

Modeling the Transmission of al-Mubashshir Ibn Fātik's *Mukhtār al-Ḥikam* in Medieval Europe: Some Initial Data-Driven Explorations

David Joseph Wrisley

American University of Beirut

Contact: dw04@aub.edu.lb

Keywords: digital humanities; digital textual studies; stylometry; multilingualism; comparative literature; Arabic literature; medieval European literature; sapiential literature; translation; discursive communities

Abstract:

This article addresses the transmission of a mid-eleventh century Arabic compilation of Hellenic wisdom, al-Mubashshir Ibn Fātik's *Mukhtār al-Ḥikam wa-maḥāsin al-kalim*, into medieval European languages. It documents new archival evidence for the scope of this textual tradition. The combination of digital textual and archival evidence provides important clues for building hypotheses for an expanded reception history of the Arabic text in Europe. Using corpora built in three languages—Castilian, Latin and French—it leverages stylometric analysis to explore the discursive communities in which the translations may have emerged and where they took on new meanings. The article puts medium-scale stylometry into practice in the field of comparative literature and translation studies for the exploration of large text collections, and suggests how quantitative methods could be deployed in

translingual corpus-level literary research. It also argues for the use of stylometry at early stages of literary historical research to discover new paths of inquiry.

About the Author:

David Joseph Wrisley is an Associate Professor in the Department of English at the American University of Beirut (Lebanon). His research focuses on digital humanities and comparative medieval literatures of Western Europe and the Mediterranean. He is the founder and organizer of the Digital Humanities Institute – Beirut: dhibeirut.org.

To Cite This Article:

Wrisley, D., 2016. Modeling the Transmission of al-Mubashshir Ibn Fātik's *Mukhtār al-Ḥikam* in Medieval Europe: Some Initial Data-Driven Explorations. *Journal of Religion, Media and Digital Culture* 5(1), pp. 228-257. Online. Available at: <http://www.jrmdc.com/journal/issue/view/9>.

Introduction¹

This article combines literary historical evidence and computational stylistic analysis to explore an understudied instance of knowledge transfer from the Islamic world into medieval Europe. The Arabic text in question, the *Mukhtār al-Ḥikam wa-maḥāsin al-kalim (MHMK)*, is a textual compilation of the lives and sayings of mostly Hellenic philosophers composed by al-Mubashshir Ibn Fātik. This Arabic text is exemplary for two main reasons. First, unlike the other Hellenic gnomic collections compiled in Baghdad from the eighth to tenth century, its author was active in Cairo in the mid-eleventh century, meaning that the compilation's appearance was coterminous with the height of Fatimid power and Shi'i learning, an influence that emerges prominently in the prologue to the Arabic text (Badawī 1958, p.1-4). Second, this text circulated in Iberia and was translated into Castilian in the mid-thirteenth century, kicking off its transmission in Europe, followed by translations into Latin in the thirteenth century, and then into French, Occitan and English throughout the fifteenth century.

Literary historians of medieval Europe have identified many of the key moments of translation from Latin and Arabic into the vernacular European languages, and yet the specific contexts of a given translation are often unknown (Galderisi and Agrigoroaei 2011).

Translation is, after all, neither identical to, nor coextensive with, transmission. Instead, the two concepts overlap, and in some cases, lacking multiple manuscript witnesses of a work, the concepts can be impossible to separate. We might consider translation to be the initial push of transmission. There must have been reasons for translators to embark on such a laborious task—knowledge lacunae, patronage demands or perhaps even court fashion—although the specific motives often remain the object of scholarly speculation. Translation makes a work available to a specific reading community, but it is only the beginning of the story of textual mobility. There must also be reasons in manuscript culture for a translation to be copied a sufficient number of times for it to catch the attention of another translator. The material record, however, only provides us with limited clues. Since a translation appears in a specific time and place, can computational text analysis be used to hone in on possible contexts for a translation's appearance, or perhaps to suggest sets of texts and authors with similar quantifiable features? This is one of the questions this article attempts to explore.

From the perspective of history of knowledge transfer, the significance of studying the *MHMK* tradition should be obvious: it is a strand of Mediterranean political and philosophical thought collated by Muslim scholars and passed on into Western Europe. The scope of the *MHMK* transmission in and of itself is also impressive enough to deserve more attention. It passed through five European languages and the number of known manuscript copies at the time of writing of this article has climbed to about one hundred and twenty in six different languages—with about seventy in middle French alone.

Two contexts of the *MHMK* translations that have particularly caught the eye of literary historians are thirteenth-century Castile and fifteenth-century England. The overwhelming number of manuscripts of the multilingual tradition, however, are in Latin and French, and what happened in the one hundred and fifty years that separate the two has not garnered critical attention. The text's influence in Italy, the Empire and northwestern Europe is not well documented. Copies of the translations of the *MHMK* are found in the libraries of famous patrons and scholars such as Boccaccio, Petrarch, Charles V, early French humanists and the Valois dukes of Burgundy. What have been the reasons for such a widespread diffusion? Which communities have taken an interest in this collection of gnomic sayings?

In order to begin to answer these questions, this article does not turn to close readings of the translations, nor does it aspire to study variance in them, although these are both valid research endeavors. Whereas theorists of translation imagine the parameters and conditions by which texts move through time and space, here I take a different approach, turning to

archival and linguistic data. Eschewing a theory-driven approach to translation, I focus instead on data-driven analysis in the hopes of exploring some of the contexts through which the translations passed. This article suggests that through a combination of material evidence and quantitative computational stylistics, we can attempt to situate writings within larger communities of textual production. We do that by constructing corpora based on what we know about the nature and variety of medieval vernacular text traditions.

One might suggest that, given the variation inherent to medieval textuality, we should use transcriptions of manuscripts as a way of describing textual behavior. The labor necessary to amass such documentation is enormous, however, and it is highly unlikely that digital text versions of more than one hundred and twenty manuscripts will be available for researchers anytime soon to study. Exploration of a corpus, however, does not need to begin with a totality of archival material. “If research follows record,” in the words of one digital practitioner, “what can we do with what we have?” (Shep 2014, p.75). This research began with digitized versions of the critical editions of the Castilian, Latin and French translations of the *MHMK* and three corpora in the corresponding languages representing *in toto* more than 500 texts and thirty-four million tokens, in order to explore their similarities with other texts.

Discovering the Extent of the Tradition

Knust studied the sapiential literature of thirteenth-century Castile in Arabic, Castilian and Latin. His work advanced knowledge about the medieval translations from Arabic, yet his edition of the Castilian translation, known as the *Bocados de Oro (BDO)* was based on only five manuscripts. In recent decades, Hispanists have provided us with more elaborate manuscript descriptions of thirteenth-century Iberian literature, and the number of known witnesses of the *BDO* has climbed to twenty-one (Alvar 1997; PhiloBiblon 2015).

Computerized records of manuscript holdings have no doubt increased the discoverability of such texts for specialists. Full journal issues have appeared dedicated to Iberian medieval wisdom literature and their relation to Arabic material in circulation. Scholars have begun to hypothesize about the relationship of translation, compilation and original composition at the time (Deyermond 2008).

Important studies and digital projects of the *MHMK*'s context within Arabic, Syriac and the late Hellenic world of wisdom literature have appeared in recent years (Cottrell 2012; SAWS 2016). No scholar or group of scholars has attempted to describe the translations of

the *MHMK* in their larger multilingual, Euro-Mediterranean context. Some European studies mention the Fatimid origin of the collection in passing, but they do not engage with its Arabic-Islamic specificity. Despite the existence of an Arabic edition since 1958, to my knowledge, there has not been a close analysis of the transformations of the Arabic text into Spanish and Latin.

In the case of the other stages of the text's transmission, analysis extends at most one language away. The scholarship on the Latin translation, known as the *Liber Philosophorum moralium antiquorum* (*LPMA*), is largely limited to its relationship with Italian humanism (Franceschini 1931-32; Billanovich 1948 and 2004). The French translation by Guillaume de Tignonville, known as the *Dits moraux des philosophes* (*DMP*), has been discussed by its editor as largely a derivation from the Latin (Eder 1915). Historians of early English incunabula typically only look to the French, and perhaps the Latin, as a source for the three versions of the *Dicts and Sayings of the Philosophers*.

