Eighteenth Century Female Authors: Women and Science in the *Coruña Corpus of English Scientific Writing*

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This paper explores the use of linguistic features characteristic of impersonal or personal style in scientific writing by female authors in the eighteenth century. Variables such as discipline, subject-matter and genre are used to assess the ways in which abstract thought and argumentation are expressed by women, given that, even when these works were accepted by the scientific establishment, such modes of expression were more typical of men and men's writing in the context of the Modern Age. Data from different genres and disciplines (History, Philosophy, Astronomy and Life Sciences) will be used in order to obtain more reliable findings.

Keywords: Corpus-Linguistics; Scientific Register; Late Modern English; Involvement

1. Introduction

Although the history of scientific discourse has received a certain amount of attention in recent years (Atkinson 1996; Gotti 1996; Gotti & Dossena 2001; Taavitsainen & Pahta 2004, 2010), female scientific discourse is still a relatively small and neglected field. This paper analyses the scientific discourse of female English authors of the eighteenth century, looking in particular at personal versus impersonal style through the use of some of the linguistic features noted by Biber (1988, 1995, 2006) in what he calls Dimension 5 (the group of linguistic features that seem to provide texts with a more impersonal character). The present study, however, will not use the techniques of multidimensional analysis but a more traditional approach based on frequency of occurrence.

    Some of the features found in this dimension, sometimes referred to as 'abstract vs non-abstract information', will be examined in order to capture the degree of abstraction used by women in their writing, as well as to explore the specific linguistic

devices used. To this end I have selected text samples from eighteenth century women writers in *The Coruña Corpus: A Collection of Samples for the Historical Study of English Scientific Writing* (henceforth, *CC*). The *CC* currently comprises four sub-corpora, with texts corresponding to the disciplines of Astronomy, Philosophy, Life Sciences and History. The main aim of the compilation of the *CC* is to provide research material for the study of change and variation within scientific writing in late Modern English (1700–1900). External socio-historical factors already dealt with extensively (Millward 1988; Görlach 1994; de la Cruz & Martín 2001) determine the chronological period covered by the *CC*, and also the decision to exclude medicine (Moskowich & Crespo 2007; Crespo & Moskowich 2010).

Scientific discourse has often been seen as strictly objective and, hence, impersonal (Hyland 1995: 33), as well as detached and faceless (Besnier 1994: 280). However, this may not always have been the case, especially if extra-linguistic variables such as sex[1] are taken into account (Tillery 2005). In order to address all these aspects the present study will be divided into five further sections: a brief overview of the situation for women in the period will be given in Section 2; Section 3 will then focus on the characteristics of impersonal style and its typical linguistic features; Section 4 will present the data from this study, to be followed by an analysis of these in Section 5. Finally, some concluding remarks will be offered in Section 6.

2. Being a 'Woman Scientist' in the 1700s

The Modern period presents us with many texts in which all references to men and women make it evident that the former are superior to the latter from all possible points of view (Torralbo 2010: 86). Indeed, within the misogyny of the 1700s (Logan & Greenblatt 2006) authors such as Sir Thomas Smith openly stated their opinion concerning the position of women in society:

> We do reject women, as those whom nature hath made to keep home and to nourish their family and children, and not to meddle with matters abroad, nor to bear office in a city or commonwealth. (1583: 30)

However, as noted by Crespo (forthcoming), women at the time, such as Margaret Cavendish (an aristocrat who published under her own name about gender, power, scientific method and philosophy), were conscious of the situation imposed upon their sex and often held a very different view (Cavendish 1668, as cited in Barker-Benfield 1992: 154). Women had traditionally been tied to certain roles and places in society, and only in a few of these places were they allowed access to education. At the time, women were educated within the family context, but only in those cases in which the family's socio-economic situation permitted. Besides, education was often

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[1] I am not dealing here with the concepts of sex as a biological feature opposed to gender as a psychological characteristic of the individual. The information we have about these authors relates exclusively to their biological condition as women.

limited to home-related affairs as evidenced by contemporary works such as Mary Johnson's (1765).

Given that women themselves were aware of the difficulties of getting a formal education, they tended to concern themselves instead with the weakest groups of the population (children, other women) for whom the obstacles to instruction were greatest. They were interested in the dissemination of knowledge, and this perhaps explains the fact that they tended to choose the kinds of genres/text types that were aimed at providing either formal or non-formal education in simple terms. Hence, treatises conceived of as teach-yourself material and textbooks to be used in schools (Görlach 2004) were among the kinds of texts frequently written by women.

From the seventeenth century onwards there has been a contradictory movement regarding women and their participation in science as a public activity. On the one hand, women did not have access to the increasing number of scientific institutions, but on the other, certain intellectual trends promoted the publication of work of a broader academic nature, and here there was no absolute barrier to the participation of women.

A similar contradiction can be perceived in the writing of these women after a close reading of those contained in the *Coruña Corpus*. Whereas they generally seem to adhere to the new patterns of empiricism, they also make reference to the moral values of the male society in which they live. This double-edged nature can be attested not only in the prefaces to their works, where they most directly address their readers, but also in the body of their works, although less openly here. Men at the time were credited as being more able to engage in abstract reasoning, with women considered to be suited to the more practical, immediate aspects of life. The principal reason for looking at linguistic features related to abstraction in these texts, then, is to gauge this capacity for abstract reasoning.

