <i>ph</i> , <i>f</i> , <i>th</i> , <i>w</i> , depending on pronunciation. The horizontal cap-line is used to distinguish the symbol from that of the letter <i>u</i> , as it can look very similar in context. It is sometimes written without the cap-line, when used in isolation and its identity is clear.  |

Fig. 28.

Figure 28 shows the symbol for the letter ‘v’, which corresponds with various phonetic sounds. It is familiar to the Latin eye as an inverted symbol. As it can look the same as the letter ‘u’ when connected to other letters, it is usually written with a cap-line to make the distinction.






| | | | | |
|--|---|---|--|---|
| Some examples of variation in triphthongs and quadraphthongs in the manuscript text. | | | | |
| <i>æpe</i> (I often) | <i>ela</i> (she) | <i>elee</i> (he is/it is) | <i>eile</i> (of which) | <i>elque</i> (what, where) |
|  |  |  |  |  |

Fig. 29.

Figure 29 shows some of the more elaborate variations on the standard model used for 'ele', 'eme', 'epe' and 'eque'. There are many such combined symbols throughout the manuscript, all based on the same calligraphic format.

The most significant differences between the writing system of the manuscript and modern writing systems are the lack of dedicated punctuation marks and the lack of uppercase symbols. The missing letters/phonemes c, k, h, ch, sh, j, g, y are not given symbols in the manuscript alphabet, either because they were not used in the manuscript language, or they were silent, or because they represent syllabic junctions that were pronounced anyway, and therefore required no symbols.

Images, texts & translations.

Many of the manuscript pages have naïvely drawn images with accompanying texts. There now follow, some examples along with translations. There are themes, such as bathing, plants and astrology.



Fig. 30. Details from Folio 79 (left) and Folio 75 (right).

Figure 30 shows the word '*palina*' which is a rod for measuring the depth of water, sometimes called a stadia rod or ruler. The letter 'p' has been extended and marked with the triple calibrations seen on a palina. The author has also added a whimsical eye because it reminds one of a snake. The word *palina* survives in modern Italian. The illustration shows a woman using a palina to gauge the depth of a bath.



Fig. 31. Detail from Folio 70 (right).

Figure 31 shows an illustration of a bearded monk in his washtub, from the monastery where the manuscript was created. The words read: opat a sa (it is abbot). His is one of very few male faces seen in the manuscript. The word opát survives to mean abbot in Polish, Czech and Slovak, demonstrating that proto-Romance reached as far as Eastern Europe. In Western Europe other variants survive: abat (Catalan), abad (Spanish), abbé (French), whilst the Latin is 'abbas'. This also demonstrates the phonetic overlap between the sounds 'p' and 'b' in the manuscript alphabet.



Fig. 32. Detail from Folio 77 (right).

Figure 32 shows a diagrammatic representation of a miscarriage or abortion, as a baby swaddled in bandages and a mass of blood exiting a tube, accompanied by the words 'omor néna' (killed/dead baby). The word 'omor' survives in Romanian, where it means 'to murder'. The word 'néna' survives in Spanish, where it now means 'female baby' ['néne' is male baby].



Fig. 33. Detail from Folio 82 (right).

Figure 33 shows two women dealing with five children in a bath. The words describe different temperaments: tozozr (buzzing: too noisy), orla la (on the edge: losing patience), tolora (silly/foolish), noror (cloudy: dull/sad), or aus (golden bird: well behaved), oleios (oiled: slippery). These words survive in Catalan [tozos], Portuguese [orla], Portuguese [tolos], Romanian [noros], Catalan [or aus] and Portuguese [oleio]. The words orla la describe the mood of the woman on the left and may well be the root of the French phrase 'oh là là', which has very similar sentiment.



Fig. 34. Oblong-leaved sundew. Manuscript Folio 53, right.

Figure 34 shows Folio 53 right: Oblong-leaved sundew (*Drosera intermedia*). The first line of the accompanying text reads: 'la nasa éo eme ona oma nor nais t' (the snare it's to acquire good growth as for normal birth). The words survive in various Romance languages and Latin: la nasa/nassa (Latin) éo (Portuguese) eme (Latin) ona (Galician) oma (Greek) nor[mais] (Portuguese) nais (Old French) t [terminus] (Latin). The plant is native to Northern Italy and Iberia, where it grows in marshes and bogs. *Drosera* contains substances known as flavonoids and quinones, which have an antibiotic, antiviral, antimicrobial and antifungal effect, so they would have helped to ward off infections and infestations during pregnancy.

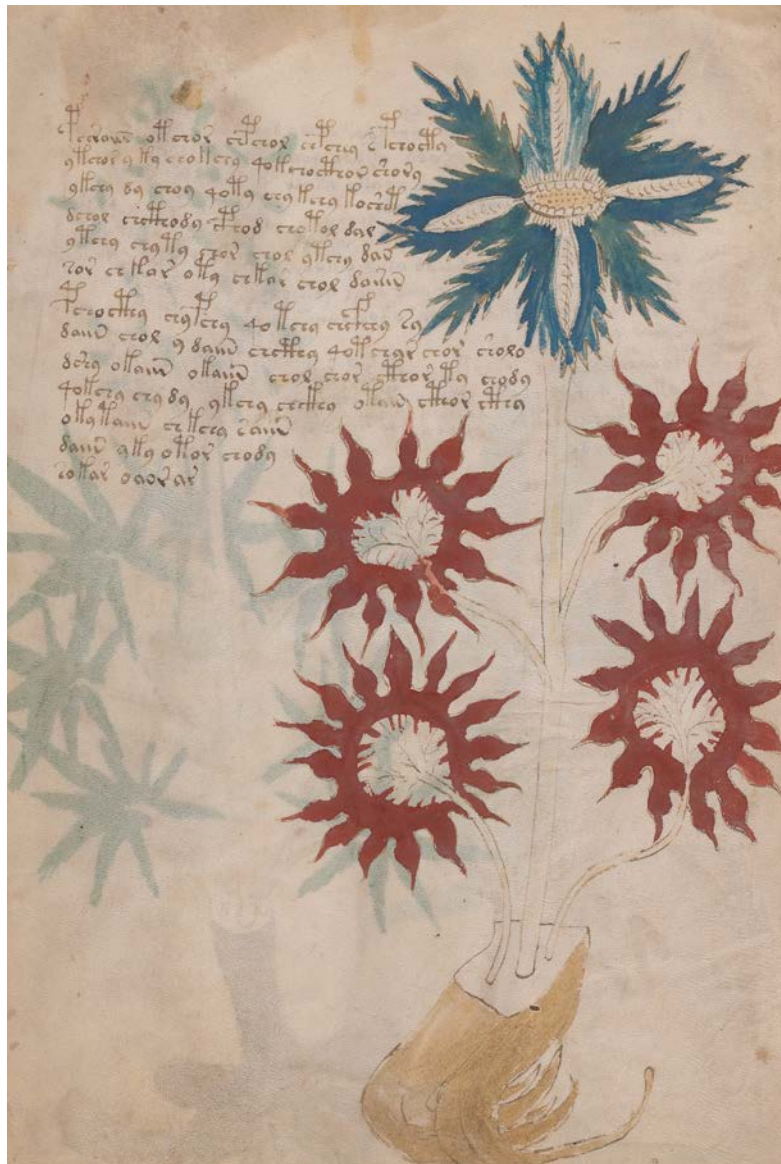


Fig. 35. Mediterranean Sea Holy. Manuscript Folio 17, left.

Figure 35 shows Folio 17 left: Mediterranean Sea holy (*Eryngium bourgatii*). The first line of the accompanying text reads: 'pésaut om eos é péor é péia t' (sorry/apologies people, they have the worst/potent sting). Sea holly has very prickly defences against being eaten by herbivores. The illustration shows the plant both in flower and in seed, where the heads are bluish and reddish-brown respectively. The text words survive in various Romance languages and Latin: pésaut (Old French) om (Romanian) eos (Latin) é péor é péia (Spanish) t [terminus] (Latin). The plant is native along much of the Mediterranean coastline. Mediterranean Sea holly contains volatile defensive chemicals called germacrene, which are antimicrobial and insecticidal, so it was a useful antiseptic and repellent when applied to the skin.