At the time of writing this article, the online Archive de Littérature du Moyen Age (ARLIMA) indicated the existence of thirteen Latin manuscripts and some fifty in French (Brun 2015). I discovered the tradition in both languages, however, to be significantly larger. This is not a surprise; definitive catalogs of medieval textual traditions do not really exist, and data about underrepresented texts are often incomplete in them. ARLIMA indicates the presence of the Latin translation in collections in Italy, France, England and the Netherlands. Using digitized library catalogs, and searching with the traditional indicators such as incipit and explicit (*Sedechias primus fuit* and *confidendum non est*) as well as variants on the title (*Liber de dictis philosophorum*, *Liber de vitis et dictis philosophorum*, *Dicta et Castigationes sapientium*), I was able to identify an additional nine candidate manuscripts containing the Latin translation.

Among the newly located manuscripts, one in particular deserves attention— Pamplona, Cathedral manuscript 24, 2. It is the only known Latin manuscript in Spain, and it could hold important clues about the Iberian context of transmission. Among the other newly-discovered Latin manuscripts, an important pattern emerged: seven of them hail from the southern Empire. It is hard to know the exact provenance of the manuscripts without further research, but it is likely that at least a few were held by monastic institutions in Haute-Savoie, Baden-Württemberg and Bavaria (Annécý, Ettenheimklöster, St. Emmeram in Regensburg and Ingolstadt). This striking geographic proximity provides a new line of inquiry concerning transmission and reception of the *LPMA* in monastic environments in the

Empire, as well as potential transmission nodes between southern Europe and northern France, England and the Low Countries in the fourteenth century.

The same method of testing incipit and explicit (*Sede chias fut le premier and dont on a este autrefois deceu*) and a variety of possible titles in French (*Le livre des philozophes, Les croniques de plusieurs saiges philosophes*, etc.) was applied. No fewer than twenty-one new candidates emerged beyond those documented in the existing ARLIMA and JONAS databases. We know that the *DMP* was composed at the tail end of the fourteenth century, but a quick glance at the date and provenance of the manuscripts allows us to see that the text had a wide transmission around northern Europe and Italy, with a significant number of manuscripts, some of them illuminated, present around the fifteenth-century ducal court of Burgundy.

The codicological context of the *DMP* both provides clues about the bilingual climate of the royal court in which the text emerged and the understandings of that text by collecting publics. This is an important point for the construction of the digital corpora that will be discussed later in this article. The *DMP* was transmitted with a number of moral texts in “bundles”: Jacques Legrand’s *Le Livre des bonnes meurs*, Jean Lefevre de Ressons’ French translations of the *Ecloga Theoduli* and the *Disticha Catonis*, Jean Vignay’s translation of Jacques de Cessole’s *Moralisatio super ludum scaccorum*, the anonymous *Chapelet des Vertus*, and Christine de Pizan’s *Epistre Othea*. What do all such texts have in common? Certainly, they are texts that deal with moral and ethical issues, drawing upon a philosophical tradition but expressed in a more popular diction. Critics of late medieval literature usually fall back on the term “mirror for princes” to describe this kind of text: they were made for the attention of royalty. It has been argued by Sterchi (2005, p.86), on the other hand, that Tignonville’s *DMP* fits into a genre of “*normative Adelsliteratur*” [normative noble literature], a set of texts that were exchanged as a form of political communication. Such theories are not mutually exclusive, but are also potentially inadequate to describe the transmission or the audience of these texts. The wisdom-oriented texts known as the *Archiloge Sophie*, written by Augustinian friar and preacher Jacques Legrand, are after all, in theory, dedicated to the three estates.

Whatever the best generic tag might be for such texts, the cultural capital and a material history of circulation are easy to demonstrate. What follows in this article is an attempt to situate the emergence of the translations of such works not within potentially

fraught generic terms but by using the affordances of stylometrics, using linguistic, discursive characteristics to hypothesize about their appearance as translations.

A computerized search is, in principle, not that different from reading through printed library catalogs looking for keywords, alternative titles or any other such clues that designate the presence of a text in a specific collection. The main difference is, of course, the speed with which we can carry out such searches, an advantage which is diminished by the inconsistency of the “metadata” of medieval texts. Not knowing even the title used to describe a text in the archives, searching for manuscript witnesses can feel like looking for a needle in a haystack. A week of gathering details through manual searches using the keywords mentioned above yielded, however, astonishing results, opening up a whole set of questions about textual provenance as well as the fabrication and mobility of manuscripts.

Stylometric Exploration of the *Mukhtār al-Ḥikam*'s Translational Contexts

Other quantitative means of exploring textual traditions are possible when we possess textual corpora. In this article, we propose measuring lexical difference across a large number of texts and visualizing that difference as a network. In this second part of the article, we use computational stylistic methods, namely those included in the Stylo package for R (Eder, Rybicki and Kestemont 2014; 2016), in order to measure most-frequent-word-occurrences in large numbers of medieval texts. This method offers a way of exploring the larger textual communities of the network of translations of the *MHMK* by looking at common quantitative assessment of stylistic features. This article focuses on word frequencies, although follow-up research could expand to investigate any countable features of the texts.

Behind stylometric experimentation lies the assumption of some form of system. Writers exist within discursive communities that are diverse groupings of both individual and common traits, inside of which there are detectable patterns of common language usage. Stylometry has been applied in textual forensics, as well as in the field of author attribution. Newer approaches have stressed its extension to corpus literary studies, employing a computational, quantitative methodological approach to stylistics (Biber 2011 and Fialho/Zyngier 2014). Working with a large corpus of texts, and incidentally medieval texts that are very often anonymous, we might attempt to extend stylometrics beyond author attribution to study formulaic genres, affinities between schools of thought, political affiliation or even groups of authors writing at the same time or in the same place. To write

epic, for instance, may just mean being close to a community in which generic, discursive norms are constantly created—and recreated—through listening, reading and interacting with other epic texts. That being said, measuring lexical difference in different systems made up of different “bags of words” is bound to pick up different kinds of signals (genre, provenance, dialect, etc) and differently constructed corpora may just yield different results. The combination of stylometric analysis and network visualization treats countable features of language between texts as an interconnected system; as such, a corpus can be broken down into communities sharing common quantifiable relationships. Furthermore, the size, the connectivity and the proximity—dare we say the influence—of such communities might be measured.

Large-corpus stylometry is only in its infancy, and both the size and the nature of the corpus pose definite methodological problems (Eder 2015). Stylometry is potentially affected by issues specific to medieval texts (variance, *scriptae*, historical language change) and the impact of these particularities on quantitative analyses are only beginning to be explored. As such, large scale stylometry of medieval texts as a way of modeling discursive communities must be viewed as experimental, exploratory and above all heuristic. Some scholars, such as Brinkman, have argued for the construction of corpora according to a strict unity of genre, time and space as the only means of assuring methodological rigor in quantitative textual studies (as cited by Kestemont, Moens and Deploige 2013, pp.55-57). Such demands of unity, however, restrict experimentation with literary historical materials, and in my opinion they run the risk of reifying normative, if not anachronistic, notions of genre. In one recent collaborative project, analyzing a large medieval French corpus has demonstrated that stylometrics not only produce results that concur with well known details in literary history, but also suggest new lines of inquiry about communities of authors working within or across the same genre, time or space (Richards forthcoming; Richards, Dulac and Wrisley 2016). These results expand upon, and even challenge, established knowledge of literary history.

The traditional use cases of stylometry have been in attempts to confirm the identity or authenticity of authorship, but its application in literary forensics (translation, co-authorship, scribal identity, etc) has blossomed in recent years. There have even been calls to reconsider the definition of style itself to construct a largely empirical perspective on texts (Herrmann, van Dalen-Oskam and Schöch 2015, pp.44-48). Stylometry has also spread, particularly in Europe, beyond the early emphasis on modern and contemporary texts in English. In pre-modern French, Schöch (2013; 2014) has worked on “fine tuning” stylometric analysis for

genre and form to study attribution controversies in the Corneille-Molière debate.

Translation, self-translation and collaborative translation have served as test cases to examine whether classic measures of distance can address the old debate of the invisibility of the translator (Rybicki 2012). What follows in this article is an attempt at pushing stylometry into a trilingual use case, to look at the wider context of three translations in large unilingual corpora in order to sketch a fuller literary historical picture for the translations of a specific Arabic text in the medieval West.

