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## Women Writing Science in the Eighteenth Century: A Preliminary Approach to Their Language in Use

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### Abstract

Female authors of scientific works were few in the eighteenth century in comparison with the increasing production of male writers. Their limited presence in the scientific panorama of the period could, therefore, account for the lack of research on how these women wrote or the sort of linguistic strategies they were familiar with from a present-day perspective. Some external considerations should be also reckoned as of paramount importance: on the one hand, science as such was an underdeveloped concept at the moment. Male writers were busy in an attempt to set the grounds of science and to determine the best linguistic choices to convey scientific knowledge. On the other, it was not socially accepted that women somehow involved themselves in matters other than those such as the family or the household, or similar matters. The results obtained from the linguistic analysis point to a predominant use of modality indicating prediction and necessity in contrast to hypothetical constructions and recognizable verbs of persuasion. It follows from this that it is a modulated discourse constrained to a certain extent by the social norms of the period.

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### 0. Introduction

This paper discusses some of the most salient characteristics of science writing by women in English after the rise of Empiricism. Texts have been taken from four of the current sub-corpora of *The Coruña Corpus: A Collection of Samples for the Historical Study of English Scientific Writing* (henceforth, CC). The CC has been designed as a tool for the study of language change and variation in English scientific writing in general as well as within the different scientific disciplines, and contains 10,000 word-samples of texts produced between 1700 and 1900, excluding medicine<sup>1</sup>. This time span is intended to reflect the establishment of the empirical approach to science in the seventeenth century, leading to a modification in scientific discourse, and ends at the time of a further shift, some two centuries later, when the evolution of science and society, through the Enlightenment and the Scientific revolution, led Huxley (1897, in Colby and Williams 1930), to claim the need for a “special” scientific discourse.

For the present analysis I have selected text samples from 1700 to 1800, from the following disciplines: Astronomy, Philosophy, Life Sciences, and History. As will be seen, the scarcity of female writers in each area mirrors the social role of women in general at the time.

Methodologically I will look into some of the linguistic features<sup>2</sup> of Biber's dimension 4, "Overt expression of persuasion" (1988, 1995) (Biber and Conrad 2009), one of the dimensions contained in his multidimensional analysis, to ascertain to what extent they are present in female writing. I will, then, attempt to measure the degree of persuasion and also the argumentation strategies, and, consequently, the degree of involvement of female authors in works produced during the eighteenth century. Whenever possible I will resort to the prefaces of their works as an aid to exploring their attitudes as scientific writers. The paper will be divided into the following sections: after the introduction, section 1 will present a brief overview of the social status of women "scientists" and their cultural milieu with the intention that the social context can contribute to the understanding of their linguistic uses. Section 2 will outline theoretical issues in relation to Biber's dimension four, and in section 3 I will describe the corpus material selected for analysis which will then be given in Section 4. It is my intention to examine possible differences in female discourse, considering as variables the particular scientific discipline and the text type used to convey information. Finally, concluding remarks will form part of section 5.

## 1. Women and science in the eighteenth century

In the second half of the seventeenth century Margaret Cavendish (1623–1674), Duchess of Newcastle, wrote on the female role in society in her *Females Orations*, stating that:

We Live and Dye as if we were produced from Beasts, rather than from Men, for, Men are happy and we Women, are miserable; they possess all the Ease, Rest, Pleasure, Wealth, Power and Fame; whereas Women are Restless with Labour, Easeless with Pain, Melancholy with want of Pleasures, they would fain bury us in their houses or Beds as in a Grave (1668).<sup>3</sup>

Cavendish's words reveal the situation of women in general, the widespread feeling of subordination to men and how in particular the most cultivated women saw themselves in relation to the other sex. This is the backdrop to the development of female science at the dawn of the Empiricist movement, but it also anticipates the situation that will go on to permeate the social consciousness and common thought of the century to come. At first, women of a high rank were able to take part in so-called "scientific circles"; the prevailing atmosphere was

one of uncertainty, plus a growing interest in the kind of science that promoted the observation and analysis of all sorts of phenomena without following any clear parameters or rules. Everything scientific, from meetings to debates, came into fashion in the last quarter of the seventeenth century for those moving in the highest circles of society, and thus certain women were able to participate in such events. There were two main reasons for women's participation:

- a) the family environment: normally pertaining to the high levels of society;
- b) the lack of institutionalization of science: at the very beginning science was a non-institutionalised activity but a hobby or part-time occupation.