Fig. 36. Borage. Manuscript Folio 19, left.

Figure 36 shows Folio 19 left: Borage (*Borago officinalis*). The first line of the accompanying text reads: 'panais-or o nauira æo arna o péor omor or é'epe a doméas t' (the narrow golden taproot, it's bark has the potency to kill the domestic/family belly). Borage oil has a long history as a toxic uterine stimulant for inducing miscarriage and abortion, which was commonly practised to deal with unwanted pregnancies as a form of birth control. The term 'emmenagogue' was used, which means to encourage menstruation, as a euphemism for an abortifacient: i.e. a substance that causes abortion. The text words can still be found in various Romance languages and Latin: panais-or (French] o'nauira (Latin) æo arna (Galician) o'péor (Galician, Spanish) omor (Romanian) or é'epe a (Old Italian) doméas (Old French) t [terminus] (Latin). Borage oil contains prostaglandins that have an agonistic effect on the body, which is why the oil causes premature labour as a biological response.



Fig. 37. Yellow Melancholy Thistle. Manuscript Folio 34, left.

Figure 37 shows Folio 34 left: Yellow Melancholy Thistle (*Cirsium erisithales*). The first line of the accompanying text reads: ‘masas naus anais, eme ea nort, æ e la as aus et’ (dough food-vessels, annually harvested from the north [top], and from the south [bottom]). The plant was used to provide food, both from the seed-heads and from the roots, as indicated by the illustration, which emphasizes those parts of the plant. The words can still be found in various Romance languages and Latin: masas (Galician, Spanish) naus (Catalan) anais (Portuguese) eme ea (Latin) nort, æ e la as (Old French) aus[tral] (Portuguese, Spanish) et (French). In French the plant is still known as ‘cirse glutineux’ (glutinous thistle) due to its historic use for making edible dough from the seeds and rhizomes.



Fig. 38. Showing the entire unfolded map with the four vignettes that provide volcanic information: A, B, C, D.

Looking at Figure 38, vignette A illustrates the erupting volcano that prompted the rescue mission and the drawing of the map. It rose from the seabed to create a new island given the name Vulcanello, which later became joined to the island of Vulcano following another eruption in 1550. Vignette B depicts the volcano of Ischia, vignette C shows the islet of Castello Aragonese, and vignette D represents the island of Lipari. Each vignette includes a combination of naïvely drawn and somewhat stylized images along with annotations to explain and add detail. The other five vignettes describe further details of the story.

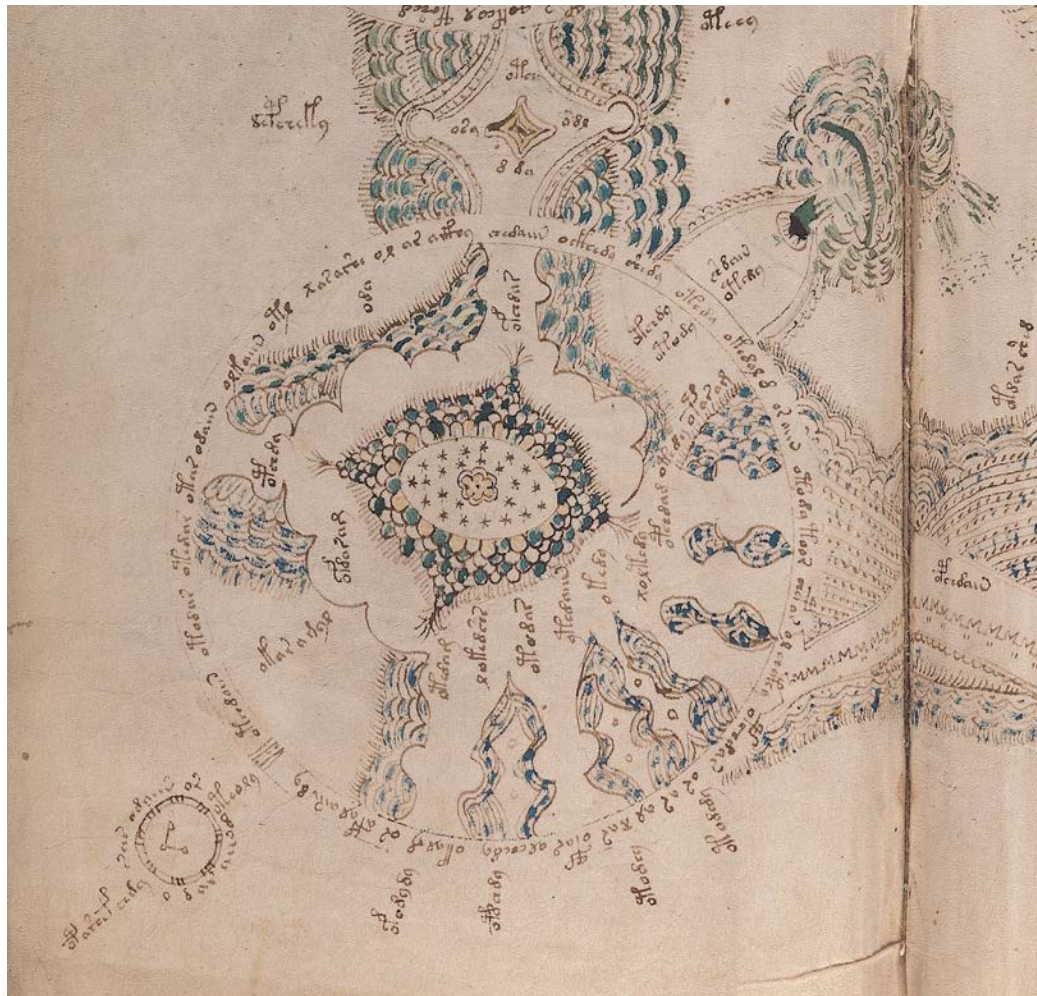


Fig. 39. Showing vignette A: The eruption of Vulcanello that resulted in a new island and which subsequently became joined to Vulcano.

The eruption of Vulcanello, in Figure 39, is seen in both plan-elevation and in side-elevation cross-section, with a surprising level of detail and annotation that must have come from firsthand observation. In addition, there is the diagram of a nautical inclinometer over the water, in the bottom-left corner, complete with wording to warn sailors of shipping hazards.



Fig. 40. Showing a detail of map vignette A. Describing the emergence and flow of magma from Vulcanello crater.

The illustration in Figure 40 shows the emergence and flow of magma from Vulcanello crater. There are nine annotations, top to bottom, that describe the process as witnessed. They read: o'péna (of rock: Old Spanish) o'qunas [cunas] asa (the cradle/birth it is: Spanish, Latin) amena sa (its lead/start: French) rolen æt (turning fire: Spanish, Latin) o'monas (of unity: Latin) amenaus (amazing/threatening: Spanish, Catalan) o'léna (of energy: Italian) formena (forming/shaping/create: Catalan, Spanish) o'péna sa (of rock it is: Old Spanish). Thus, we see the magma spilling from its cradle in the crater, then its flows coming together and then cooling to form igneous rock (lava).



Fig. 41. Showing detail of map vignette A. Describing the hazards around the periphery of Vulcano crater.