3. Abstraction in Multidimensional Analysis

One of the theoretical approaches dealing in depth with the linguistic manifestations of abstraction in discourse is multidimensional analysis, the framework which Biber has been using since the late 1980s. This approach allows for the analysis of texts at a microscopic level as a means of characterizing a particular facet of linguistic production. Different dimensions are said to be observable in language, each of them represented by different parameters or bundles of features. Over the years the different dimensions have varied in number and changed their names as the theory has developed and grown in complexity. Thus, the five dimensions originally presented by Biber (1988) became six, with the addition of Dimension 6 'On-Line Informational Elaboration', in 1995; subsequently the analysis of academic discourse would be carried out using the 1988 structure (Biber *et al.* 2007), that is, with the original five dimensions. Other studies (Biber 2003, 2006) use only four, since some of those originally proposed merge into a single dimension. Contrary to what we see in other theoretical approaches, dimensions are not isolated phenomena to be

studied in a language, but rather are composed of different features, forming a continuum. Those features that tend to co-occur in a text form a particular dimension, the analysis of which gives us a very detailed depiction of a linguistic entity (Biber 1988: 28).

In his later works, Biber proposes the existence of five such dimensions or groups of features: involved vs informational production; narrative vs non-narrative concerns; elaborated reference vs situation-dependent reference; overt expression of persuasion; and impersonal vs non-impersonal style.[2] As their names suggest, some contain both positive and negative items, whereas others do not. This paper will revolve around the features proposed for Dimension 5, 'Impersonal vs Personal Style' precisely because, according to Biber (1995: 164), this is the most typical of academic prose. Concentrating on these features will allow us to provide evidence on the extent to which eighteenth century writers were visible in their work, or, on the contrary, whether they disappeared behind the objectivity often attributed to scientific discourse (Garzone 2004).

We can venture that in the case of female scientific writers, their sex might have led to a certain increase in their invisibility within the text. As already mentioned, this functional category is seen through different linguistic features or parameters that can be independently quantified and analysed, including the following: past participial (passive) adverbial clauses, past participial (passive) post-nominal clauses, agentless passives, *by*-passives, conjuncts and adverbial subordinators (Biber 1988). The initial assumption here is that the more of these features we find in our material, the more impersonal or abstract the style of the authors under study can be said to be. For the present analysis I have simplified this approach, since not all features will be dealt with here. Thus, adverbial clauses are introduced by adverbial subordinators, and these will all be considered together (Biber 1988). Instead of six features, then, we will analyse five. All instances recorded for each of these features will be counted, in an attempt to provide a detailed characterization of this type of text. I will also try to provide a qualitative study by examining variables such as genre and subject-matter (discipline), since these may have some influence on language choice. On occasions, for a thorough account of the data, it may also be necessary to take into account factors such as addressee or the epistemological nature of the discipline under consideration (Biber 1988: 70).

Although the parameters of Biber's multidimensional analysis can certainly be useful for the description of language, it is also the case that not all scholars concur as to the effectiveness of his methodology, and arguments against its use have been raised (Hyland 2000). Thus, in Grieve-Smith's words (2011):

> Multidimensional analysis is exciting, but there are significant problems. The main one that I found is that Biber did not use per-choice frequencies, so the co-occurrences he identified could have been due to grammar. In fact, you could

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[2] The name formerly given to this particular dimension was 'abstract vs non-abstract information' (Biber 1988; Biber & Finegan 1997: 259).

Table 1 Sub-corpora contained in the *CC*

Discipline	Sub-corpus
Philosophy	*Corpus of English Philosophy Texts (CEPhiT)*
Life Sciences[a]	*Corpus of English Life Sciences Texts (CELiST)*
Astronomy	*Corpus of English Texts on Astronomy (CETA)*
History	*Corpus of History English Texts (CHET)*

[a]Life Sciences includes diverse disciplines such as Biology, Zoology, and Botanics, nowadays considered independent fields.

> interpret his Dimension 1 as simply 'nouns vs verbs' and Dimension 2 as 'past vs present'. I tried to use the envelope of variation to counteract this, but I was not successful.

In the sections that follow I will present the corpus material used for this preliminary survey of the linguistic manifestations of abstract thinking in female scientific writing, before moving on to present the findings.

4. Corpus Material

As noted in the Introduction, my data are drawn from the *Coruña Corpus of English Scientific Writing*. With a total of 811,150 words, the corpus is divided into four sub-corpora. The disciplines for which texts have been compiled and the names of their corresponding corpora are shown in Table 1.

    CC is intended to be representative of a particular reality, and since few women published their scientific work in the eighteenth century, it is not surprising that few female writers are included. Hence, all texts written by women have been selected for analysis. The samples by women represent only 8.73% of all the samples recorded in the four sub-corpora here, as shown in Figure 1, in which this information is provided for each sub-corpus.
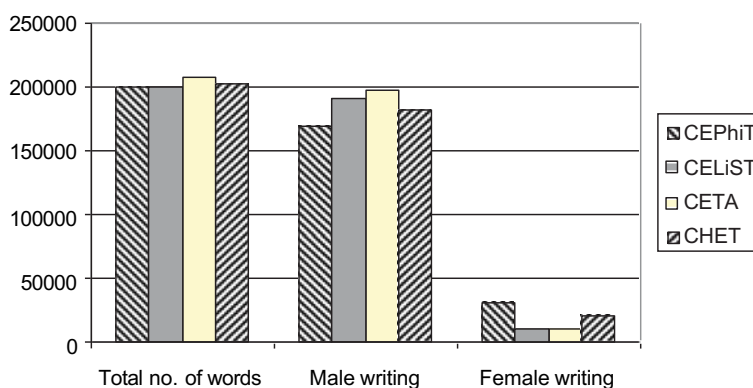