For the authors included in the present analysis, some extra linguistic considerations which help explain their role as "science writers" in the eighteenth century English-speaking world of men can be taken into account. One of them is their family context and education: the fathers of our female writers normally occupied important social posts, being bankers, landowners, members of parliament or merchants interested to a certain extent in intellectual matters (Sarah Scott, Mary Astell). Some of them possessed large libraries (Catherine Macaulay) or were concerned with ladies' education and sent their girls either to boarding schools or provided them with private tuition at home (Elisabeth Justice). Others married men of learning (Margaret Bryan, Elizabeth Blackwell) and took on professional activities directly relating to their husbands' work. Mary Wollstonecraft was sent to a day school where she learnt the basic skills of reading and writing, after which she taught herself. It is worth mentioning that some of these women did not write about or practice "science" as a vocation but as a consequence of financial problems caused by their husbands (Blackwell, Justice) or because they were unmarried and family income was not enough to survive (Wollstonecraft, Astell). Wollstonecraft, for instance, worked first in typical female jobs such as those of teacher, governess and lady's companion, whereas Mary Astell was educated by a curate and intellectual, and although her family possessed considerable wealth, she eventually needed his support to survive as a writer (CETA 2012)<sup>4</sup>.

If there is something common to many of the texts written by these women, it is the instructional nature of these works. Scott wanted children to learn history and geography; Bryan wrote for school children on Astronomy; Blackwell addressed her writings to lay people and contributed to the dissemination of knowledge; Astell endeavored to instruct female audiences in logic; Justice wrote a travelogue which differed from those published at the time by male authors, since it included ordinary, everyday observations and did not limit descriptions to fascinating historical events. Meanwhile, as a professional writer Mary Wollstonecraft examined female manners and attacked male behavior at an individual and also at a political level.

There is another common characteristic which cannot be dismissed in this brief account of eighteenth century women scientists: the vindicative element present in their writings. The pursuit of equality between men and women, especially

in education, is claimed by these authors to such an extent that Mary Astell is regarded nowadays as a pioneer of feminism. However, although only about two hundred years ago, all these women worked at the lower end of the scientific scale.

Women's exclusion from scientific knowledge runs parallel to the process of the institutionalization of science which developed between the last part of the seventeenth century and throughout most of the eighteenth century (Solsona i Pairó 1997, 86–87) with the creation of societies and specialized associations to which women were not admitted. Nevertheless, the dissemination of science among the growing number of literate people also included the tentative participation of women in these matters. In fact, “from 1730 onward there was a European-wide effort led by Newtonians (...) to find a female audience for science. British periodicals appeared specifically aimed at making science accessible to women” (Jacob 2003, 206). The *Female Spectator* was one of these, but women also attended lecture courses and endeavoured to find sponsors to write textbooks. For these reasons there are different types of texts in the samples selected, the so-called *treatise* predominating, as will be seen in section 4 below. This type of text would be defined by Olmsted (1841, vii) in the next century as one in which “the deepest research is united with that clearness of exposition which constitutes the chief ornament of a work intended for elementary instruction”. The last part of this definition indicates the goal or purpose for which this type of text was designed: the written manifestation of the author's ideas and, consequently, the transmission of knowledge. By way of illustration, in the preface to Scott's work (1762, xiv) it can be read that the goal of the treatise is “to satisfy so restless a passion”.

It was a common desire of all the authors under survey here to spread knowledge independently of the field, and this desire bore a relation with the kind of reading public to whom the work was addressed: students in the case of Bryan, general readers in the case of Scott, or specialized readers as in the addressee of Blackwell's *Herbal*. Nevertheless, in all cases, the writers used a clear and intelligible language, the topic under discussion easier for lay readers to grasp (Bryan, writing on Astronomy, admits that her phrasing lacks ornament), although it should be borne in mind that at the other end of the scale the language used could also be full of metaphors, as was the case with Justice's *Voyage to Russia* (...).