The illustration in Figure 41 shows the hazards presented by the magma as it cools to form lava around the periphery of the erupting Vulcanello crater. There are eight annotations, clockwise from top. The first four annotations refer to conditions on land. They read: *alas a asar* (area is roasting hot: Latin, Spanish) *ona* (good/safe: Galician) *o'qué nas* (this is flowing: Catalan, French) *omina opas asa* (dangerous passage it is: Latin, Spanish). The second four annotations refer to conditions in the water. They read: *omone na* (large mass floating/moving: Italian, Latin) *omone a* (a large mass: Italian) *opna na* (membrane floating: Adriatic, Latin) *o'quo nana* (of where small: Latin, Italian). It is interesting to note that the floating lava is pumice, which is indicated by the circular bubbles drawn on the images.



Fig. 42. Detail from map vignette A. Showing the diagram of a nautical inclinometer.

The illustration in Figure 42 shows a diagram of a nautical inclinometer - a device for measuring the yaw and pitch of a ship in order to keep it level and upright, similar to a balance scale. The annotations read: op (necessary: Romanian) a æqu (to equal/level: Latin) é na (it is to float: Latin) tas [tasse] (the hull/bowl: French, Adriatic) o'naus os (of the ships: Catalan) o' meor a (for to pass: Latin) o n [offici nostri], [ill]as aus [auspicio] n [nostro] (our duty to those under our protection: Latin). The lower annotations are based on common abbreviated Latin phrasing. Clearly it was very important to right (level) the ships to avoid taking on water or capsizing whilst passing, especially when low in the water with a cargoes of passengers.



Fig. 43. Detail from map vignette A. Showing the side-profile of the erupting Vulcanello in cross-section.

The illustration in Figure 43 shows a side view of Vulcanello erupting in cross-section. Above the dome, the cap can be seen, drawn as an arc, being elevated by the explosive blast of the eruption. The cap is inside a cloud of pyroclastic gas, hot ash and airborne material. Clusters of debris are seen projecting right with the annotation: *omnas en* (everything in: Latin, Galician, Old French) to indicate where most of the debris fell into the water. Inside the volcano there is the annotation: *æ nais omina* (birth of the menace: Latin, French, Spanish) and below the volcano there is the annotation *[d]oména omona* (big man dominates: Portuguese, Italian). The 'big man' is Vulcan, King of the Underworld, who was believed to reside beneath nearby Vulcano, hence its name. The eruption of Vulcanello, or Vulcanino (Vulcan's baby), was therefore viewed as the spawning of the devil child of Vulcan.

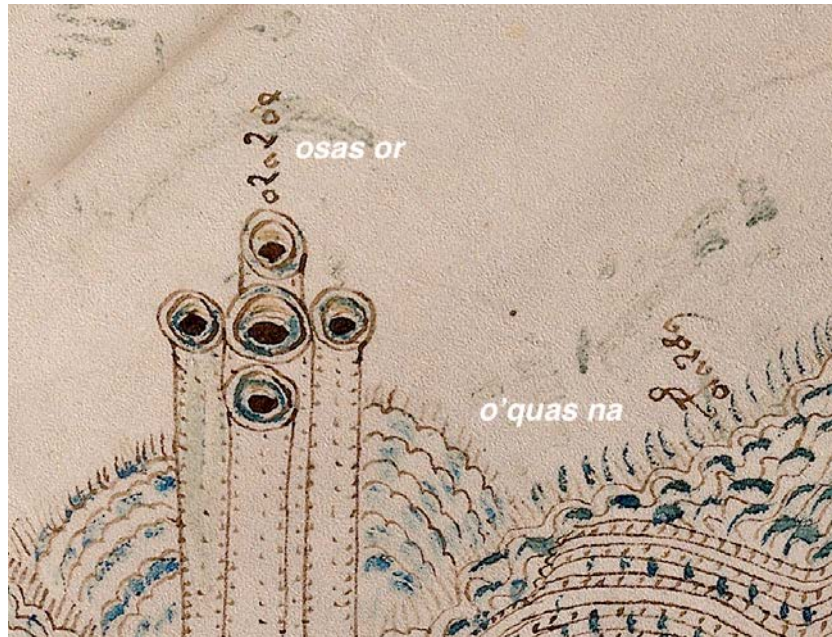


Fig. 44. Detail from map vignette B. Showing fumarole chimneys and small tsunamis caused by earthquake tremors.

The image in Figure 44 shows the fumarole chimneys emerging from the side of Ischia volcano. The annotation at their mouth reads: *osas or* [*ora*] (now disliked: Latin, Italian). They were evidently rather active at the time, which was interpreted as Vulcan's annoyance. The deposit chimneys no longer survive, but the fumaroles are still active. The annotation to the right reads: *o'quas[se] na* (of shaking/quaking waves: Latin). A series of small tsunamis can be seen running along the shoreline and radiating from beneath the fumaroles due to earth tremors from Ischia volcano.



Fig. 45. Detail from map vignette C. The heavenly castle seen among the clouds en route between Lipari and Ischia.

Figure 45 shows a representation of heaven as a castle in the sky, where the deceased are imagined to travel. The annotation reads: o'ména omor na (the direction of death's flight: French, Romanian, Latin) clearly demonstrating the Christian belief in a celestial afterlife.



Fig. 46. Details from manuscript map vignette C. Causeway between Castello Aragonese and Ischia island.

Figure 46 shows the causeway attaching *Castello Aragonese* to the island of Ischia, with waves lapping on each side. It was built in stone in 1441-2 when Maria and Alfonso took up residence in the castle, having previously been made from timber. The words read: o quais aqua requi[ro] a (the quay/wharf, is required by water: Galician, French, Italian, Latin).



Fig. 47. Detail from vignette D, showing the view of the volcano of Vulcano, as seen from Lipari port. Sitting above the crater there is the symbolic crown of Vulcan, King of the Underworld.

The image in Figure 47 shows the view of the volcano of Vulcano as seen from the port of Lipari. The annotation coming from the volcano mouth read: *osas sa* (demon's displeasure: Vulgar Latin, Catalan). These words refer to Vulcan's perceived annoyance and the reason for the eruption of Vulcanello according to the prevailing belief system. The crenellations drawn encircling the crater form a crown, to symbolize their belief that Vulcano was the home of Vulcan, King of the Underworld: i.e. the Devil. Therefore, it was viewed as the most regal of the Mediterranean volcanoes in Medieval times.

There follow, some details taken from the astrology pages of the manuscript. Interestingly, the annotations are written in conventional Italics, suggesting that Maria herself added these words for those uninitiated in the Ischia alphabet, and that she understood both languages and writing systems.



Fig. 48. Detail from Folio 70 (right).

Figure 48 shows the central disc from Folio 70 (right), portraying the Zodiac sign Pisces – two fishes. The word between the fish is ‘mars’, written in conventional Italics, which survives to mean the month of ‘March’ in French. Note that the fish shown are most likely to be the Mediterranean seabass (*Dicentrarchus labrax*), as it has the scaly body with a smooth head and slightly upturned lip.

Note: This was the first month of the Roman calendar. The Gregorian calendar was introduced in 1582 by Pope Gregory VIII, which post-dates the manuscript by 140 years.



Fig. 49. Details from Folio 71 (left) and 71 (right).

Figure 49 shows the central discs from Folio 71 (left and right), portraying the Zodiac sign 'Aries' – ram. Both images include the word 'abril' written in conventional Italics, which survives to mean the month of 'April' in Catalan, Galician, Occitan, Portuguese, Spanish, Turkish.

The breed of sheep shown in the images is a Medieval ancestral domestic type, very similar to the long-legged wild mouflon (*Ovis orientalis*) and urial (*O. o. vignei*) species, suited to Mediterranean maquis scrub, as shown by their foraging from shrubs rather than grazing from the ground.



Fig. 50. Detail from foldout Folio 72 (far-left) and 72 (middle-left).

Figure 50 shows details from the central discs of foldout Folio 72 (far-left, middle-left), portraying the Zodiac sign Taurus – bull. Both images include the word 'may' written in conventional Italics, which survives to mean the month of 'May' in Latin (May) and Portuguese, Spanish (Mayo), Catalan (Maig), Galician (Maio). Note that the Latin spelling is used, indicating that the words are contemporaneous with the manuscript. The breed of cattle shown in the images is the now-extinct Medieval red oxen (*Bos primigenius taurus*), which had a glossy fulvous coat and high counter-curved (lyre-shaped) horns, and is seen in many 15th century manuscripts.