The approach here involves computing lexical difference between works in a large corpus in order to build bootstrap consensus trees for each of the three research languages. The bootstrap consensus network method used in this research combines “many different tree diagrams for a variety of parameter values,” yielding a compromise view over a number of iterations (Eder, Rybicki and Kestemont 2014). As such, it imitates attempts to visualize networks of textual relations carried out for classical and patristic Latin (Eder 2014; 2015) and for modern English (Rybicki 2014). The workflow for carrying out such research begins with the acquisition and pre-processing of a large number of texts, representing a considerable investment of time and energy. Yet those corpora can always grow larger, to cover the field of literary production at any given moment. A corpus never fully captures a textual tradition, but it can approximate it. In the three languages an effort was made to construct as comprehensive a corpus as was possible for the hypothesized moment of emergence of a translation.

Stylometric analysis resembles other forms of computational modeling. It is a quantitative approach to textual corpora that “instantiates an attempt to capture the dynamic, experiential aspects of a phenomenon rather than to freeze it into an ahistorical abstraction” (McCarty, 1998/2014). Iterative modeling of a textual tradition over time might provide a description of a larger and larger system, or one with ever-growing detail, but it ultimately yields “temporary states in a process of coming to know” (McCarty 1998/2014, p.27). A question to be answered by large-scale stylometry in the near future will be how large such textual systems can grow while remaining a viable model with useful results. Approaches applied to modern languages will necessarily also have to be refined to explore pre-modern corpora.

A few words on visualizations: we model a literary tradition based on the calculated distances across a plain-text corpus. The network visualizations translate the tables of calculations into undirected graph structures. Those visualizations, like the calculations they

rely upon, resemble digital maps in the sense that they are not static objects and they “do not explicitly seek authority or objectivity but provoke negotiation ... [and] they are inherently unstable, continually unfolding and changing in response to new data, new perspectives and new insights” (Bodenhamer, Corrigan and Harris 2015, p.4). The digital literary historian must exercise caution with such visual representations and their interpretation. Embedded in the linear flow of academic prose argument such as this article, the visualizations could wrongfully be taken as frozen abstractions and read as authoritative, even unchanging results. Instead, the network graphs reproduced here are really a compromise with the print medium—an analytical snapshot—representing a certain stage of development of the corpus as well as parameter-specific results. The relationships between texts are better explored in their online, interactive graph version (available at <http://djwrisley.com/networks/JRMDC/>).

The *Bocados de oro* in the Medieval Iberian Context

A selection of sixty-some texts for the analysis of the Iberian context spanning the period of the mid thirteenth-century to late fourteenth-century was assembled. It came mostly from the Hispanic Seminary for Medieval Studies digital library (and in particular, from the sections Prose Works of Alfonso X El Sabio, Spanish Medical Texts, Navarro-Aragonese Texts and Spanish Legal Texts), with a few additions from online editions, the Biblioteca Virtual Cervantes and Wikisource. This sample amounted to around five million six hundred thousand tokens. Digitized versions of both the Crombach and Parker editions of the *BDO* were included. The Crombach digital edition of *BDO* was prepared to a high degree of accuracy, whereas the microfilm copy of the Parker only produced a digital text of medium accuracy. The algorithm used for this graph is Eder's simple Delta, a variation on Delta that slightly weights the most frequent words and is the best solution for inflected languages such as Latin and the Romance Languages. A bootstrap consensus network was created using Stylo in R and was visualized using the Force Atlas 2 algorithm in Gephi.

Complex networks can be seen as composed of communities, by which is meant that there are sub-groups of nodes that exhibit a particularly dense interrelationship. Using the modularity detection algorithm indigenous to Gephi, eight different communities were identified (modularity 0.779) (Blondel et al. 2008). A high modularity points to more robust connections between texts (nodes) in the communities and less robust connections between texts falling outside of those communities.

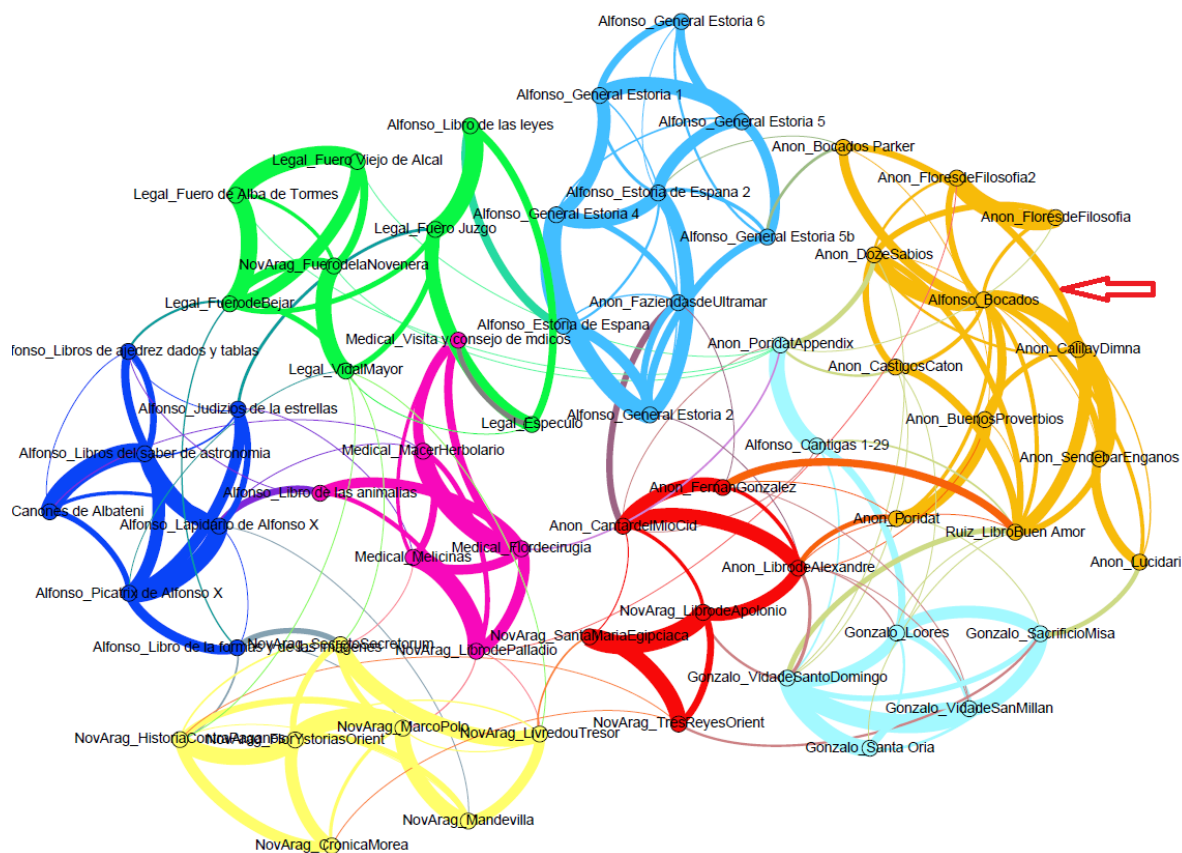


Figure 1: Network visualization of 1000 most frequent word calculations carried out on a corpus of Castilian, Navarro-Aragonese and Galician Literature. The *Bocados de oro*'s position is labeled by the red arrow (upper right)²

The network visualization of most frequent word difference in the medieval Iberian corpus illustrates clearly formed communities around generic or thematic lines. We find clusters for historical writing (cornflower blue, center top), legal texts (green, upper left), medical texts (fuschia, center left), late fourteenth-century Navarro-Aragonese texts (yellow, bottom left), a single-author cluster by Gonzalo de Berceo made up of texts of Marian devotion (baby blue, bottom right), the genre of *Mester de Clerecia* texts (red, center right), Alphonsine scientific translations (royal blue, left) and sapiential literature (orange, right). It is in the last community that the translation of the *MHMK* into Castilian sits squarely. A few details in the whole network, however, merit attention. A few Navarro-Aragonese works are situated within other communities (the *Fuero de la Novenera* sits with the other legal texts in green at

top left, and the *Libro de Apolonio*, *Santa María Egipcíaca* and *Tres Reyes d'Orient* cluster with Castilian texts of the Mester de Clerecía genre in red). This corpus has been constructed of works of different times, genres and authors, breaking three of Brinkman's commandments for authorship attribution, numbers 5, 6 and 7 (cited by Kestemont 2012, p.56). It will be worthwhile in further research, therefore, to explore whether legal diction is sufficiently language independent, and likewise if the stylometric results that group some of the Navarro-Aragonese texts with the Castilian are due either to language difference or generic issues.