The new empirical approach to science can also be noted in the prefaces to many of these writings. Observation is one of the principal methodologies of Empiricism that writers claim to have followed: hence there is an abundance of expressions such as “from a common observation” (Macaulay 1783, vii), “I observ'd” (Justice 1739, xiv), and “I flatter myself, that my imparting to general curiosity what in my researches I have been able to discover concerning it” (Scott 1762, xiii). Reference to authorities and sources from which material has been extracted is also given in prefaces: Macaulay, for example, explains that what she says coincides with the writing of Dr Clarke, an authority who indirectly bestows truthfulness and reliability to her observations. Scott, meanwhile, claims

to have searched for reliable information from authors to write her treatise on the House of Mecklenburgh.

Another common characteristic is the female presence in her texts, in a variety of forms: to defend the role of women through reflections meant to correct some abuse for power or prescription (Astell 1700, Advertisement), to ardently vindicate women's rights (Wollstonecraft 1792), to criticize female behavior (Justice 1739), or to make a positive reference to the female sex (Bryan) without any of the aforementioned connotations. Similarly, different sorts of references to the male sex have been noticed: from Wollstonecraft's identification of man as a tyrant to the words of gratitude offered by Bryan to Charles Hutton or the fact that it was John Newbury who wrote the dedication to the Queen in Scott's treatise. It can also be frequently observed that the prefaces are permeated by references to vices, virtues and religious morals (Justice 1739, Macaulay 1783) which can be interpreted as evidence of the socio-religious atmosphere of the Reformation period.

All in all, by the end of the eighteenth century, despite the fact that many women had devoted their lives to the cause of acquiring national education and certain other civil rights, "pledging for their sex and not for themselves" (Wollstonecraft 1792, iv), the situation had not improved as much as it might have done. In *A Letter to the women of England on the injustice of mental subordination with anecdotes* by Mary Robinson *alias* Anne Frances Randall (1799, 1), an early summary of women's role in society at the time reads as follows:

Custom, from the earliest periods of antiquity, has endeavoured to place the female mind in the subordinate ranks of intellectual sociability. WOMAN has ever been considered as a lovely and fascinating part of the creation, but her claims to mental equality have not only been questioned, by envious and interested sceptics...

Randall concludes the letter with a fierce defence of women's capacities:

In order that this letter may be clearly understood, I shall proceed to prove my assertion in the strongest, but most undecorated language. I shall remind my enlightened country-women that they are not the mere appendages of domestic life, but the partners, the equal associates of man: and, where they excel in intellectual powers, they are no less capable of all that prejudice and custom have united in attributing, exclusively, to the thinking faculties of man. I argue thus, and my assertions are incontrovertible (Robinson 1799, 3)<sup>5</sup>.

There is evidence that some of these women believed themselves "the equal associates of man" and indeed demonstrated their capacities by writing on scientific topics. Samples from these works, included in the CC, will be studied in the pages that follow.

## 2. Overt expression of persuasion

Biber's multidimensional analysis (1988, 1995, also Biber and Conrad 2009) is primarily based on the fact that "researchers have considered texts to be related along particular situational or functional parameters" which "can be considered as dimensions" (Biber 1988, 9) in the sense that they do not refer to specific and isolated aspects but to a non-discrete continuum. He adds (1988, 28) that these linguistic features co-occur repeatedly in texts and that their study makes possible an analysis of a text at a very detailed, microscopic level. He proposes the existence of several of these dimensions: 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. From these I have selected the fourth, "overt expression of persuasion" as a means of assessing the extent to which the author is present in her writings, exerting pressure to convince the reader or to make him participate in an *a priori* unidirectional communicative process. The bundle of features whereby this functional dimension is represented encompasses predictive modals, suasive verbs, conditional subordination, necessity modals, split auxiliaries, infinitives, and possibility modals (Biber 1995, 159). In general terms, some of the dimensions contain both positive and negative features. This is not the case of overt expression of persuasion which only includes features with a positive loading that reinforce the argumentative nature of the text, that is, distinctive markers of persuasion the presence or absence of which indicate the tone employed by the author. In Hallidayan terms, this dimension is directly related to the interpersonal metafunction and tenor (Halliday 2013).