Fig. 51. Detail from foldout Folio 72 (middle-right).

Figure 51 shows a detail from the central disc of foldout Folio 72 (middle-right), portraying the Zodiac sign Gemini – twins: here they are shown as boy and girl twins. The central word reads ‘yuny’ written in conventional Italics to mean the month of ‘June’, which still survives as ‘juny’ in Catalan, Galician, and as ‘yunyu’ in Berber. Note that the letter y and j are homophones, as both are derived from the Latin ‘iūnius’. The use of the symbol j to denote a distinctly different sound from y or i, did not begin until the late 15th century, thereby proving that the Italic annotations are contemporaneous with the manuscript. Both figures are wearing typical aristocratic attire from the mid 15th century Mediterranean.



Fig. 52. Detail from foldout Folio 72 (far-right).

Figure 52 shows the central disc of foldout Folio 72 (far-right), portraying the Zodiac sign Cancer – two lobsters. The word beneath the lobsters, written in conventional Italics, reads ‘yulho’, which means the month of ‘July’ and survives as ‘julho’ in Portuguese. Again, we see the y and j homophone. The species of lobster seen in the images is a common Mediterranean species known as the spiny lobster or crawfish (*Palinurus elephas*). One can see that it has far smaller claws, in proportion to the body, than the common lobster (*Homarus gammarus*) and they are of equal size. The spiny lobster also comes in two colour phases as shown - one greenish with reddish extremities, one entirely reddish. In fact, its modern Italian name is ‘l’aragosta’, which is derived from a combination of the words ‘Aragonese’ and ‘locusta’ (Latin for lobster): i.e. the Aragonese-lobster.



Fig. 53. Detail from foldout Folio 72 (reverse-left).

Figure 53 shows the central disc of foldout Folio 72 (reverse-left), portraying the Zodiac sign Leo – lion. The word beneath the lion, written in conventional Italics, reads 'aug'st', which means the month of 'August' and survives in Latin as a contraction of 'Augusta'. Note that the letter s is written in the ancient form *f*, known as the 'long s', again indicating that the writing is contemporaneous with the manuscript. The image is that of a lion cub, as it has faint spots and it is being playful.



Fig. 54. Detail from foldout Folio 72 (reverse-right).

Figure 54 shows the central disc of foldout Folio 72 (reverse-right), portraying the Zodiac sign Virgo – female virgin. The word beneath the virgin, written in conventional Italics, reads 'septemb-', which means the month of 'September' and survives in Latin as 'septembre'. Note the grave accent < over the letter m to indicate lower pitch, which was a Medieval device. Again, the s is the ancient form *f*. The virginal figure wears typical aristocratic attire from the mid-15th century.



Fig. 55. Detail from Folio 73 (left).

Figure 55 shows the central disc of Folio 73 (left), portraying the Zodiac sign Libra – balance scales. The word beneath the balance scales, written in conventional Italics, reads 'octobre', which means the month of 'October' and survives in Latin, French, Galician, Catalan. The balance scale in the image, more accurately called an 'equal-arm beam-balance', is a late Medieval design, with and slot above the fulcrum. It enabled the user to easily see that the two pans were balanced.



Fig. 56. Detail from Folio 73 (right).

Figure 56 shows the central disc of foldout Folio 73 (right), portraying the Zodiac sign Scorpio – scorpion (green lizard): In the Medieval period the term ‘scorpion’ was used colloquially for both lizards and scorpions, as they lived in similar terrain and both had long tails, so they were superficially similar animals to the unenlightened. There are places in southeast North America where this linguistic curiosity has persisted since the Spanish conquest and colonization of the Florida peninsula in 1513. The word beneath the lizard, written in conventional Italics, reads ‘nov’bre’, which means the month ‘November’ and survives as ‘novembre’ in Portuguese, Catalan, Italian. The type of lizard shown in the image is a Mediterranean species known as the western green lizard (*Lacerta bilineata*).



Fig. 57. Detail from Folio 74 (left).

Figure 57 shows the central disc of foldout Folio 74 (left), portraying the Zodiac sign Sagittarius – archer (crossbowman). The word at the feet of the archer, written in conventional Italics, reads ‘dece’bre’, meaning the month of ‘December’. It survives as ‘decembre’ in Portuguese, Spanish, Catalan, Galician. The crossbow seen in the image is a Medieval composite (wood and steel) design from the 15th century. It has a steel loop at the front, where a foot was used to hold the bow to the ground while the string was being tensioned with the hands. It also has a long steel lever-trigger, beneath the stock, for releasing the string to shoot the bolt. The crossbowman is wearing typical mid 15th century Mediterranean aristocratic attire.

The 11th Zodiac sign Capricorn – goat (January) and 12th Zodiac sign Aquarius – water (February) are both missing from the manuscript.

Hybrid Writing.

So, we have proto-Romance words surviving in the Mediterranean from Portugal, in the west, to Turkey, in the east. Clearly, it was a cosmopolitan *lingua franca* until the late Medieval, when the political map began to inhibit meme flow, so that cultural isolation caused the modern languages to begin evolving. As a result, proto-Romance survived by vestigial fragmentation of its lexicon into the languages we see today. As such, manuscript MS408 is immensely important, because it is the only documentation of a language that was once ubiquitous over the Mediterranean and subsequently became the foundation for southern European linguistics in the present day.

Furthermore, we have proto-Romance words written on the Zodiac pages of the manuscript contemporaneously with conventional Italics, thereby demonstrating the proximity of both writing systems. On the reverse of the very last page (Folio 116: right) of the manuscript there are four lines of notes that combine the manuscript writing symbols with Italic symbols, demonstrating that the two writing systems were contemporaneous.

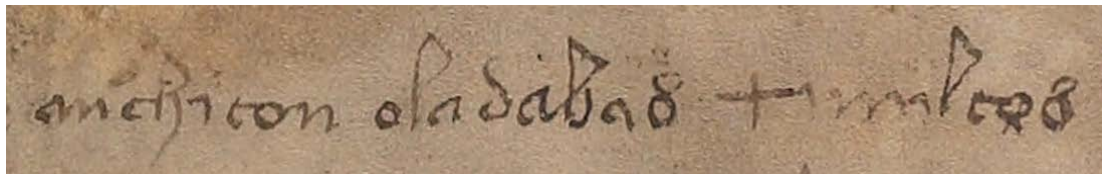


Fig. 58. Detail from reverse of the final page of the manuscript (Folio 116: right).

Figure 58 shows a sample of the most legible words from this hybrid writing. One can clearly see a number of manuscript MS408 symbols mixed with prototype Italic symbols, as if the calligrapher had been experimenting with a crossover writing system. With informed judgement, the words may read: *mériton o'pasaban + mapeós* (thanks is given to God for the mappings: French, Galician, Latin, Spanish). The Greek sign of the holy cross '+' is commonly used as a Latin text symbol to represent faith in God, Christ, Christianity. The circumflex accent '^' beneath the final letter 'o' translates into a modern accented 'ó' making the word 'mapeós' a preterite indicative verb form: i.e. associated with a past event.

The Second Manuscript.

There is another manuscript to introduce here, because it has similarity in calligraphic style and similarly combined letterforms. It is a memoir written by Loise De Rosa (1385-1475), who lived and worked in the court of Naples. It is titled *De Regno di Napoli* (The Kingdom of Naples) (Altamura, 1971; BnF, 2018).

He wrote in his spoken language, Neapolitan, and was master of the royal house (head of the royal servants) under none other than Alfonso V, during his reign over Naples. In fact De Rosa served under many kings and queens, as he lived to the ripe old age of ninety. On the first page of the manuscript he states that Alfonso was his sixth king: "lo siesto [sexto] Re Alfonzo".