The relationships of proximity in the orange community point to a number of issues related to sapiential literature. First, over repeated attempts to build this network graph with differently-composed corpora, this orange community of texts remained tightly clustered. Curiously, stylometric analysis never divided the texts that are direct translations from Arabic, or indirect from Arabic via Latin, from those texts that are derived from largely Latin sources. Two non-mutually exclusive conclusions might be drawn from this scenario: either most-frequent-word stylometry is unable to distinguish between different source languages of translations, or the culture of sapiential literature in thirteenth-century Iberia had found a sufficiently common language in Castilian.

Second, the inclusion of the fourteenth-century *Libro de Buen Amor* firmly in the cluster would seem to suggest persistent intertextual influence of that genre on Jean Ruiz. This is not discordant with scholarly opinion about the *Libro de Buen Amor*.

Third, the orange cluster of sapiential literature is very distinct from the royal blue Alphonsine scientific translations, discouraging us from thinking of all Iberian translations from Arabograph culture as being the similar. Stylometrics detects a distinct signal for the texts from the schools of scientific translation.

Fourth, not all texts we label as "sapiential" find themselves in the orange cluster, because the appendix of the *Poridat de los Poridades* is just outside and the Navarro-Aragonese *Secreto de los Secretos* sits along with the yellow cluster, although the latter may be due to language difference as mentioned above.

Last, throughout this stylometric experiment the orange-colored cluster of sapiential literature remained steadily connected to the baby-blue cluster of writings of Gonzalo de Berceo, the Castilian religious poet closely related to the Benedictine monastery of San Millán de la Cogolla. This close connection should encourage literary historians to investigate the connection between sapiential literature and popular piety. Too often the sapiential literature is described as falling in the "mirror for princes" category, restricting our

view of its cultural import. We need to think more about the literary and cultural context of both its emergence and reception.

The Liber Philosophorum Moralium Antiquorum in Medieval Latin

As if he were anticipating distant reading as early as the close of World War Two, Curtius evoked the impasse of literary nationalisms in his landmark *European Literature and the Latin Middle Ages* (first published in 1948). In his Foreward to the English translation of his book, he suggested the need for a more than just a bird's eye view in order to see a larger, but temporarily masked, unity of Latin European culture (Curtius 2013, p.xxv). He invoked the metaphor of aerial photography, the military technology that created huge advances in the archaeological scholarship of his age, perhaps hoping for a similar means that would allow literary historians to see larger patterns. Stylometry does suggest “big picture” connectivity of textual communities across space and time. One can only imagine Curtius' curiosity viewing stylometric network visualizations.

The spatio-temporal breadth of Latin is greater than the medieval vernacular languages (yet rivaled by Arabic) and its scale is both a boon and a challenge. A culture of Latin learning assured a shared textual culture and its wide diffusion. What we might call “big Latin data” also facilitated cross-lingual transmission in the multilingual environments discussed in this essay. Language change and orthographic variance are not as significant as in the case of the vernacular languages, but given the size of the Latin corpus in the Middle Ages, and the variety of texts composed in it, stylometric analysis could pick up many different signals and perhaps several at the same time. Writing in Latin sometimes meant engaging with very old and distant models of style. This requires delicate analysis of results, since the large scenario modeled here moves us toward Eder's experiment with the medieval Latin of the *Patrologia Latina*. Our corpus was much smaller, yet the spatio-temporal and generic spread of works was nonetheless large.

A corpus of more than one hundred and twenty texts, representing approximately four million tokens, was assembled from various sources: the Archivio della Latinità Italiana del Medioevo (ALIM), The Latin Library, the Bibliotheca Augustana, Biblioteca digitale di testi latini tardoantichi (digilibLT), the Corpus Thomisticum as well as some digitized books. In building the corpus, an effort was made to adjust it to include representative “best-sellers” of the Latin Middle Ages. Based on the FAMA project data, texts such as Aegidius Romanus'

De regimine principum, Dares Phrygius' *De excidio Troiae historia* and Boethius' *Consolatio philosophiae* were added, representing textual traditions each with a very large number of manuscripts: 350, 200 and 900 respectively (Bourgain, Siri and Stutzmann 2015). Including these texts does not mean that their diffusion was even across time and space, but it does populate the corpus with texts that would have been easier to locate and read in the Middle Ages, providing a wider representative sample of influential kinds of writing. With the indigenous modularity algorithm of Gephi, nine communities were detected within this graph (modularity 0.707).



Figure 2: Network visualization of 1000 MFW most frequent word calculations carried out on a corpus of medieval Latin Literature for 3 character n-grams. The position of the *Liber Philosophorum Moralium Antiquorum* is labeled by the red arrow (upper right)³

The Latin network graph is too detailed to be discussed in full in this article, but I will offer four general comments. First, stylometric analysis does not separate Latin textual production into secular and Christian camps as Raby did nearly a century ago or as the online Latin

Library (<http://www.thelatinlibrary.com>) still does.⁴ The two separate worlds, if they ever really existed, appear in this analytic framework as fully interconnected, at least linguistically.

Second, certain authors and texts seem very central in the network. Major nodes possessing dense connections within communities are apparent: Albertano of Brescia, Augustine, Abelard, Bede, Hrabanus Maurus, Jacques of Voragine, Otto of Freising, William of Tyre. These authors seem to be stylometric “anchors” that medievalists will no doubt want to investigate in subsequent quantitative models.

Third, as far as texts of Arabic-Islamic origin go, they are not detected as a separate community – just as we found in the case of the Castilian translations. The light purple philosophic community (left) contains Latin translations of al-Fārābī as well as Gerard of Cremona’s translation of an Arabic pseudo-Aristotle text, the *Liber de causis*, clustering with such authoritative Latin philosophical authors as Aquinas, Albertus Magnus or Boethius of Dacia. What is more, the Latin translation of Al-Kindi’s *Risāla* clusters with other Latin anti-Jewish apologetic texts in the fuschia cluster at center.

Fourth, the *LPMA* was initially attributed to John of Procida, Salernitan physician of the late thirteenth century based on the colophon of one of the oldest manuscripts (Bibliothèque nationale de France, manuscrit latin 6069V). This seemed to square with some of the moral and medical contents of the text, although this attribution has now largely been discredited. In the interest of experimentation, I strategically placed a key text of Arabic medical practice in Salerno, the *Flos Medicinae* of the Schola Medica Salernitana, as well as other Sicilian texts by Peter of Eboli to see if a signal of either provenance or authorship might be detected. None was, and the latter texts clustered together in mustard yellow at the right of the network without attracting the *LPMA*. This does not disprove the hypothesis of southern Italian provenance, but in combination with evidence provided below it seems that an Iberian provenance is just as likely, if not more likely.