In this study, as a preliminary approach to women's use of argumentative strategies, I have selected four kinds of linguistic features, those referring to predictive and necessity modals, suasive verbs and those indicating conditional subordination as can be seen in Table 1:

**Table 1.** Linguistic features (from Biber 1988)

Predictive modals	Necessity modals	Conditional subordinators	Suasive verbs
would	must	if	agree, allow, arrange, ask, beg, beg, command, decide, decree, demand, desire, determine, enjoin, entreat, grant, insist, instruct, intend, move, ordain, order, pledge, pray, prefer, pronounce, propose, recommend, request, require, resolve, rule, stipulate, suggest, urge, vote
shall	ought	unless	
will	should		
contracted forms			



The initial quantitative analysis will be followed by a qualitative one for which some extra-systemic aspects, also mentioned by Biber (1988, 70), will be taken into account where necessary: “Subject-matter, purpose, rhetorical structure, and style in addition to situational parameters” such as the relation between communicative participants, the relation of the participants to the external context and the relations of the participants to the text itself...” (70) will be considered in those cases in which they are useful for the interpretation of data.

In my analysis, as will be seen in Section 4 below, figures will be normalised to 1,000 words in order to provide more accurate results. However, other statistical methods will not be applied.

### 3. Corpus material

For the present study I have worked initially with 810,609 words, which correspond to the total number of words recorded for each discipline in the eighteenth century. Thus far, the different sub-corpora that will be examined are:

**Table 2.** Sub-corpora contained in the CC and number of words male vs. female writing

Discipline	Sub-corpus	Total words	Male	Female	%
Philosophy	CEPhiT ( <i>Corpus of English Philosophy Texts</i> )	200,022	169,828	30,194	15.09%
Life Sciences	CELiST ( <i>Corpus of English Life Sciences Texts</i> )	200,557	190,498	10,045	5.00%
Astronomy	CETA ( <i>Corpus of English Texts on Astronomy</i> )	208,079	197,816	10,263	4.93%
History	CHET ( <i>Corpus of Historical English Texts</i> )	201,951	181,832	20,119	9.96%
TOTAL		810,609	739,974	70,621	9.54%

However, the scope of this paper involves only the analysis of samples written by women, and upon breaking down the totals into male and female, I have found that only 70,621 words, corresponding to 9.54% of all the samples recorded, will be analysed.

The scant number of words from texts written by women can be explained, on the one hand, by several socio-external factors: the political, cultural, socio-economic and religious environment of the period, as well as the well-known practice of women leaving their names off a work or using a male pseudonym; and, on the other, by looking at the specific requirements of corpus compilation



applied to the CC: for an author to be included in the corpus it was necessary that some kind of biographical data be added to the metadata section, and in most cases of female authorship this information was difficult to obtain. In addition, there is a clear link between both conditions and requirements. Table 3 shows all the female writers, the discipline and sub-corpus to which each sample belongs, the exact date of the source text and the number of words:

**Table 3.** Female authors

Author	Sub-corpus	Discipline	Title	Date	Words	Genre
Mary Astell	CEPhiT	Philosophy	<i>Some reflections upon marriage.</i>	1700	10,077	essay
Katharine Macaulay	CEPhiT	Philosophy	<i>Treatise of the immutability of moral truth.</i>	1783	10,059	treatise
Mary ollstonecraft	CEPhiT	Philosophy	<i>Vindication of the Rights of Woman</i>	1792	10,058	treatise
Elizabeth Blackwell	CELiST	Life Sciences	<i>A Curious Herbal, containing five hundred cuts of the most useful plants which are now used in the practice of physick.</i>	1737	10,045	treatise
Margaret Bryan	CETA	Astronomy	<i>A compendious system of astronomy</i>	1797	10,263	textbook
Elizabeth Justice	CHET	History	<i>Voyage to Russia: describing the Laws, Manners, and Customs, of that great Empire, as govern'd, at this present, by that excellent Princefs, 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.</i>	1739	10,005	others (travel-ogue)