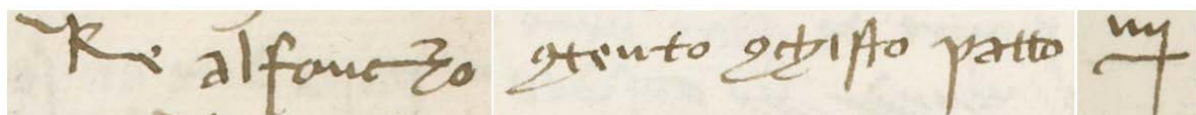


Fig. 59. Three text samples from the De Rosa manuscript.

Figure 59 shows three samples of text from the De Rosa work. The first reads: Re Alfonzo (King Alfonzo: Italian) and the second reads; 'contento conchisto [conquista] patto' (satisfactory conquest pact: Italian). The third image is the Roman numeric symbol for the century '1400' (MCCCC: M C x 4) that De Rosa uses in combination with other numbers to indicate the particular year he is referring to. Note how the letter 'z', the phonemes 'con' and 'ch', and the symbol for '1400' are all styled in a very similar calligraphic manner to the symbols in manuscript MS408. Also, the 's' is the ancient form *f* as used for the Zodiac names of the months. Note, as well, that the De Rosa lexicon can now be found scattered amongst Latin and the Romance languages, just like that of manuscript MS408. Both were the spoken vernacular of their respective courts, used for everyday communication.

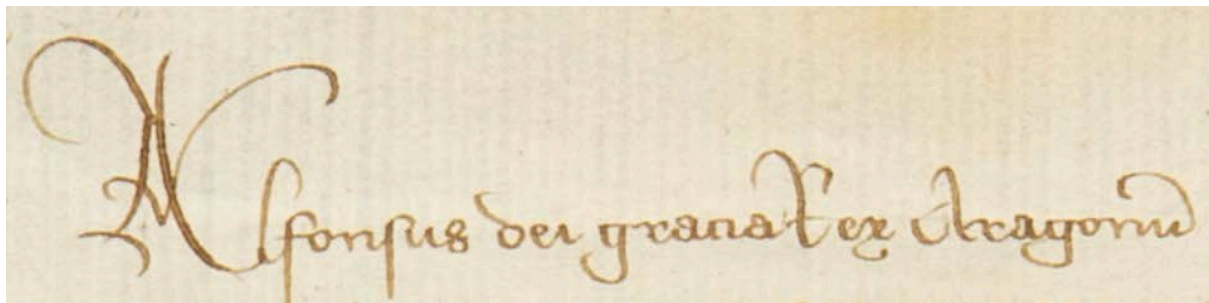


Fig. 60. Sample from official letter by Alfonso V.

Figure 60 shows a detail from an official letter by Alfonso V, for comparison with De Rosa. It reads: Alfonsus dei gracia Rex Aragome (Alfonzo of the gracious, King of Aragon: Italian, Spanish, Old Portuguese). Note that his language also uses words now found in various Romance languages, as he was Spanish by birth.

We can see that the calligraphic forms are quite legible and familiar to the modern eye and also noticeably different from those shared by manuscript MS408 and De Rosa. This flowing handwriting style is known as 'humanistic miniscule cursive script'. It was developed by the Italian scholar Niccolò de' Niccoli (1364-1437) in the 1420s, with the intention of formalizing and standardizing Italic handwriting and type. It was duly adopted by the Vatican to make communication more consistent and reliable across Catholic Europe. One might also note, that the Alonso letter has both an uppercase 'A' and lowercase 'a', whilst De Rosa uses only the lowercase for both intentions, just like MS408.

De Rosa's work thus provides documentation of a writing system and a language akin to those of manuscript MS408, demonstrating that both evolved from the same naïve linguistic rootstock: i.e. both had emerged from Vulgar Latin, but in different ways due to their geographical and cultural separation. The consonants De Rosa uses have Italic symbols, but some are stylized and abbreviated in a remarkably similar way to the symbols in the manuscript, demonstrating a level of cultural overlap.

In fact we know, from De Rosa's manuscript, that he fled to the safety of *Castello Aragonese* in 1441-2, when Alfonso was busy conquering Naples: He writes: "The patron said to me: "Son of mine, go to Ischia, for the great of age the place is safe". I went to the marina and took a boat that travelled to the Castello di Ischia". As

incredible as it may seem, the chances are that De Rosa actually met the author of manuscript MS408 during his stay at the citadel. It's incredible too, that both manuscripts survived, as neither was written in the Latin of officialdom and might easily have been discarded.

De Rosa also mentions meeting the lady of the house, with her daughters and their female court, who were all interested in male companionship and congress, having been confined to the citadel for some time, with the king and all of the eligible men away doing battle.

So, from De Rosa's manuscript we understand just why manuscript MS408 is so dominated by female issues, activities and adventures and why so few images of men appear. The only males in the citadel were the abbot, celibate monks and young boys, leaving the women and girls sexually and emotionally frustrated, so they amused and distracted themselves whilst they waited and yearned for male attention to return. They must have jumped at the chance of an adventure when the volcano erupted in 1444, as the citadel would have felt like a gilded cage by then.

Maria was unable to produce a son and heir for Alfonso, so he eventually negotiated with the Vatican to allow his illegitimate son to succeed him on the throne as Ferdinand I of Naples (1423-94), whose mother was a Calabrian noble woman named Giralda Carlini (1401-58) whom Alfonso had met and seduced when he had first visited Naples in 1423. When young, Maria had suffered smallpox, leaving her scarred, frail and barren, so she was deeply upset to learn of the king's infidelity and of his siring a son by another woman. They eventually went their separate ways, but remained married under Catholic law, finally dying in the same year, but in different parts of their kingdom: she in Valencia, Spain and he in Naples, Italy (Earenfight, 2010; Jansen: 2002; Ryder, 1990: Ryder, 1990).

References.

Altamura, A. 1971. "Nei ricordi di Loise de Rosa in Napoli Aragonese: Transcription." Naples: Libreria Scientifica Editrice.

Amancio, D., E. Altmann, D. Rybski, O. Oliveira & L. Costa, L. 2013. "Probing the statistical properties of unknown texts: application to the Voynich Manuscript." PLOS, One. doi: <https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0067310>

Archive. 2018. Voynich Manuscript – High Resolution Scans. doi: <https://archive.org/details/voynich>

Balandin, A. & S. Averyanov. 2014. "The Voynich Manuscript: new approaches to deciphering via a constructed logical language." *Laguna Verde University Proceedings* 3: 15-18.

Barlow, M. 1986. "The Voynich Manuscript – by Voynich?" *Cryptologia* 10 (4): 210-16.