Figure 1 Number of words (male vs female writing)

Table 2 Female authors and works

Author	Title	Sub-corpus	Date	No. of words
Mary Astell	*Some reflections upon marriage*	*CEPhiT* (Philosophy)	1700	10,077
Katharine Macaulay	*Treatise of the immutability of moral truth*	*CEPhiT* (Philosophy)	1783	10,059
Mary Wollstonecraft	*Vindication of the Rights of Woman*	*CEPhiT* (Philosophy)	1792	10,058
Elizabeth Blackwell	*A Curious Herbal, containing five hundred cuts of the most useful plants which are now used in the practice of physick*	*CELisT* (Life Sciences)	1737	10,045
Margaret Bryan	*A compendious system of astronomy*	*CETA* (Astronomy)	1797	10,263
Elizabeth Justice	*Voyage to Russia: describing the Laws, Manners, and Cuſtoms, of that great Empire, as govern'd, at this preſent, by that excellent Princeſs, the Czarina. Shewing the Beauty of her Palace, the Grandeur of her Courtiers, the Forms of Building at Petersburgh, and other Places: with ſeveral entertaining Adventures, that happened in the Paſſage by Sea, and Land*	*CHET* (History)	1739	10,005
Sarah Scott	*The History of Mecklenburgh, from the Firſt Settlement of the Vandals in that Country, to the Present Time; including a Period of about Three Thouſand Years*	*CHET* (History)	1762	10,301
			Total	70,808

Table 2 contains all the information on the texts written by women, samples of which will be analysed in the following section. This includes authors' names, title of works, sub-corpus to which the sample belongs, date of publication and number of words contained in the extract.

Figure 2 complements Tables 1 and 2, illustrating the distribution of total words written by women in each of the sub-corpora in the *CC*. As already noted, discipline
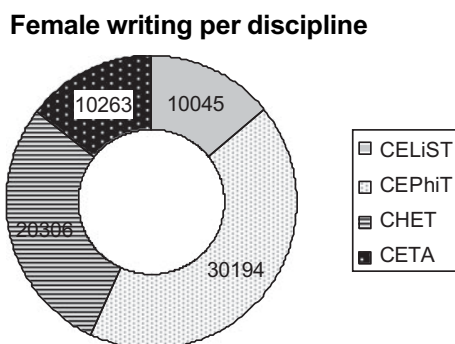
Female writing per discipline

Figure 2 Distribution of female writing per sub-corpus

Words per genre

textbook 14%   essay 14%
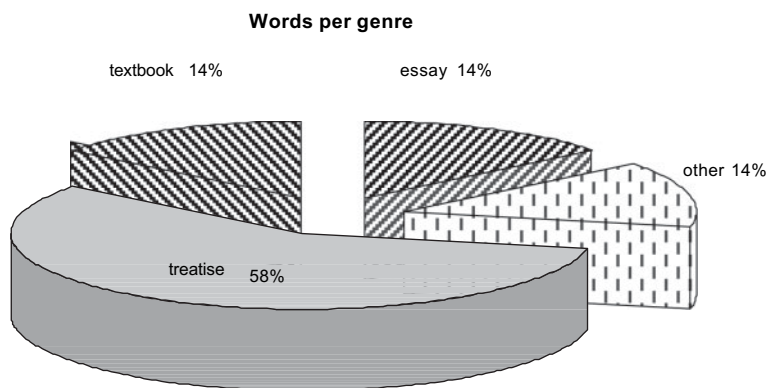
other 14%

treatise   58%

Figure 3   Words per genre

is one of the variables considered for this study of female scientific writing in the eighteenth century.

If we were to apply the UNESCO classification (1978), as in the *CC*, these sub-corpora contain texts representative of the Humanities as well as of the Natural and Exact Sciences. Not surprisingly, sub-corpora including texts belonging to the Humanities contain the largest number of words by women (*CEPhiT*, 49% and *CHET*, 29%). The remaining 28% is equally distributed between *CETA* and *CELiST*, both belonging to the field of Natural and Exact Sciences.

The second variable I will analyse, genre or text-type, has been established here using the taxonomy proposed by Görlach (2004) since this is the one used to classify the texts in the *Coruña Corpus*[3]: textbook, treatise, article, letter, lecture, dialogue, essay and others. Women's texts fall into four of the eight text-types included in the *CC*. Accordingly, we can observe the distribution shown in Figure 3.

As mentioned in Section 2, the type of texts most often authored by women seem to suggest that women were particularly interested in providing instruction for those who had the greatest difficulties in accessing education (Perl 1979; Holmes 2010), this being reflected in their choice of genres. This could explain why a treatise (58%) of an instructional character is the preferred option by female authors. Essay, textbook and 'other' (travelogue) are equally represented (14%), whereas the remaining genres often used by male writers, such as dialogue, letter and lecture, do not appear at all.