Sarah Scott	CHET	History	<i>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.</i>	1762	10,114	treatise
				Total	70,621	

The distribution per discipline of the number of words for which I will apply the linguistic parameters of Biber’s dimension 4 can be observed in Figure 1:

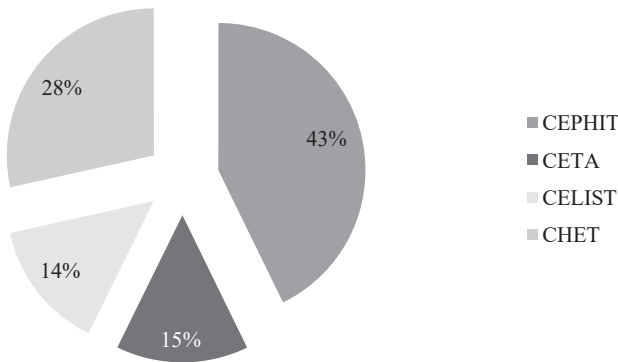


Fig.1. Distribution per discipline of eighteenth century female writing

As can be seen, Philosophy is the most prominent discipline. It falls within the field of the Humanities, which seems to have been a typical area of activity for women. Moreover, the period under analysis here coincides with a moment in history when the vindication of women’s rights was gaining importance in the social discourse. This again confirms that the CC is successful in aiming to represent the social and linguistic reality of the period, as noted above in Section 2 in relation to authors themselves.

If we look at the second variable I will employ in the analysis, that of genre or text-type, the distribution is as shown in Figure 2:

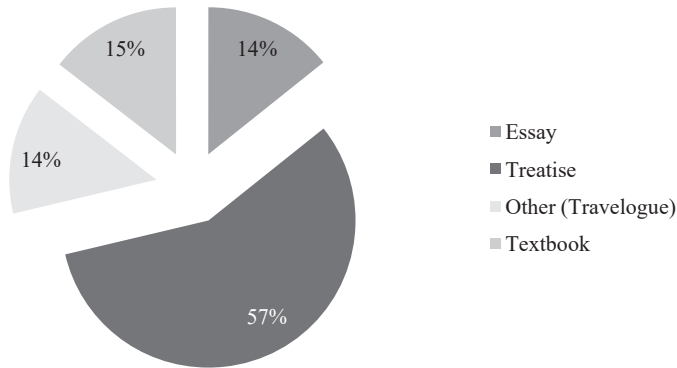


Fig. 2. Words per genre

More than half the total number of words (57%) represents the text-type treatise. Textbook, essay and other (travelogue, in this case) are equally distributed in the remaining 43%. Treatises, then, were the most common texts written by the female writers in our samples. I assume that the kind of text-types or genres used by the female authors included in the CC and their distribution could serve as a guidance of the sort of genres preferred, in general terms, by women writers. In what follows I will examine how indications of persuasion are affected by discipline or text-type.

#### 4. Analysing data

As mentioned in section 2, I intend to examine some of the linguistic features which constitute Biber's dimension 4, "Overt expression of persuasion". The features to be studied are the following: predictive modals, suasive verbs, conditional subordination, and necessity modals. I have found 1,052 tokens of these features indicating persuasion or argumentation. In normalised figures this means a ratio of 14.89 of these tokens every one thousand words. The detailed distribution of these features is as shown in Table 4 below:

**Table 4.** Frequency of occurrence per feature

Features	Raw numbers	Nf/1,000
conditionals	197	2.78
necessity modals	281	3.97
predictive modals	361	5.11
suasive verbs	213	3.01

Searches were carried out with the aid of the *Coruña Corpus Tool* (henceforth CCT) but in many cases, following these (computational) analyses involving automatic searches, the results were checked manually, a procedure also used by Biber (1988, 67). After searching for the types<sup>6</sup> mentioned by him (1988, 1995) I added several more verbal forms, such as those ending in *-ed*, *-ing* and *-s*, bringing the total of types searched to 236. However, only 79 types were found (see Figure 3 below), many of those not found belonging to suasive verbs in their several forms.