Concerning the kind of sapiential literature found bound together and described in the first section of this article, curiously the *Disticha Catonis*, a very popular group of aphorisms attributed to Cato, fell nowhere near the main sapiential cluster. Instead it found a place above, linked to Boethius’ *Consolatio Philosophiae* and Geoffrey of Winchester’s *Epigrammata*. Likewise, Bede’s *Liber Proverbiorum* remained distant from the community in question. A close-up of the section of the community that corresponds to Iberian sapiential literature in Latin is shown here:

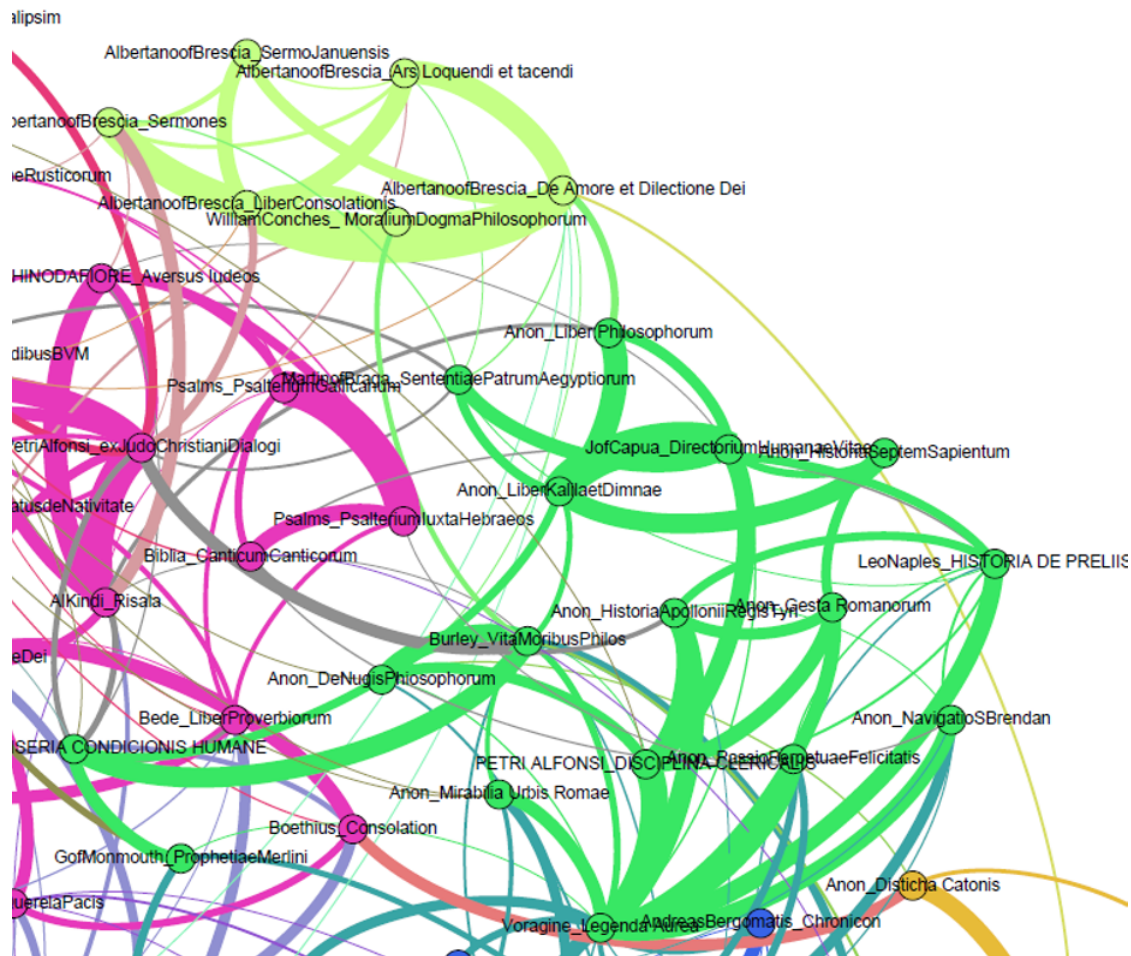


Figure 3: Close-up of the Community Containing Medieval Latin Sapiential Literature, including the *Liber Philosophorum Moralium Antiquorum*

The green in the lower right appears to contain sub-cluster. One links the *LPMA*, the *Liber Kalilae et Dimnae*, John of Capua's *Directorium humane vitae* and the *Historia Septem Sapientum*. To the left and below, also in green, are the *De Nugis Philosophorum* and William Burley's *De Vita et Moribus Philosophorum*. To the right, one finds the *Legenda Aurea* along with Peter Alphonse's *Disciplina Clericalis* and the *Gesta Romanorum*. The entire green cluster, in other words, largely groups together works whose textual structure is terse and anecdotal. In the latter two sub-clusters we find some of the most popular texts in the Middle Ages for citation about the late antique world *ad usum predicatorum*. That is, they were used for contemporary sermoneering or compilation. The interconnected light-green cluster above links this sapiential literature to Albertanus of Brescia, author of many Latin social and religious sermons.

The *LPMA* exhibits strong bonds with four works. The first two are lighter bonds with Albertanus's *De Amore et dilectione Dei* and al-Kindi's *Risāla*. In the case of the former, this is perhaps due to a significant intertext—Seneca's *Epistulae morales*—whereas in the latter the relationship as two texts of Arabic origin can only be worth investigating. These bonds are reminiscent, of course, of the relationship evoked above with the *BDO* and the way its network brought together sapiential literature, sermoning and popular religious treatises. It would be useful in subsequent research to examine this nexus (that is, at the interface of Latin and the vernacular) and to consider translation as one of the vectors of its robustness.

Returning to the first sub-cluster, John of Capua's *Directorium Humanae Vitae* is a Latin translation of Rabbi Joel's Hebrew version of the Calila and Dimna legend. The *LPMA*, therefore, maintains a close connection to two versions of the same legend, to John of Capua's and to the anonymous *Liber Kalilae et Dimnae*, but not to the same extent with each. The latter was among the first translations from Arabic commissioned by Fernando III, and was completed under Alfonso X of Spain. Since John of Capua was a Jewish convert to Christianity and was active in Rome later in the late thirteenth century, and the *BDO* is believed to be from the mid-thirteenth century, the strong linkage between the three works is surely not a synchronic indication but rather one of shared subject or genre. Nearby texts include the twelfth-century *Disciplina clericalis*, a collation of Mediterranean fables also made by a Jewish convert in Iberia, often used in sermoning, and the *Historia Septem Sapientium*, a framed narrative of Sanskrit, Persian and Hebrew rather than Iberian origin, and Mediterranean in transmission. This part of the network features works from different places and times, making it difficult to interpret. Is the signal detected here thematic? That of translations? A common origin of the tales? Could it be, more abstractly, the general diction of the framed narrative system of the pre-modern Mediterranean (Mallette forthcoming)? No doubt more research is needed.

As mentioned above, the degree of closeness between the *LPMA* and the two versions of the Calila and Dimna legend is not equal. Across iterations of this network graph, the edge linking the *LPMA* to the anonymous *Liber Kalilae et Dimnae*, and the edge between the latter and John of Capua's *Directorium Humanae Vitae* remained stronger than the edge between *LPMA* and John of Capua. This repeated empirical finding of stronger lexical affinity leads me to believe that the *LPMA* was, like the *Liber Kalilae et Dimnae*, actually one of the Iberian translations commissioned by Fernando III. The strong bond between the two translations points no doubt to a similar subject, namely being derived from the same source. Stylometry

has not provided us with exact dating for the *LPMA*, but its appearance in Latin with closer proximity to *Liber Kalilae et Dimnae* is suggested by the preliminary analysis here. More clues are likely to be found by taking a fresh look at the Latin–vernacular interface, examining the Arabic text with the Spanish and the Latin together, while keeping in mind the influence of popular piety and sermoning. It may also be along these lines that the reception of the Latin work in monastic environments in the southern Empire could be explained. As the medieval Latin and vernacular corpora grow, it could prove beneficial to build custom sets to test out specific relationships of texts at that bilingual interface.

The *Dits moraux des philosophes* and its Medieval French Context

Whereas corpora of hundreds of medieval Spanish and Latin texts exist in open access, this is not true of medieval French. Existing French corpora are smaller, they are largely built for the purposes of linguistic research and they are not open. What is more, most corpora of medieval French do not extend past the thirteenth or fourteenth centuries. I have been building a plain-text corpus in collaboration with Jeff Richards (Bergische Universität Wuppertal, Germany), and at the time of writing we have assembled over three hundred and fifty medieval French texts, representing about twenty-four million tokens. The corpus contains texts in both verse and prose spanning the twelfth to fifteenth centuries, with particular attention to late fourteenth-century humanism because of our overlapping research interests. Using this corpus, lexical differences were computed with the Stylo package for R and were visualized, producing the labeled graph below. The colors indicate the sixteen communities detected by Gephi’s modularity algorithm (modularity 0.793).