5. Analysis of Data

My focus here is on some of the linguistic features which constitute Dimension 5 of Biber's multidimensional analysis, although, as noted in Section 3, I will not adopt the same analytical approach. In his study, Biber (1988: 151) states that 'genres with high scores for Dimension 5 make frequent use of conjuncts, agentless and *by*-passives,

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[3] Other text-types have been established. Such is the case with those proposed by the *Helsinki Corpus* (Kytö 1996) or those included in the *Middle English Medical Texts* (2005) and in *Early Modern English Medical Texts* (2010). This variety of classifications is a manifestation of changing textual traditions and needs.

past participial clauses, WHIZ deletions and certain types of adverbial subordination'. Since we are dealing with academic prose, the texts under survey should, in principle, have a highly abstract and technical informational focus. Therefore, the linguistic features listed by Biber should be well represented. Not all the features initially proposed by Biber have been considered, however. Those selected include conjuncts, *by*-passives, agentless passives and adverbial subordinators.

For this study, both automatic and manual methods of retrieving data have been used. For automatic searching I have used the *Coruña Corpus Tool* (*CCT*, henceforth) but manual checking also had to be used to ensure accurate results (Biber 1988: 67). This manual disambiguation by careful reading of the samples was required especially with conjuncts, agentless passives and *by*-passives since, in these cases, not all the forms of a type corresponded to the linguistic features under study. An example of this is the use of *however* (see example (1)) not as a conjunct but as a premodifier, which could only be determined by careful reading of examples yielded by an automatic search:

(1) was convicted of having the ſmalleſt ſhare in a robbery <however> conſiderable his rank for ſome of the principal men in. (Scott 1762: 179)

Disambiguation was also necessary to determine whether an −*ed* form found by the *CCT* in fact corresponded to a passive construction or, on the contrary, was either a simple past or part of a perfect tense. Similarly, all the *by*-phrases identified automatically had to be revised to discard instrumental *by*-structures, such as in the following example:

(2) nineteen times greater than that of our earth from it <by> observation of its progress in different parts of its orbit. (Bryan 1797: 91)

The number of these linguistic features found in the corpus material is represented in Figure 4.

Of the four sets of features, agentless passives has the highest number of occurrences, remarkably so. This may be accounted for by the nature of the texts themselves, not only in terms of genre but also of subject-matter, which demands that information is presented to the reader in the most objective way. This implies that it is the action that constitutes the focus of the informational process and not the agent
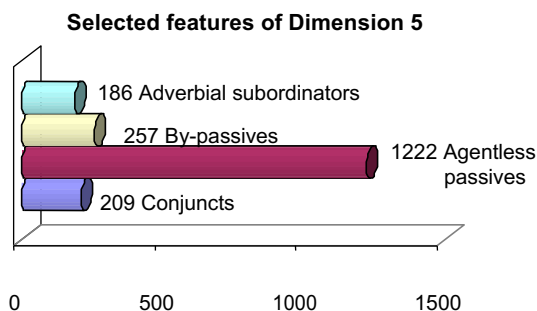
Selected features of Dimension 5

186 Adverbial subordinators
257 By-passives
1222 Agentless passives
209 Conjuncts

0   500   1000   1500

Figure 4   Selected features

Dimension 5 features per discipline

23% Philosophy   29% Astronomy
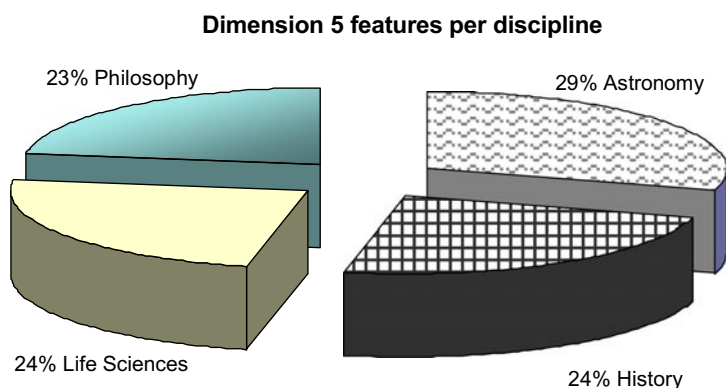
24% Life Sciences   24% History

Figure 5   Distribution of features per discipline

of the action itself. The remaining features occur at relatively comparable, low levels of frequency. There are few *by*-passives, for the reason just mentioned. As for conjuncts and adverbial subordinators, their low frequency of use may be because their presence tends to make the syntax more complex and they are not really essential for the understanding of the message conveyed. In this sense, what Biber terms Dimension 5 could indeed be said to echo Boyle's claims (1744) about clarity and simplicity and his naked style when writing rather in a philosophical than a rhetorical strain

Turning to the variable of discipline, we can observe that the features of Dimension 5 are more abundantly found in Astronomy samples (964.95 tokens in normalized[4] figures). History (791.02), Life Sciences (784.5) and Philosophy (752) samples follow, in that order. It should be noted that there is not a large gap between any of them. Also, there is no clear pattern according to which disciplines belonging to either the Humanities or Natural Sciences contain more features typical of an abstract or impersonal style. The distribution of these features per discipline can be observed in Figure 5.