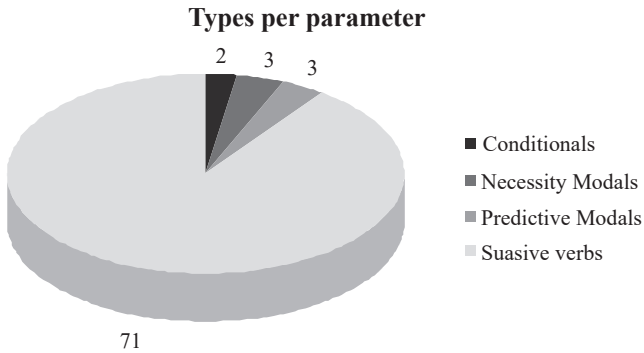


Fig. 3. Number of types per linguistic parameter

As a consequence of manual checking, it was found that not all types are equally represented. Figure 4 below shows the difference between the number of tokens that could possibly occur in each of the parameters, 1,167 (those automatically searched by CCT) and the 1052 that do in fact correspond to dimension 4 (following manual disambiguation).

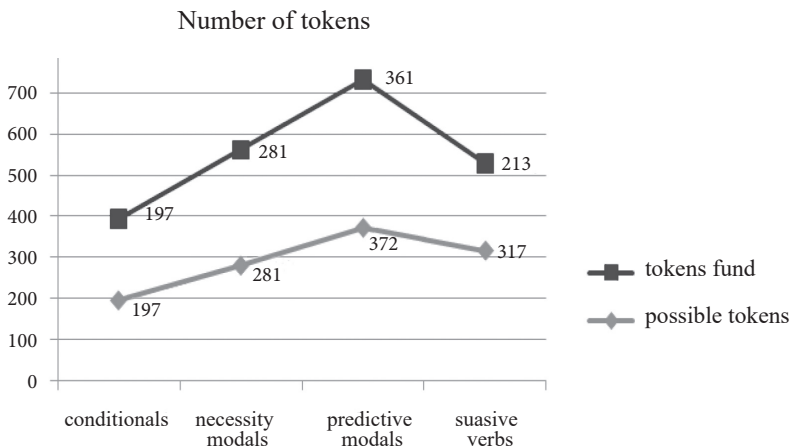


Fig. 4. Number of tokens per linguistic feature

When analysing each of these features separately I can appreciate that there is an important difference in some cases between the number of tokens that could have been found and those which are actually representative of each linguistic parameter. Interestingly enough, this phenomenon is to be observed in predictive modals and in suasive verbs, as will be explained in sub-section 4.1.

#### 4.1. Predictive modals

The three types of predictive modals searched (*will*, *shall* and *would*) have all been found in our samples. A search using CCT found 372 tokens for all three types but manual checking found that only 361 of them corresponded to verbal forms since *will* could belong to the nominal category or it could have a different meaning. In the case of contracted forms (*'till* and *the'll*), there is no way of knowing whether they are contractions of *will* or of *shall*, and for this reason I have treated them separately.

**Table 5.** Predictive modals

Type	Tokens	NF 1000
would	125	1.77
shall	48	0.67
will	172	2.43
contracted forms <sup>7</sup>	16	0.22
Total	361	5.11

Some examples of these forms can be found in (1) to (3) below:

- (1) from those authors who have published them but as you **would** not understand the principles upon which they are constructed (Bryan 1797, 104)
- (2) pay fuch a fine as the mafter of the police **fhall** think fit if the servants are guilty of any faults (Justice 1739, 31)
- (3) women do not refign the arbitrary power of beauty they **will** prove that they have lefs mind than man (Wollstonecraft 1792, 38)