- Bax, S. 2014. "A proposed partial decoding of the Voynich script." University of Bedfordshire. <http://stephenbax.net/wp-content/uploads/2014/01/Voynich-a-provisionalpartial-decoding-BAX.pdf>.
- BnF. 2018. National Library of France, Paris: Luigi de Rosa, *De regno di Napoli*. (Original De Rosa manuscript. High Resolution Scans). doi: <https://gallica.bnf.fr/ark:/12148/btv1b84333263>
- Brumbaugh, R. 1975. "The solution of the Voynich 'Roger Bacon Cipher'. *The Yale University Library Gazette* 49 (4): 347-55.
- Cheshire, G. 2017a. 'Linguistic missing links.' *Lingbuzz: preprint linguistics website*. doi: <https://ling.auf.net/lingbuzz/003737>
- Cheshire, G. 2017b. 'Linguistically dating and locating Manuscript MS408.' *Lingbuzz: preprint linguistics website*. doi: <https://ling.auf.net/lingbuzz/003808>
- Earenfight, T. 2010. *The King's Other Body: María of Castile and the Crown of Aragon*. Philadelphia: University of Pennsylvania Press.
- Hall, R. 1950. "The reconstruction of proto-Romance." *Language* 26 (1): 6-27.
- Hall, R. 1983. *Proto-Romance Morphology*. Amsterdam/Philadelphia: John Benjamins.
- Herman, M. 2017. "The Voynich Manuscript is written in natural language: The Pahlavi Hypothesis". arXiv.org. DOI: <https://arxiv.org/abs/1709.01634>
- Jansen, S. 2002. *The Monstrous Regiment of Women: Female Rulers in Early Modern Europe*. New York: Palgrave Macmillan. ISBN 0312213417.
- Kennedy, G. & R. Churchill. 2006. *The Voynich Manuscript: the Mysterious Code that has Defied Interpretation for Centuries*. London: Simon and Schuster.
- Landini, G. 2001. "Evidence of linguistic structure in the Voynich Manuscript, using spectral analysis." *Cryptologia* 25 (4): 275-95.
- Levitov, L. 1987. *Solution of the Voynich Manuscript. A Liturgical Manual for the Endure Rite of the Cathari Heresy: the Cult of Isis*. Walnut Creek, California: Aegean Park Press.
- Montemurro, M. & D. Zanette. 2013. "Keywords and co-occurrence patterns in the Voynich Manuscript: an information-theoretic analysis" PLOS,One. doi: <https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0066344>
- Reddy, S. & K. Knight 2011. "What we know about the Voynich manuscript." In *Proceedings of the 5th ACL-HLT Workshop on Language Technology for Cultural Heritage, Social Sciences and Humanities*: 78-86. Stroudsburg, PA: Association for Computational Linguistics.
- Reeds, J. 1995. "William F. Friedman's transcription of the Voynich Manuscript." *Cryptologia* 19 (1): 1-23.

Rugg, G. 2004. "An elegant hoax? A possible solution to the Voynich Manuscript." *Cryptologia* 28 (1): 31-46.

Ryder, A. 1990. *Alfonso the Magnanimous: King of Aragon, Naples and Sicily (1396-1458)*. Oxford: Clarendon Press.

Schinner, A. 2007. "The Voynich Manuscript: evidence of the hoax hypothesis." *Cryptologia* 31 (2): 95-107.

Schmeh, K. 2013. "A milestone in Voynich Manuscript research: Voynich 100 Conference in Monte Porzio, Catone, Italy." *Cryptologia* 37 (3): 193-203.

Stallings, D. 1998. "Understanding the second-order entropies of Voynich Text." Ixoloxi.com. doi: <http://ixoloxi.com/voynich/mbpaper.htm>

Steriade, D. 1988. "Gemination and the proto-Romance syllable shift." In *Advances in Romance Linguistics*, edited by D. Birdsong and J. P. Montreuil, 371- 409. Dordrecht: Foris.

Strong, L. 1945 "Anthony Askham: the author of the Voynich Manuscript." *Science* 101: 608-09.

Tordella, 1970. "Letter to Dr. Erich Huttenhain". NSA Archive. doi: <https://www.nsa.gov/Portals/70/documents/news-features/declassified-documents/voynich/voynich-manuscript-tordella-correspondence.pdf> & <https://www.nsa.gov/news-features/declassified-documents/voynich/>

Tucker, A. & J. Janick. 2018. *Unravelling the Voynich Codex*. London: Springer.

Ulyanenkov, A. 2016. "Voynich Manuscript, or book of Dunstan coding and decoding methods." arXiv.org. DOI: <https://arxiv.org/abs/1604.04149>

Ward, P. 1971. *The Aeolian Islands*. The Oleander Press. ISBN: 0902675435.

Wilson, J. 1810. *A History of Mountains: Geographical and Mineralogical*. Vol. III. Riddell of London.

To ensure clarity, portfolio 53 (right) has been used for this demonstration, as identification of the illustrated species of plant, Oblong-leaved Sundew (*Drosera intermedia*), is beyond doubt: see Figures 10 & 11. The two other European species of sundew (*D. rotundifolia* & *D. anglica*) have entirely different leaf forms: disc-shaped and linear-spatulate, respectively. The text for this page is generally quite clearly written and preserved, so correctly identifying the symbols was fairly straightforward. In accordance with the general theme of the manuscript, the page is concerned with the use of the plant as a medicinal and therapeutic substance for childbearing and childbirth.

We can see, from this example page, that the manuscript language is predominantly Latin, with a minority of words having originated from other sources and been incorporated. These subsequently survived in various Romance languages as their linguistic evolution saw them diverge. Running west to east geographically, the western Romance languages include Portuguese, Spanish, Catalan, Aragonese, Galician, French, Corsican, Occitan, Italian, Romansh and Ladin. The eastern Romance languages are the Romanian, Aromanian and Dalmation groups. Basque has also borrowed many early Romance words, due to meme flow through geographical and cultural proximity, which is a useful point of reference for the archaic assimilation of some Latin words. As the manuscript originates from Ischia during the Crown of Aragon, it is primarily a combination of Latin and western Romance.

As with all Latin palaeography, the sentence structure used in the manuscript is often inversive and fragmented, so it becomes necessary to piece the sentences together in accordance with modern linguistic habits, by rearranging the words and using connectives to make sense of them. The process requires the application of time and intuition to arrive at reasonable interpretations of intended meaning.

The nine lines of text have here been digitally isolated to make them easier to read: see Figures 1 – 9. The symbol key, Figure 12, is first used to convert the manuscript symbols into Italic symbols. The translations then follow a simple algorithmic pattern of prioritisation: < Latin < Vulgar Latin < Archaic Western Romance < Western Romance < Eastern Romance < Other Languages. This is known scientifically as ‘array priority queueing’. Thus, being the root language, Latin is always given top priority, followed by the other categories in sequence if necessary: i.e. in the absence of a higher priority representative. By deploying this simple method we know that all permutations have been optimally ordered and attenuated to arrive at the most plausible translations.

The words and their meanings were sourced by using a combination of prior knowledge and research by using the internet and books. In addition, there are various online search engines, dictionaries and translation tools for locating documents, phrases, words and abbreviations, and for verifying their meanings or definitions. Due to the absence of punctuation, it is necessary to work out whether, or not, sequences of symbols are in fact phrases that require dividing into unit words. It is also worth noting that double consonants were abandoned during much of the Medieval period and only came back into use when writing systems became more formalized during the Early Modern Period, so it is sometimes necessary to try spellings with double consonants.

There is some evidence for literary creativity in the text. For example, the righthand parts of lines 6, 7 and 8 each begin with similar word forms: ‘aléna’ (to gasp), ‘a léona’ (the lioness), ‘aleion’ (friend), respectively (see Figures 6, 7, & 8). This suggests a level of visual and phonetic playfulness with word structure, which can often be seen in the manuscript.

Lines 1— 4: // la nasa éo eme ona o’ma // nor nais t éo æ i o’ma // æo eis é olas ona // a meo naus al a o’méia omon

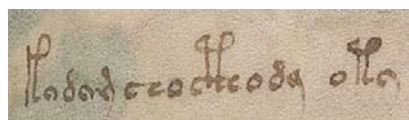


Fig. 1. Line 1. la nasa éo eme ona o’ma



Fig. 2. Line 2. nor nais t éo æ i o'ma

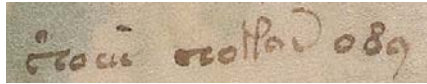


Fig. 3. Line 3. æo eis é olas ona

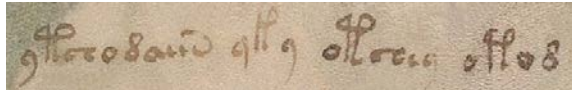


Fig. 4. Line 4. a méo naus al a o'méia omon

//1

la. Italian/French/Ladin: *the*.

nasa. (v. nassa) Latin: *snare, trap*. Italian/Catalan/Galician/Corsican: *trap*. [Basque: *trap*].