Figure 4: Network visualization of 1000 MFW calculations carried out with corpus of medieval French Literature. The position of the *Dits moraux des philosophes* is indicated by the red arrow (upper left)⁵

The royal blue community in which we find Guillaume de Tignonville (indicated by the red arrow in the upper third of the graph at left) is a veritable who's who of court translators, a real-life community steeped in the bilingualism of the late fourteenth and early fifteenth centuries. They are Jean Gerson, Christine de Pizan, Jean Miélot, Jean Courtecuisse, Evrart de Conty, Guillaume de Tignonville, Jean Vignay, Raoul de Presles, Evrart de Tremeaugon, Jean Miélot, Denis Foulechat, the anonymous translators of the *Miroir des Dames* and the various anonymous translators of Boethius's *Consolatio Philosophiae*.

Authorship, dating and localization of the text are easier in the case of the *DMP*, for the simple reason that much more archival evidence is available for the literary history of the fifteenth century. Guillaume de Tignonville's text is a major source for Christine de Pizan's

Epistre Othea, the latter being dated around 1400 (Campbell 1924, pp.177-184; Wrisley 2012). For the purpose of understanding court literature of this period, our French corpus was specifically enriched with one its most robust forms: translations made from Latin. The corpus consists of every major figure who was writing in Paris in the late 14th century whose works have been edited.⁶ The rationale behind including so many translations is not only that this is the milieu from which Tignonville as a translator emerged, but also that the world of French writing overlaps significantly with writing in Latin, many of the writers drawing upon their bilingualism for the purposes of textual creation. There is little scholarship on Tignonville, although his bond to humanist scholarship of the late fourteenth century has been previously suggested (Eder 1915; Parussa 1999). With the goal of focusing on the specific period of Tignonville in mind, a smaller subcorpus of some ninety texts from the fourteenth and fifteenth centuries was assembled.

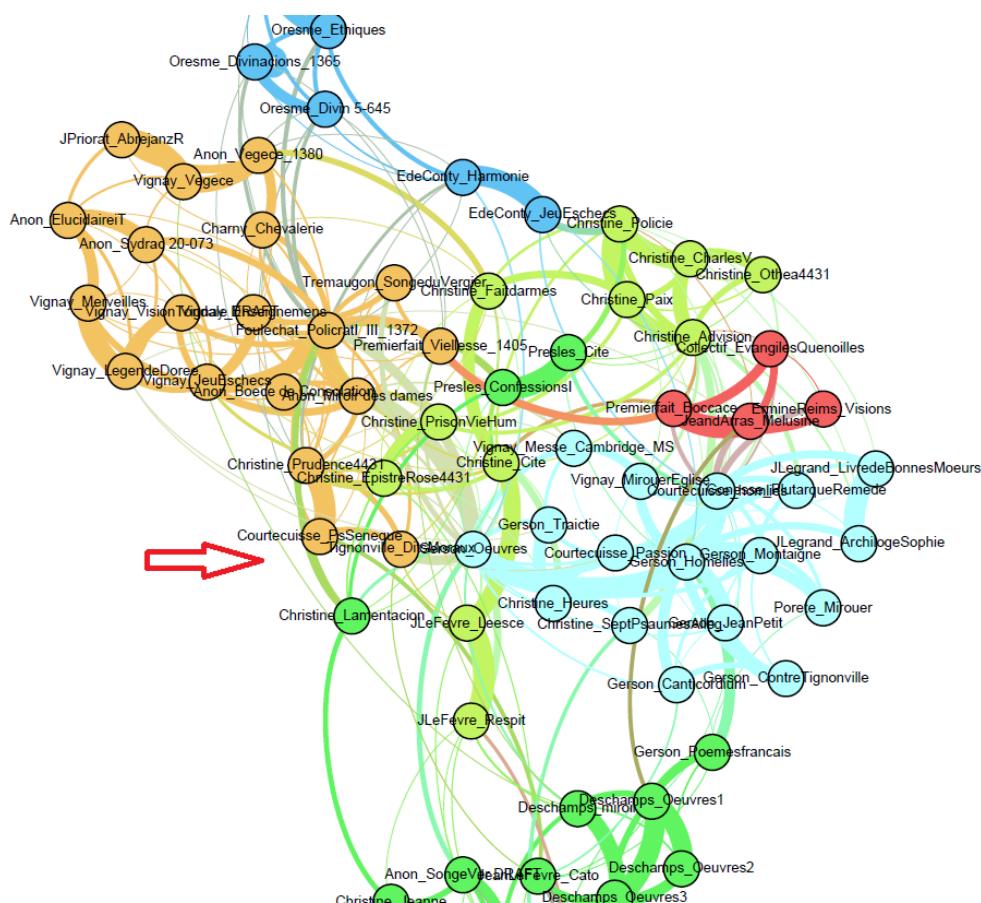


Figure 5: Detail of a network visualization of 1000 MFW calculations done with the Stylo package in R on a French subcorpus of fourteenth- and fifteenth-century works. The position of the *Dits moraux des philosophes* is indicated by a red arrow

(left middle)⁷

In this smaller sub-corpus, we are viewing a close-up of the specific relations of a moment of late fourteenth- and early fifteenth-century court writing. First, it is worth noting a major difference between the French and Latin translations of the *MHMK*. The *DMP* reaches the community of French-language writers in an environment stewarded by the court of King Charles V. The *DMP* is no longer associated with popular piety or preaching as was the case of the Latin sapiential community, but it is here associated with humanistic translations. That a bilingual early humanist circle exists, sharing a common discursive orientation, is borne out by stylometric analysis, but traditional literary criticism also tells us that these writers were citing each other, such as the case of Jean Miélot using Tignonville as a sourcebook (Visser-Fuchs 2005, p.198).

Second, it is worth commenting on the difference between stylometry and what is proved by more traditional source studies. We know, for example, that Christine de Pizan cites the *DMP* in the many of the chapters of her “bestseller,” the *Epistre Othea*. This direct intertextual evidence has been used to suggest a specific affinity, even friendship, between Christine de Pizan and Guillaume de Tignonville, and yet no strong network bond between these two authors' texts emerges in the stylometric analysis. Some literary scholars would claim that the persistent citation of another author is strong proof of intertextuality. We can be quite sure in such a case that one author was acquainted with another author's work. This intertextual link is not the same as the lexical proximity based on most frequent word stylometrics across a corpus. Discursive systems no doubt include instances of authors who imitate the style of others, or even cite them repeatedly, but these are distinct from a quantitatively detectable similarity across thousands, even tens and hundreds of thousands, of words.

On the weaker edges in the network connected to Tignonville's text, we find Christine de Pizan's *Livre de faits d'armes et de chevalerie* (1410), Jean Lefevre's *Livre de Leesce* (1380-87) as well as his translation of the *Disticha Catonis* and Denis Foulechat's translation of the *Policraticus* (1372). The stronger edges of the network point to what was a rather tight discursive community of high-ranking personages at the turn of the fifteenth century. These include Guillaume de Tignonville, who was named *prévôt de Paris* (chief of police) in 1401, Jean Gerson, chancellor of the University of Paris beginning in 1396, Jean Courtecuisse, canon of Notre Dame Cathedral in Paris and translator of the pseudo-Seneca in 1403, as well

as Christine de Pizan, woman of letters and daughter of the court astrologer of Charles V. This group might be thought of as an inner circle of the three key urban institutions of medieval Paris: university, church and court. Stylometrics confirm this group as a discursive community. A cursory “human” readthrough of Christine’s *Livre de Prudence* (1405-07) suggests a shared diction with Tignonville and many thematic commonalities. Stylometry picks up this signal as well.

By discursive community is not meant immediate political alliance. The first version of Christine’s epistles for the debate of the Rose had been dedicated to Tignonville, but she removed that dedication some years later after Tignonville’s falling out with the chancellor of the university in 1408. The shifting sands of political relationships do not necessarily negate the linguistic affinities built into communities of interchange, based on a variety of formal and informal kinds of contact. Or at least it does not happen quickly. More research is needed to understand better how, where and on what basis such linguistic affinities come into being, but also how they may indeed change or disappear during the lifetime of an author.

A computational modeling approach to examining the place of a translation of a work from Arabic in the discursive community of the French court has confirmed what was suggested by literary historians, namely that Tignonville sits within a network of early French humanism. It illustrates a fascinating set of relationships between writers, political figures and translators that deserves further investigation. Such research is best done in combination with other forms of literary historical evidence, further digital textual analysis and close reading. This will also include network actors who were not producers of a large amount of text. A common figure unmentioned here since we do not have any writings by him is Jean, duke of Berry, present at Charles VI’s literary court founded in 1401, known as the *cour amoureuse*. It is crucial to mention many texts are dedicated to Jean de Berry, for example Courtecuisse’s translation.