As for genres, Table 6 below shows the irregular distribution of the modal forms. The normalisation of figures reveals that modals abound mainly in essays, followed by textbooks, others (travelogue) and treatises. This could be accounted for by the nature of the genres themselves. Treatises are of a more dialogical nature whereas essays and textbooks tend to be informative and the travelogue by Justice is simply describing her observations whilst in Russia. The presence of these modals implies a decrease in the level of objectivity normally attributed to scientific discourse (Garzone 2004) since authors may choose to “violate the

principles of scientific expression to enhance the persuasive force of their text” (Sokól 2006, 44).

**Table 6.** Predictive modals per genre (normalised figures)

Genre	Predictive modals found	Normalised figures
essay	92	9.12
other	53	5.29
textbook	71	6.91
treatise	145	3.6

In terms of the target audience, predictive modals predominate in texts which aim to influence or convince the reader, that is, in essays and textbooks.

As noted in the introduction to section 4, above, I have also included discipline as one of the variables in my analysis, since I think scientific writing may be discipline dependent (Moskowich 2013). There are, in this sense, epistemological restrictions that a discipline imposes on the author’s choices in text production (Garzone 2004). My findings here are as follows:

**Table 7.** Predictive modals per discipline (normalised figures)

Discipline	Predictive modals	Normalised figures
Astronomy	71	6.91
History	73	3.62
Life Sciences	1	0.09
Philosophy	216	7.15

The analysis of predictive modals as one of the parameters in the dimension concerning persuasion and argumentation is in accordance with what might be expected, given that the two disciplines with the highest number of instances, Philosophy and Astronomy, are those in which their own epistemological nature leads to the need to convince the reader. In Philosophy argumentation is the very tool of inquiry, and whereas Astronomy itself may be grouped with other observational sciences, the text-type selected by the author here (textbook) requires to a certain extent the use of persuasive strategies (see Figure 6). In the sample representing Life Sciences (Blackwell 1737, *A Curious Herbal...*) description and condensed explanations prevail. This particular treatment of the topic could be the reason for the low number of occurrences here (see example 4).

## (4) Plate 7. Rue. Ruta.

1. The Leaves are a Willow-green, and the Flowers yellow; the Stalks grow about two Foot high.
2. It is planted in Gardens, and flowers in Iune and Iuly.
3. The Leaves and Seed are ufed, being esteem'd alexipharmic, good against all infectious and pestilential Difeases, and all kind of Fevers; it eafes Diforders of the Head, Nerves, Womb, convulfion and Hifteric Fits, the Collick, Weaknefs of the Stomach and Bowles, it repells Poison, and Cures the Bite of venemous Creatures and mad Dogs. It is an Ingredient in the Aqua Brion. [comp]. and the Agua Theriacalis. The officinal Preparations are the fimple Water, Conferve of the Leaves, and an Oil by Decoction. (Blackwell 1737: 2).

#### 4.2. Suasive verbs

According to the application of Biber's model in this paper, the total number of types searched for is 187, with only 116 occurring in the material under survey. Many of the expected types were not recorded and some others either did not belong to the lexical category I was examining, or despite being verbs they were not used with a suasive meaning. As for the type/token distribution not all possible types found are suasive verbs, and the same is true of tokens. Of the 317 possible tokens only 213 are actually instances of suasive verbs.

Examples (5) to (7) illustrate some of these suasive uses of verbs:

- (5) The malecontents deputed fome of their chiefs to represent their grievances, and **alk** aid of Margaret, fince they were determined to oppofe their King by force (Scott 1762, 168).
- (6) This greatly incensed the King; who, affifted by his allies, again laid fiege to the city; he himfelf **commanding** the fleet, (Scott 1762, 135).
- (7) And for thofe other little things that **move** their Envy and Ambition, they are of no Esteem with a juft Confiderer, nor will fuch as violently purfue, find their Account in them. (Astell 1700, 49).