A more detailed account of the occurrence of each feature in each of the disciplines is presented in Table 3, with both raw frequencies and normalized figures included. The agentless passive is the most frequent feature in Astronomy samples, with adverbial subordinators the least represented feature. In History texts the highest number of occurrences is again agentless passives, but with conjuncts the least represented, with only 77.32 tokens (normalized). Observed differences in the use of these features in Life Sciences are very significant, with 697.36 tokens of agentless passives compared to only nine of adverbial subordinators. The other two sets of features are also barely represented, conjuncts with 12.02 tokens and *by*-passives with 66.12 tokens. This imbalance may be explained in terms of the way in which the sample itself has been written. As for Philosophy texts, agentless passives (421) again

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[4] Figures have, in all cases, been normalized to the highest raw frequency in the set.

Table 3 Raw frequencies and normalized figures per discipline and linguistic feature

Discipline	Conjuncts	Conjuncts (nf)	Agentless passives	Agentless passives (nf)	*By-* passives	*By-* passives (nf)	Adverbial subordinators	Adverbial subordinators (nf)
Astronomy	40	117.68	215	632.53	46	135.33	27	79.41
History	52	77.32	354	526.38	72	107.06	54	80.26
Life	4	12.02	232	697.36	22	66.12	4	9
Philosophy	113	113	421	421	117	117	101	101
TOTALS	209	320.02	1222	2277.27	257	425.51	186	269.67

Table 4 Features per genre

Genre	Features
Treatise	1134
Essay	674.55
Textbook	1293.13
Other	986.76

predominate, followed by *by*-passives (117), conjuncts (113) and adverbial sub-ordinators (101). The similar frequencies for these final three features may be accounted for by the argumentative nature of philosophical texts, which demands a higher use of adverbial subordinators and conjuncts, and also the need to overtly express the agent in actions.

The second variable, genre, is also of interest here since I believe it may have some weight in linguistic features choice. As Table 4 and Figure 6 illustrate, the genre of textbook, of which we have only one sample, is the text-type containing the highest proportion of features typical of abstract or impersonal style. The instructional nature of this genre may explain this. Clear and direct information, transmitting actions or describing concepts, is what really matters here, and mentioning who performs the actions may not be relevant at all. The text-type essay and treatise seems to have more or less comparable behaviour in this respect, whereas our sample belonging to 'other' genre (travelogue) exhibits a more concrete style in which authorial presence is more clearly manifested, with an absence of abstract features.

Each of the features under survey will now be dealt with separately, looking at the influence of the variables genre and discipline.

5.1. Conjuncts

Biber *et al.* (1999) note that the following conjuncts can be considered for the study of abstract or impersonal style: *alternatively, altogether, consequently, conversely, eg, e.g., else, furthermore, hence, however, i.e., instead, likewise, moreover, namely, nevertheless,*
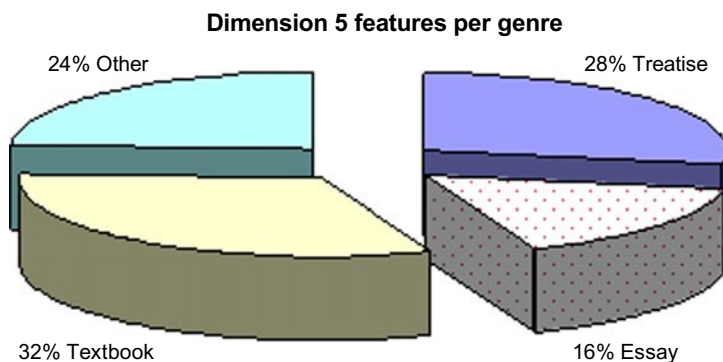
Dimension 5 features per genre

Figure 6 Features per genre

Table 5 Conjuncts

Type	Tokens	Type	Tokens
consequently	12	in sum	1
else	3	likewise	19
for instance	3	nevertheless	1
for example	1	notwithstanding	5
hence	2	on the contrary	2
however	14	otherwise	10
in other words	3	on the other hand	1
in comparison	1	rather	19
in consequence	2	therefore	46
in particular	3	thus	50
instead	11		
TOTAL			209

nonetheless, notwithstanding, otherwise, rather, similarly, therefore, thus, viz, in comparison, in contrast, in particular, in addition, in conclusion, in consequence, in sum, in summary, in any event, in any case, in other words, for example, for instance, by contrast, by comparison, as a result, as a consequence, on the contrary, on the other hand, that is.

Not all the types on this initial list have been found in the corpus here. Table 5 sets out those types for which tokens have been found.

The two most numerous types here are *thus* and *therefore*, two resultative conjuncts (Quirk *et al.* 1985: 635) which are typical of logical reasoning. The remaining 209 tokens, seen from a semantic point of view, belong to either the summative, appositive, inferential, contrastive or equative kinds of conjuncts.

As can be seen in Table 6, after the normalization of raw data, the distribution of conjuncts per discipline is highest with Astronomy, followed by Philosophy (113) and History (77.32). Life Sciences, on the other hand, stands out in that it has a very low number of this type of connector, due to the fact that the text sample here is a descriptive one in which no reasoning or argumentation is used; rather, there is a mere progression of facts sequentially presented.

In this particular case there is a distributional pattern of these features that differentiates humanistic disciplines from those in the field of Natural and Exact Sciences, with the two humanistic disciplines, Philosophy and History, containing 59% of the conjuncts, and Life Sciences and Astronomy 41% (see Figure 7).