We are lucky to have a plethora of texts from a specific time and place in order to be able to come up with such fine-grained results in the case of the translation of the *MHMK* in French. Subsequent modeling of this first decade of the fifteenth century in Paris might proceed with the inclusion of additional texts. To further the hypothesis of the 1396-1408 community, other sufficient textual samples from around the *cour amoureuse* might include Jean de Montreuil, Alain Chartier and Gontier Col. The challenge of such stylometric analysis for such historical cultural modeling is to navigate the available texts of the historical record always keeping in mind that this way of asking questions “[opens] up rather than glossing

over the inevitable discrepancies between representations and reality on which that questioning focuses” (McCarty 1998/2014, p.38).

Conclusion

Supranational approaches to literary studies of the middle ages do not make up a large portion of research in traditional medieval studies, but even less so if one includes relationships with the Arabograph world. In the digital humanities this is also very much the case. There are very good digital projects in Arabic and Islamic studies, as well as in comparative literature in languages other than English, but compared to the bulk of research, topics of Arab heritage, interaction and influence are definitely underrepresented. Digital Mediterranean approaches to cross-cultural and cross-confessional research need to be encouraged, but at the same time their application is more difficult where language resources and corpora are not as developed. This article has focused on stylometric analysis of the *MHMK* within the Romance language corpora. Our understanding of the fuller picture of the *MHMK* depends on extending that into Arabic and middle English. Fine-tuning stylometry for many historical states of so many languages, and for Arabic with its particularities, is an important task for the future.

This article raised two points early on that I would like to repeat. First, when embarking on experimental digital research we often have to make do with what we have available to us. Second, modeling is an iterative, dynamic process that yields “temporary states in a process of coming to know” (McCarty 1998/2014, p.27). This being said, the impact of modeling the transmission of the *MHMK* breaks new ground. Whereas Hispanists knew that their thirteenth-century sapiential literature was co-created with translations from the Arabic, few specialists of medieval Latin, and ever fewer French medievalists, knew that there was an Arabic text circulating amongst their canon, a text which was being used as an important sourcebook for court writers. If they did know this, few have considered the implications of its existence.

Stylometric analysis has allowed us to suggest that the Spanish and the Latin translations should be thought of as close to the discursive community of sermoning and popular piety, ostensibly for the purposes of conversion in multi-confessional Iberia. This article has not addressed the thorny question of exact timing of the translation into Spanish and into Latin, as well as the issue of whether those translations were serial or simultaneous. Further modeling of Iberian Castilian and Latin works may or may not solve that problem in

literary history. Some one hundred and fifty years later, at the turn of the fourteenth century, the French translation is made within the context of an erudite Parisian community of humanists and is put to an entirely different cultural use. We are not able to do stylometry on a multilingual corpus in a single operation, but we can do it on parallel, historically overlapping corpora. In both the Iberian and the French case, there are examples of bilingual writers, and the closeness revealed by stylometry allow us to build bridges via such texts and authors that give some insight into the linguistic interfaces of the period. One can only hope that in other fields of textual studies—text alignment, text reuse—advances will be made in multilingual applications that will enhance the possibilities of semi-automatic research on corpora interesting to researchers invested in digital comparative literature.

Notes

1 Early versions of this work were circulated at the 13th Annual Mediterranean Research Meeting in Montecatini Terme, Italy (March 2012). My thanks go to the organizers of our session, Brian Catlos and Sharon Kinoshita, as well as to the participants for their helpful feedback, in particular Maribel Fierro. Particular thanks go to Jeff Richards for his collegiality and enthusiasm in building the Latin and French corpora, as well as to Maciej Eder and Jan Rybicki who originally taught me to use the Stylo package for R at a workshop at the Göttingen Center for Digital Humanities in the Fall of 2013. Additional thanks to Susanna Allés who offered input on a draft as well as to my former research assistants, Amin Kurani and Amina Jaafar Harb and the anonymous reviewer's thoughtful comments that made this piece stronger.

2 An interactive version of this network can be explored at djwrisley.com/networks/JRMDC/MedIbe. The nature of our corpus does not permit open publication. The final features data for this network (the frequencies, wordlists and Gephi project file) can be downloaded at djwrisley.com/networks/JRMDC/MedIbe/data.

3 An interactive version of this network can be explored at djwrisley.com/networks/JRMDC/MedLat. The final features can be downloaded at djwrisley.com/networks/JRMDC/MedLat/data/.

4 I acknowledge Jeff Richards for this observation.

5 An interactive version of this network can be explored at djwrisley.com/networks/JRMDC/MedFre. The final features can be downloaded at djwrisley.com/networks/JRMDC/MedFre/data.

6 Notable exceptions are Jean de Vignay's translation of Vincent de Beauvais, as well as the translation of Livy.

7 An interactive version of this network can be explored at djwrisley.com/networks/JRMDC/MedFre14-15. The final features can be downloaded at djwrisley.com/networks/JRMDC/MedFre14-15/data.

Bibliography

Editions of the *MHMK* text tradition

- Badawī, 'A. ed., 1958. *Mukhtār al-Ḥikam wa-maḥāsīn al-kalim*. Madrid: Publicaciones del Instituto Egipcio de Estudios Islámicos. (Arabic)
- Brunel, C. ed., 1939. Une traduction provençale des « Dits des philosophes » de Guillaume de Tignonville. *Bibliothèque de l'école des chartes* 100, pp.329-338. [online] Available at: http://www.persee.fr/web/revues/home/prescript/article/bec_0373-6237_1939_num_100_1_449197. (Occitan) [Accessed 15 June 2015]
- Bühler, C. ed., 1941. *The Dicts and Sayings of the Philosophers: The Translations Made by Stephen Scrope, William Worcester, and an Anonymous Translator*. London: Oxford University Press. (English)
- Crombach, M. ed., 1971. *Bocados de Oro*. Romanistische Versuche und Vorarbeiten, 37. Bonn: Romanisches Seminar der Universität Bonn. (Castilian)
- Eder, R. ed., 1915. Tignonvillana inedita. *Romanische Forschungen* 33(3), pp.851-1022. [online] Available at: <http://catalog.hathitrust.org/Record/008890214>. (French) [Accessed 15 June 2015]
- Franceschini, E. ed., 1931-32. II *Liber philosophorum moralium antiquorum*. Testo critico. *Atti del Reale Istituto veneto di scienze, lettere ed arti* 91(2), pp.393-597. (Latin)
- Parker, M. ed., 1993. *Text and Concordance of Bocados de Oro: BNM I-187*. Hispanic Seminary of Medieval Studies 90. Madison: Hispanic Seminary of Medieval Studies. (Castilian)
- Sutton, J. ed., 2006. *The Dicts and Sayings of the Philosophers*. TEAMS Middle English Texts Series. [online] Available at: <http://d.lib.rochester.edu/teams/publication/sutton-the-dicts-and-sayings-of-the-philosophers>. (English) [Accessed 15 June 2015]

Secondary Works

- Alvar, C., 1997. Manuscritos y tradición textual: desde los orígenes hasta c. 1350. *Revista de Filología Española* 77(2), pp.33-68.
- Biber, D., 2011. Corpus Linguistics and the Scientific Study of Literature: Back to the Future? *Scientific Study of Literature* 1(1), pp.15-23.
- Billanovich, G., 1948. La Tradizione del ‘Liber de dictis philosophorum antiquorum’ et la cultura di Dante del Petrarca e del Boccaccio. *Studi Petrarqueschi* 1, pp.111-123.
- Billanovich, G., 2004. Il *Liber de dictis philosophorum antiquorum*. In: M. Cortesi, ed. 2004. *Itinera : Vicende di Libri e di Testi*. Rome: Edizioni di storia e di letteratura. pp.261-279.
- Blondel, V., J.-L. Guillaume, R. Lambiotte and E. Lefebvre, 2008. Fast Unfolding of Communities in Large Networks. *Journal of Statistical Mechanics: Theory and Experiment* 10, p.1000.
- Bodenhamer, D., 2015. Between Matter and Meaning: Deep Maps and the Spatial Humanities. In: D. Bodenhamer, J. Corrigan and T. Harris, eds. 2015. *Deep Maps and Spatial Narratives*. Bloomington : Indiana University Press. Introduction.
- Bourgain, P., F. Siri and D. Stutzmann (2015) FAMA : Œuvres latines médiévales à succès, Institut de recherche et d'histoire des textes (IRHT-CNRS). [online] Available at: <http://fama.irht.cnrs.fr>. [Accessed 15 June 2015]
- Brun, L., 2015. *Archives de littérature du moyen âge (ARLIMA)* [online] Available at: <http://www.arlima.net>. [Accessed 15 June 2015]
- Campbell, P., 1924. *L'Épître d'Othéa. Etude sur les sources de Christine de Pisan*. Paris : Honoré Champion.