éo. Latin: *proceeds*.

eme. Latin: *to acquire*.

ona. Galician: *good, goodness*. [Basque: *good*].

o'ma. (abb. o'mater/mae/mare) Latin/Portuguese/Catalan. *of mother*. (oma) Ladin: *mother*.

//2

nor. Galician: *who*.

nais. French: *birth*.

t. (abb. terminus) Latin: *full-stop, period*.

A reasonable interpretation would be: *the snare plant is considered good for mothers with babies to be born, because it traps insects, so it contains nutritional goodness*.

//2 cont.

éo. Latin: *proceed*.

æ. Latin: *us, we*.

i. Latin: *go to*.

o'ma. (abb. o'mater/mae/mare) Latin/Portuguese/Catalan. *of mother*. (oma) Ladin: *mother*.

//3

æo. (v. eo) Catalan: *the*.

eis. Latin: *this, he*.

é. Latin: *from*

olas. (v. ollas) Latin: *cooking pots*.

ona. Galician: *goodness*. [Basque: *good*].

A reasonable interpretation would be: *the plant is considered good for mothers straight from the cooking pot*.

//4

a. Latin: *from*.

meo. Latin: *I pass*.

naus. (v. nauca/naucum) Latin: *bowl, nutshell-shaped*. v. noce/nuez. Italian/Spanish: *nut*.

al a. Italian/French: *to the*.

o'méia. Portuguese: *of the middle, of the mean*.

omon. (abb. homon) Latin: *person*. (abb. omone) Italian: *fat person*.

A reasonable interpretation would be: *I pass a bowl of the food to the person large in the middle (in mid-pregnancy)*.

Lines 5—9: // olæ omor equea epe o nor alona doméon oméo dom o'ma // alionas odoas o ele onos é ais dolon aléna éi et nar // tonas omos doa méa omia éot olon a léona doléa // doméor nas doma élos ormæo emo aleion o a mo an // omor éor omeiet o t osor éon doma

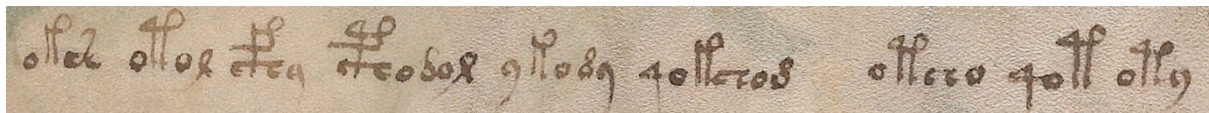


Fig. 5. Line 5. olæ omor equea epe o nor alona doméon oméo dom o'ma

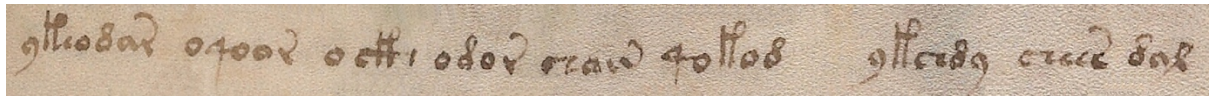


Fig. 6. Line 6. alionas odoas o ele onos é ais dolon aléna éi et nar

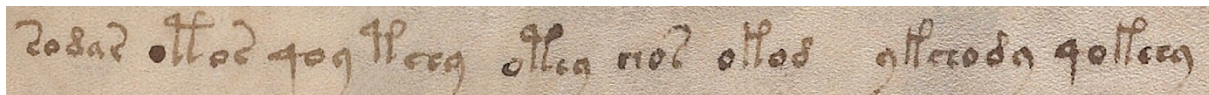


Fig. 7. Line 7. tonas omos doa méa omia éot olon a léona doléa

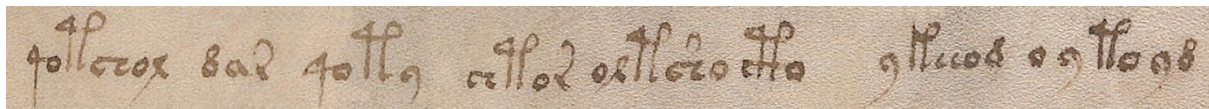


Fig. 8. Line 8. doméor nas doma élos ormæo emo aleion o a mo na

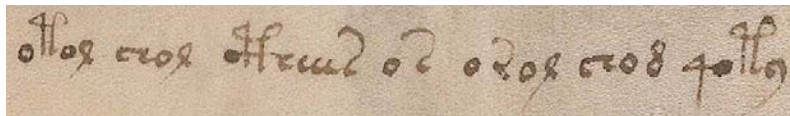


Fig. 9. Line 9. omor éor omeiet o t osor éon doma

//5

olæ. (v. olae) Latin: *a little, small amount*.

omor. (abb. omori/umore/humor) Latin: *essence, substance*.

eque a. Italian: *is adequate*.

epe. Old Italian: *belly, abdomen*.

o nor. Galician: *of who*.

alona. Italian: *to halo, protect*.

doméon. Spanish: *controlling*.

o'méo. Latin: *of passing*.

dom. Latin: *family*.

o'ma. (abb. o'mater/mae/mare) Latin/Portuguese/Catalan. *of mother*. (oma) Ladin: *mother*.

A reasonable interpretation would be: *a little of the remedy is adequate for controlling the belly of the pregnant mother with a protective halo*.

//6

alionas. Latin: *to pursue, confront*.

odoas. (v. odias) Latin: *anger, dislike, hatred*.

o ele. Portuguese: *of she*.

onos. (abb. sonos) Latin: *talking, speaking*.

é ais. Portuguese: *is there*.

dolon. French: *to smooth, to reduce*.

aléna. Italian/Catalan: *to gasp, to breathe*.

éi et. Latin: *and it*.

nar. (cont. luna/lunar) Latin/Catalan/Galician/Portuguese: *lunacy, night madness*. [nar. Romansh: *madness*. Arabic: *fired, enflamed, heated*].

A reasonable interpretation would be: *To remove her anger we talk her through it, to help reduce the delirium of night madness by breathing deeply.*

//7

tonas. Latin: *loud noises*.

omos. (abb. somos) Galician/Portuguese: *to be, created, made, exist*.

doa. Portuguese: *of pain*.

méa. Latin: *my, mine*.

omea. Latin: *my love*.

éot. Latin/Greek: *it is*.

olon. (abb. holon) Latin/Greek: *merged, together, whole*.

a léona. Portuguese/Spanish: *the/a lioness*. [Basque: *the lioness*].

doléa. Latin: *suffer*.

A reasonable interpretation would be: *she makes loud noises from the pain and my love it is merged for the suffering lioness.*

//8

doméor. Italian: *dominating*.

nas. Portugues/Galician: *in the, at the*.

doma. Latin: *house, room, chamber*.

élos. Old Portuguese: *anus, vulva, nether-regions*.

ormæo. (v. ormao) Latin/Greek: *excited, aggrevated*.

emo. Latin: *I acquire, I procure*.

aleion. Latin/Greek: *ally, friend*.

o a. Portuguese: *or in*.

mo. Italian: *now*.

an. Latin: *or, instead, rather, perhaps, also*.

//9

omor. (abb. omori/umore/humor) Latin: *essence, substance*.

éor. Latin: *this*.

ome. Old Portuguese: *person*.

uit. (contraction of 'obliviscator') Vulgar Latin: *to forget, ignore*.

o. (abb. opus) Latin: *work*.

t. (abb. testamento) Latin: *will, desire*.

osor. Vulgar Latin: *Devil, Demon, Vulcan*.

éon. Latin/Portuguese: *spirit, entity*.

doma. Latin: *house, room, chamber*.