Table 6 Conjuncts per discipline

Discipline	Conjuncts/nf
Astronomy	117.68
History	77.32
Life	12.02
Philosophy	113

Conjuncts per discipline

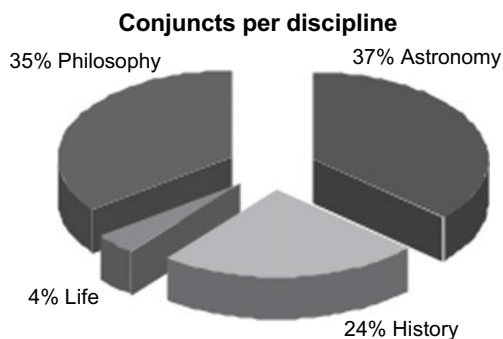35% Philosophy

37% Astronomy

4% Life

24% History

Figure 7 Conjuncts per discipline

Conjuncts such as *therefore*, *consequently*, *notwithstanding* and *thus* are often used in the kind of argumentative reasoning typical of expository prose. However, they are not exclusive to the Humanities by any means, since my analysis reveals that Astronomy is the individual discipline containing the largest number of conjuncts. The explanation for this may lie not only in the specific scientific discipline but also in the stylistic/rhetorical characteristics of particular genres.

The findings on conjuncts by genre coincide with those by discipline. Astronomy occupied the first position in the former analysis, and now textbook, the genre to which the Astronomy text belongs, is also first. There may be a functional explanation for this in that the characteristics of the genre seem to require the presence of these indicators of logical relationships within the discourse. The logical succession of events must be very clearly expounded so that the reader can grasp all the meanings which lie behind what is being said. Essay, with 136 tokens (53 in normalized figures), comes second. The essay represents another textual category in which logical thinking must be rigorously expressed. Although the sample from Life Sciences is a treatise, the presence of conjuncts in the other two works (both pertaining to the discipline Philosophy) is so strong that it effectively compensates for their scarcity in Life Sciences.

The genre labelled 'other' in the *CC* is represented here by a text on history in the form of a travelogue. It contains the lowest number of conjuncts, probably because of its more narrative nature. All of the above details are set out in Table 7, in which only normalized figures have been included.

Table 7 Conjuncts per genre

Genre	Conjuncts/nf
Essay	136.52
Treatise	121
Textbook	157.7
Other	56.61

5.2. Passive Constructions

My data contain a total of 1,479 passive structures. As mentioned above, this includes 1,222 agentless passives and 257 containing an overt agent in the form of a *by*-phrase. Both kinds of passive structures will be dealt with in Sections 5.2.1 and 5.2.2, below.

5.2.1. Agentless passives

There may be different reasons explaining the preference for agentless passives in scientific writing, given that when no agent occurs this favours end focus on other elements, such as verbs or complements. This means of presenting the information is highly relevant in such texts, placing emphasis on processes, concepts or objects which are new to the reader. Other reasons for silencing the agent may be:

> it is unknown although implied […]; it has already been referred to, directly or indirectly […]; it may be understood from the context, but it is considered irrelevant […]; the implied Agent is 'people' or 'one', the passive expressing a general statement […]; either out of politeness, to avoid blaming someone else, or conversely, to avoid taking the blame oneself, the speaker wishes to mask the origin of the action. (Downing & Locke 1992: 254)

As regards discipline, agentless passives are not equally distributed. Normalized figures show that Life Sciences has the highest proportion of agentless passives, followed by Astronomy. It is worth mentioning that the two disciplines belonging to the group of Natural and Exact Sciences, according to the UNESCO classification, contain the highest rates; consequently, the two Humanities disciplines (History and Philosophy) exhibit the lowest numbers, as shown in Table 8.

Figure 8 presents this same information expressed as percentages.

Table 8 Agentless passives per discipline

Discipline	Normalized figures	Tokens
Astronomy	632.53	215
Philosophy	421	421
Life Sciences	697.36	232
History	526.38	354

Agentless passives per discipline

23% History   28% Astronomy

31% Life Sciences   18% Philosophy
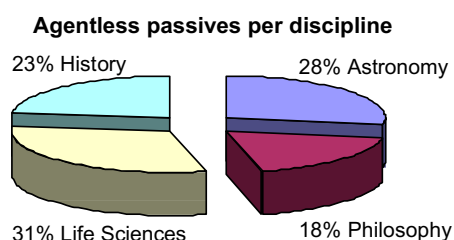
Figure 8 Agentless passives per discipline

Table 9 Agentless passives per genre

Genre	Normalized figures	Tokens
Textbook	847.66	215
Essay	353.35	88
Treatise	726	726
Other	780.54	193

The fact that in Exact Sciences it is generally unimportant to know who performs an action can account for the predominance of agentless passives here. An example is seen in (3) below, where the act of having seen the luminary in 1680 is the important element for the reader, not who actually saw it:

(3) its nearest approach to that luminary he supposed the one <seen> in 1680 might have retained its heat for twenty thousand. (Bryan 1797: 93)

As regards text-type or genre, textbook and 'other' are the genres with the highest number of agentless structures (see Table 9). In the case of textbook, the results for genre coincide with those observed for discipline. However, the second genre in which these structures proliferate is 'other', the sole sample of which belongs to History, a branch of the Humanities. Although I noted earlier that the Humanities could be expected to present less agentless passivization, the narrative style required by the genre (travelogue in this case) explains this initial contradiction.