- Cottrell, E., 2012. Al-Mubaššir ibn Fātik and the α Version of the Alexander Romance. In: R. Stoneman, I. Erickson, I. Netton, eds. 2012. *The Alexander Romance in Persia and the East*. pp.233-254.
- Curtius, E., 2013. *European Literature and the Latin Middle Ages*. Translated from German by W. Trask. Princeton: Princeton University Press.
- Deyermond, A., 2008. Contexto codicológico y otros contextos de la *Historia de la donzelle Teodor*. In: J. Lera, F. López and L. Pérez, eds. *La Fractura Historiografica: las investigaciones de edad media y renacimiento desde el tercer milenio*. Salamanca : Publicaciones del SEMYR. pp.229-238. [online] Available at: <http://dialnet.unirioja.es/servlet/libro?codigo=367952>. [Accessed 15 June 2015]
- Eder, M., 2014. Stylometry, Network Analysis, and Latin Literature. Poster Abstract, Digital Humanities 2014. [online] Available at: <http://dharchive.org/paper/DH2014/Poster-324.xml>. [Accessed 15 June 2015]
- Eder, M., 2015. Taking Stylometry to the Limits: Benchmark Study on 5,281 Texts from ‘Patrologia Latina’. Paper Abstract. *Digital Humanities 2015*, Sydney, 29 June – 3 July. [online] Available at: http://dh2015.org/abstracts/xml/EDER_Maciej_Taking_Stylometry_to_the_Limits_Benc/EDER_Maciej_Taking_Stylometry_to_the_Limits_Benchmark.html. [Accessed 15 June 2015]
- Eder, M., J. Rybicki and M. Kestemont, 2014. Stylo Package for R, Version 0.5.9. [online] Available at: <http://sites.google.com/site/computationalstylistics/stylo>. [Accessed 15 June 2015]
- Eder, M., J. Rybicki and M. Kestemont, forthcoming 2016. Stylometry with R: A Package for Computational Analysis. *The R Journal*. [online] Available at: <https://journal.r-project.org/archive/accepted/eder-rybicki-kestemont.pdf>. [Accessed 15 June 2015]

- Fialho, O. and S. Zyngier, 2014. Quantitative Approaches to Stylistics. In: M. Burke, ed. *The Routledge Handbook of Stylistics*. London : Routledge, 2014. pp.329-345.
- Galderisi, C. and V. Agrigoroaei, 2011. *Translations médiévales : cinq siècles de traductions en français au Moyen Âge (XIe-XVe siècles) : étude et répertoire*. Turnhout : Brepols.
- Herrmann, B., K. van Dalen-Oskam and C. Schöch, 2015. Revisiting Style, A Key Concept in Literary Studies. *Journal of Literary Theory* 9(1), pp.25-52.
- Hispanic Seminary of Medieval Studies, 2011. *Digital Library of Old Spanish Texts*. [online] Available at: <http://www.hispanicseminary.org/textconc-en.htm>. [Accessed 15 June 2015]
- Kestemont, M., S. Moens and J. Deploige, 2013. Stylometry and the Complex Authorship in Hildegard of Bingen's Oeuvre. Paper Abstract. *Digital Humanities 2013*, Nebraska, 16-19 July. [online] Available at: <http://hdl.handle.net/1854/LU-3119482> [Accessed 20 April 2016]
- Kestemont, M., 2012. What Can Stylometry Learn from Its Application to Medieval Dutch Literature? *Journal of Dutch Literature* 2(2), pp.46-65.
- Leurquin, A.-F. and M.-L. Savoye, 2013. JONAS: Répertoire des textes et manuscrits médiévaux en langue d'oc et d'oïl. [online] Available at: <http://jonas.irht.cnrs.fr>. [Accessed 15 June 2015]
- Malette, K., in press. The Seven Sages at Sea: Framed Narrative Systems in the Pre-modern Mediterranean. In: M. Allan and E. Benigni, eds. *Lingua Franca. Explorations of the Literary Geography of the Mediterranean*. Berlin: Zukunftsphilologie.
- McCarty, W., 2014. *Humanities Computing*. New York-London: Palgrave Macmillan.
- Parussa, G., ed., 1999. *Epistre Othea*. Geneva: Droz.

- Philobiblon, 2015. A Bio-Bibliographical Database of the Iberian Peninsula. Berkeley: University of California. [online] Available at: <http://bancroft.berkeley.edu/philobiblon>. [Accessed 15 June 2015]
- Richards, E., in press. Jean de Meun mis en réseau : une analyse stylométrique de la Querelle de la Rose. Conference Proceedings. *Jean de Meun et la culture médiévale : littérature, art, science & société aux derniers siècles du Moyen Âge*, Orléans, 15-17 May.
- Richards, E., L. Dulac and D. Wrisley, 2015. Author! Author! Christine de Pizan's Styles : Did She Have a Moi Prosaique Distinct from Her Moi Lyrique ? The Comparative Insights of a Tradition Stylistic/Thematic and a Stylometric Analysis of Christine's Writings. Unpublished Paper. *IXe Colloque International Christine de Pizan*, Louvain-la-Neuve, Belgium, 7-11 July.
- Rybicki, J., 2012. The Great Mystery of the (Almost) Invisible Translator. In: Oakes, M. and J. Meng, eds. *Quantitative Methods in Corpus-Based Translation Studies: A Practical Guide to Descriptive Translation Research*. pp.231–248.
- Rybicki, J., 2014. Validating a Large Bootstrap Consensus Network in Literary History. Paper Abstract. *Digital Humanities 2014*, Lausanne, 7-12 July. [online] Available at: <http://dharchive.org/paper/DH2014/Paper-857.xml>. [Accessed 15 June 2015]
- Schöch, C., 2013. Fine-Tuning our Stylometric Tools: Investigating Authorship and Genre in French Classical Drama. Paper Abstract. *Digital Humanities 2013*, Nebraska, 16-19 July. [online] Available at: <http://dh2013.unl.edu/abstracts/ab-270.html>. [Accessed 15 June 2015]
- Schöch, C., 2014. Corneille, Molière et les autres. Stilometrische Analysen zu Autorschaft und Gattungszugehörigkeit im französischen Theater der Klassik. In: C. Schöch and L. Schneider, eds. *Literaturwissenschaft im digitalen Medienwandel*, Mainz-Berlin: Philologie im Netz, pp. 130-157. [online] Available at: <http://web.fu-berlin.de/phn/beiheft7/b7i.htm>. [Accessed 15 June 2015]

- Shep, S., 2014. The Printers' Web: New Tools to Crack Old Chestnuts. In: P. Arthur and K. Bode, eds. *Advancing Digital Humanities: Research, Methods, Theories*. London-New York: Palgrave Macmillan, pp.68-82.
- Sterchi, B., 2005. *Über den Umgang mit Lob und Tadel: normative Adelsliteratur und politische Kommunikation im burgundischen Hofadel, 1430-1506*. Burgundica 10. Turnhout: Brepols.
- Visser-Fuchs, L., 2005. Le conte dont on chante : Burgundian popular ballads and courtly poems on the Earl of Warwick. In: J.-M. Cauchies, ed. *Poètes et musiciens dans l'espace bourgignon: Les artistes et leurs mécènes*. Publication du Centre Européen d'Etudes Bourguignonnes 45, pp.191-235.
- Wrisley, D., 2012. Christine de Pizan and Guillaume de Tignonville, Revisited. Unpublished Paper. 8th International Christine de Pizan Conference, Institute for Romance Philology, University of Poznań, Poland, 10-14 July.