A reasonable interpretation would be: *when the room is dominated by the labour contractions the remedy is an ally to forget the will of the Devil's spirit is in the house.*

So, in precis, the complete page may be interpreted thus:

The Snare Plant is considered good for a pregnant woman because it is a trap for goodness. It is best given straight from the cooking pot, by passing a bowl to the childbearing mother as a protective halo for her growing belly. A little of the remedy is also good for controlling the pregnant belly by removing anger during night madness, by assisting with deep breathing as we talk her through it. And, when the mother is crying like a lioness with the pain of labour contractions, and this dominates the birthing chamber, the remedy becomes a friend in helping to forget the work of the Devil.

In the Medieval period people had no scientific understanding of plants and nutrition. Instead, they made naïvely logical connections between plant characteristics and their supposed medicinal properties. In the case of the sundew, they knew that it ensnared insects, so they believed that the plant held a bounty of goodness inside. We now know, of course, that the plant merely supplements its own nutrition by consuming insects, so that it can colonize habitats with poor soil conditions. There was also a common belief that the sun was godly and the moon was devilish, causing night madness or lunar madness, as people's suffering seemed worse at night and was followed by restfulness in daylight.

Medieval medicinal ideas were largely homeopathic rather than allopathic, as most of them were based on belief rather than empirical evidence. That doesn't necessarily mean that such medicines were ineffectual though, as the power of belief can have a strong placebo effect on the mind and body. Especially so when the malign agent, such as the will of the Devil's spirit, is also a belief. So, homeopathy is perfectly compatible with imagined ailments that arise through superstition.

Pregnancy was an anomaly for Medieval people, as it was necessary for reproduction, yet it was fraught with danger, as it brought extreme discomfort, pain and a genuine risk of illness and death. Therefore, there was a strange juxtaposition between perceived powers of good and evil. On the one hand, there was the possibility of surviving pregnancy with the enjoyment of having children, on the other hand there was the possibility of failure and fatality, for mother, for child or for both. Without knowledge of ecological explanations, Medieval people saw it as a battle between the benign nature of their god and the malign nature of their devil, in every detail.

By comparing the manuscript image of the Oblong-leaved Sundew (*Drosera intermedia*), Figure 10, with a photograph of the real plant, Figure 11, we can see that the artist was reasonably accurate in botanical terms. The only significant inaccuracies are the precise architecture of the stem and the number of petals on the flowers. Nor are the beads of sticky mucilage (dew) shown on the leaf trichomes (hairs), indicating that they had not seen the plant *in situ*, and were drawing from a dried, pressed and browning specimen without detailed knowledge of its predatory mechanism. From Ischia, the nearest location for collecting the plant is the northern region of Italy, so the islanders would have taken delivery of sundews, along with other medicinal plants, in trade from the mainland.

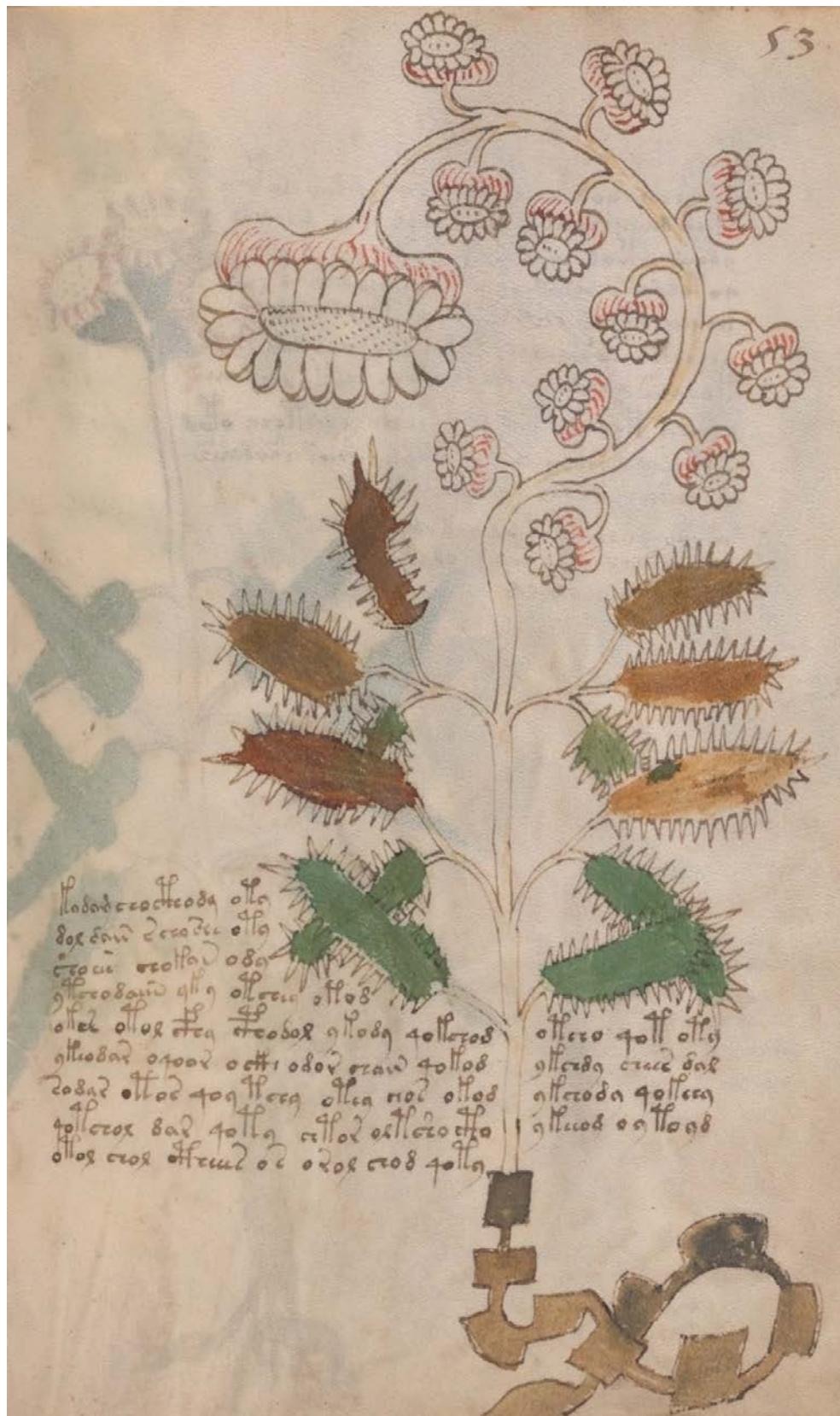


Fig. 10. The entire page for portfolio 53 (right), showing the Oblong-leaved Sundew (*Drosera intermedia*) complete with flowers, leaves and root. The plant is simply described as 'The Snare' (*La Nasa/Nassa*) in the manuscript, which was sufficient to distinguish it from other Mediterranean plant species.



Fig. 11. A photographs of the Oblong-leaved Sundew (*Drosera intermedia*) in its natural marshland habitat.
[Photos: Aaron Carlson, Doug McGrady].

Symbol key for Manuscript MS408. Gerard Edward Cheshire. University of Bristol. www.sciencesurvey.in

| Symbol-Italic key for MS 408. | | | |
|-------------------------------|--------------------|---------------------|---------------------|
| Symbol | Italic | Symbol | Italic |
| a | a (trapped) | 9 | a (free) |
| aw | ais | aw | aus |
| æ | æ (ae, a, e, i) | 4 | d |
| c | e (short) | cc | e'e (intonation) |
| cc | é (long) | c | i |
| ll | l (ll) | ele | ele (elle) |
| mm | m (mm) | eme | eme (emme) |
| n | n (nn) | o | o |
| p | p (pp) | epe | epe (eppe) |
| qu | qu | eque | eque |
| r | r (rr) | s/z | s/z (ss, zz) |
| s/z | s/z (ss, zz) | sa/za | sa/za |
| t | t (tt) | ta | ta |
| u | u | v, f, fv, ph, pv | v, f, fv, ph, pv |

Fig. 12. Symbol conversion key for MS408.