Genres, as constructs, may be considered to have certain prototypical features. Some of the syntactic characteristics expected in treatise and essay are agentless passives, since such constructions seem to convey objective information in whose transmission the author is a mere intermediary. My data here, however, reveal the opposite. Figure 9 shows the corresponding percentages of frequency of occurrence.

In the particular case of agentless passives, the characteristics of genres are, therefore, subject-matter constrained (Moskowich 2012; Crespo forthcoming).

5.2.2. By-passives

By-passives are characterized by the overt expression of the agent of an action. As Downing and Locke (1992: 252) have pointed out, this 'agent or instrument or force
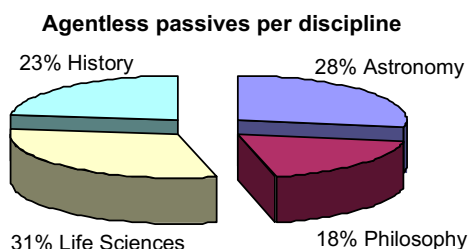

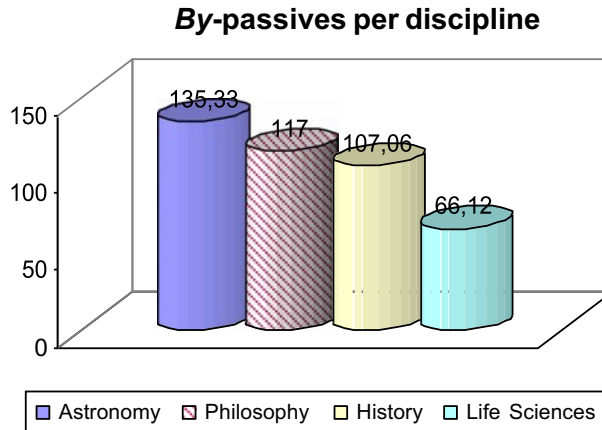Figure 9   Agentless passives per genre

Figure 10 *By*-passives per discipline

participant provides the new information'. This is why it is sometimes useful for authors to include *by*-phrases after passive constructions, and there must be a conscious decision on the author's part to use this kind of phrase. Although I have excluded all *by*-phrases that do not function as agents, this new information can still be found as the focus of interest of scientific authors when using a passive clause with a *by*-phrase. In passives with an overt agent, *by*-phrases are used to 'guide the reader towards the most informative part of the message' (Downing & Locke 1992: 253). Example (4) below illustrates this phenomenon:

(4) to him and conscious of the happy equilibrium sought after <by> all natural bodies which is happily attainable by the constitutional. (Bryan 1797: 92)

Figure 10 shows the distribution of *by*-passives per discipline. Normalized figures confirm that Astronomy contains the highest proportion of these structures, with 135.33 cases, followed by Philosophy (117) and History (107.06). To account for the predominance of these constructions in Astronomy we can perhaps assume that it is the informative character of the text that determines the need to attract the reader's attention to what is yet not known to him (rheme). In the case of the humanistic disciplines under survey (Philosophy and History) the reason for the presence of these constructions may be related to the importance that subjects have in the Humanities in general, given their narrative character. Such importance is syntactically expressed either by resorting to active constructions or to passive sentences with an overt agent. To convey who performs the action may, in certain cases, be more interesting for the writer than the action or the process itself. The sample from Life Sciences, as was expected following findings on agentless passives, contains fewer agents expressed in the form of *by*-phrases (66.12). This may be accounted for by the fact that the descriptions which the texts present seem to need no information about who performs the action but only about the action itself.

Table 10 *By*-passives per genre

Genre	Normalized	Tokens
Textbook	181.36	46
Essay	76.29	19
Treatise	173	173
Other	76.84	19

   The analysis of genre as a variable for the behaviour of *by*-passives seems to demonstrate that once more it is intimately related to the variable of discipline. Textbook (pertaining to Astronomy) contains the highest number of forms with *by* (181.36), closely followed by treatise, a genre which subsumes both Philosophy and History texts (173). It is worth mentioning that there is only a slight difference in the distribution of instances in the other two genres: essay and other (travelogue), 76.29 and 76.84 tokens, respectively. Essay is characterized by its descriptive nature since it is text describing herbal remedies and, therefore, no experiencer is needed for the understanding of the information conveyed. In travelogue, the sample by Justice, the emphasis is not on agents but on the events being transmitted. All these findings can be seen in Table 10, where both normalized figures and absolute values are shown.
   The final linguistic parameter I have analysed is concerned with adverbial subordinators which, as already noted, also includes adverbial clauses.

5.3. Adverbial Subordinators

Adverbial subordinators have differing meanings, since some are concessive, while others are adversative or express time relations. From all those under survey, it is *(al)though* that stands out. Two different types have been merged under this form: *though* and *although*. The first of these is the older form, originating in Old English, and it is worth mentioning that both its meaning and use are equivalent to *although* during the period under examination. As a matter of fact, the first use of *though* in a colloquial context dates back to 1905 in the *OED*. Some of the adverbial subordinators mentioned by Biber (1988) are not present at all in my texts. This is the case with *whereupon, inasmuch as, forasmuch as, insofar as, insomuch as* and *as long as*.
   According to subject-matter (see Table 11), Philosophy is the field in which most adverbials are found (101). This is followed by another humanistic area of knowledge,

Table 11 Adverbial subordinators per discipline

Discipline	Number of adverbials found	Normalized figures
Astronomy	27	79.41
History	54	80.26
Life Sciences	4	9
Philosophy	101	101

Table 12 Different types of adverbial subordinators per discipline

Discipline	Astronomy	Life	History	Philosophy	Total
although	32.36	0	0	1	33.36
as soon as	0	0	16.35	0	16.35
because	8.82	0	2.97	19	30.79
since	2.94		11.89	13	24.89
so that + n/a	2.94	0	0	5	7.94
so that	2.94	3	4.46	6	16.4
such that	0	3	0	0	3
though	5.88	3	14.86	30	53.74
whereas	14.71	0	0	2	16.71
whereby	5.88	0	8.92	2	16.8
while	0	0	16.35	4	20.35
whilst	2.94	0	4.46	19	26.4

History (80.26), closely followed by Astronomy (79.41). There is a considerable gap between Astronomy and Life Sciences, with only nine examples of adverbial subordinators in the latter, according to normalized figures.

The reason for the difference between the first three disciplines and the fourth can be seen in the formal nature of the sample by Blackwell, structured in short paragraphs with little or no subordination, as can be observed in Example (5).

(5) a. The Leaves of this Plant lie on ye Ground; the Pedikels or Pipes on which the Flowers grow are about six or eight Inches high; and the Flowers yellow. The Root grows about a Finger thick, and eight Inches long, full of a white bitter Milk.

b. It grows almost every where in Fallow Ground, & flowers moſt Months in the Year.

c. The Roots & Leaves are uſed, as cooling, aperative, provoking Urine & strengthening ye Stomach, and are much eat as a Sallad in the Spring. (Blackwell 1737: 1)

A more detailed account of the uses of adverbial subordinators can be seen in Table 12, in which types with no tokens have not been included.

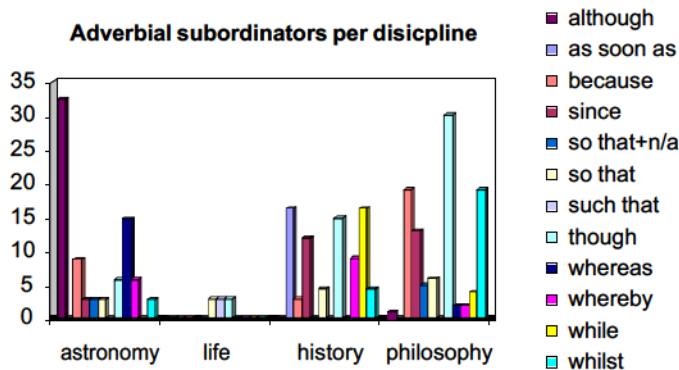All these figures are visually displayed in Figure 11.

Figure 11   Different types of adverbial subordinators per discipline

Table 13 Types of adverbial subordinators per genre

Adverbial subordinator	Treatise	Textbook	Essay	Other (Travelogue)
although	1	43.36	0	0
as soon as	5	0	0	24.26
because	19	11.82	8.03	0
since	9	3.94	48.18	4.04
so that + n/a	2	3.94	12.04	0
so that	2	3.94	20.07	12.13
such that	0	0	0	4.04
though	41	7.88	0	0
whereas	0	19.71	8.03	0
whereby	8	7.88	0	0
while	9	0	8.03	16.17
whilst	18	3.94	4.01	12.13
	114	106.41	108.39	72.77

My examination of the second variable, genre (see Table 13), has found that treatise has the highest rates for adverbial subordinators, and it might be ventured that this rate would have been higher still had Blackwell's sample not been included. In fact, the genre in which the next highest number of subordinators has been traced, essay, shares with treatise the main characteristics of expository prose.

Both essays and treatises are addressed to a more cultivated readership, one familiar with a more elaborate organization of thought, often reflected in a more complex syntax, including a high level of subordination. The same argument can be used to account for the use of adverbials in textbooks. Although such a text-type may be thought to represent a lower academic and technical level, we must bear in mind that the Astronomy sample demands a considerable degree of knowledge on the reader's part. Finally, the sample by Justice, representing travelogue, contains only 72.77 tokens, probably due to its narrative rather than argumentative character.

6. Final Remarks

The study of some of the linguistic parameters related to the expression of impersonal vs personal or abstract vs non-abstract style in eighteenth century scientific writing by women reveals that passive constructions are the most abundant feature used by these authors. If we consider that in present-day scientific discourse such constructions are widely accepted as being characteristic of scientific prose, we can conclude that women writers at that time were already making use of these devices to mark logical thinking and impersonal style. As for the two variables I have dealt with, discipline and genre, findings show that Astronomy is the discipline with the higher number of occurrences. Likewise, textbook is the genre in which these same features predominate. Coincidentally, the only sample pertaining to the discipline of Astronomy is the one written in the textbook format. This is the most obvious coincidence between discipline and genre, but findings in other cases have also shown that there is a

tendency to find some sort of interdependent relationship between genre and subject-matter as reflected in discipline.

The findings here seem to shed light on an abstract trend of mind in scientific writing by women which in some ways contradicts the socially attested assumption that men were the only ones capable of using a high degree of logical thought and reasoning in their argumentation. It might, then, be interesting for future research to compare these findings with those obtained from male writing for the same disciplines and genres during this period.

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