Of all the suasive verbs proposed, 71 types have not been found at all. Sometimes the explanation for this is that the suasive meaning is recorded later than the date in which the text was published. This is the case with *suggest* according to the OED:



- (8) 1837 Dickens *Pickwick Papers* xli. 450 ‘Will you take three bob?’ ‘—And a bender,’ **suggested** the clerical gentleman.

In other cases the suasive meaning of certain verbs was developed during the eighteenth century, and thus was not yet of common use among contemporary writers. An example of this is *stipulate* with the meaning of “To make an express demand for something as a condition of agreement”, first recorded in 1790.

- (9) 1790 *Dallas’ Rep.* I. 105 What do treaties **stipulate** for to guard against violence on the seas?

I have come across several types of which only a few tokens have been found. Among them I could mention *arrange*, *agree*, *beg*, *decide*, *desire*, *entreat*, which were attested in our samples, whereas some corresponding grammatical forms were not (*agreeing*, *arranged*, *begged*, *begging*, *begs*, *deciding*, *desires*, *entreats*, *entreating*, *entreated*). Example (10) illustrates the use of suasive verbs:

- (10) the platonic system of philosophy though it does not exactly **agree** with this system as to the imperfections of these inferior (Macaulay 1783, 26).

Other types, such as *demands*, are only partially represented. On the three occasions in which *demands* appears, for example, manual disambiguation showed that only one of these expressed a persuasive/argumentative meaning. Example (11) below accounts for its use as a suasive verb, whereas example (12) shows its use as a noun:

- (11) Suasive: [...] whose althes still preach peace, and whose memory **demands** a respectful pause, when subjects are disuffled that lay so near his heart. (Wollstonecraft 1792, 25).

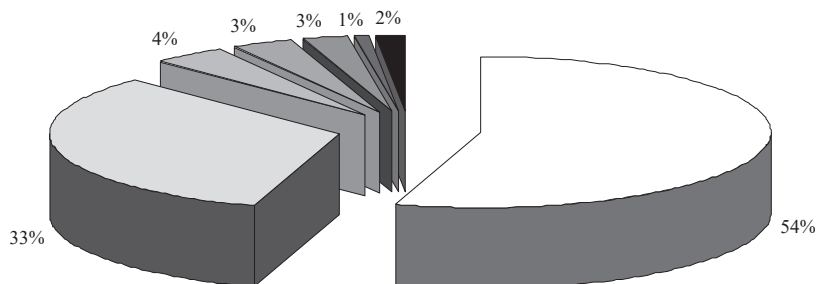
- (12) Non-suasive: and he gave her Leave, on Condition of fatisfying his **Demands**; which he did, and had Abfolution. (Justice 1739, 25).

There are cases in which the type corresponding to the base form has not been recorded although other types corresponding to other grammatical forms do appear. Such is the case of *pronounces* and *resolved* in examples (13) and (14).

- (13) have drawn their swords in’t all that the wife man **pronounces** is an oracle and every word the witty speaks a (Astell 1700, 59).

- (14) in the latter end of the year the duke **resolved** to invade zealand but finding the place too well prepared (Scott 1762, 147).

*Recommends* and *allowed* are the types that appear most frequently, with 12 tokens each. By contrast, I have found 65 *hapax legomena* with only one token (*agree, commanded, desired, grant, prefer*). Figure 7 below sets out the lexical variety to be found in the writing of these authors, with 54% of forms found used only once and 33% corresponding to instances with two tokens. Together, this represents 87% of the suasive verb forms used. The low repetition of terms is another indicator of this lexical richness. Having said that, I am conscious of the fact that the larger the corpora I analyse, the lower the number of instances that will be found (Baayen 2001).



□ one token □ two tokens ■ three tokens ■ four tokens ■ five tokens ■ eight tokens ■ twelve tokens

Fig. 7. Number of suasive verbs (tokens)

As for the variable genre, the distribution of the suasive verb forms is as follows:

**Table 8.** Suasive verb tokens per genre (normalised figures)

Genres	Suasive verb tokens	Nf/1,000
essay	35	3.47
other	22	2.19
textbook	29	2.82
treatise	127	3.15

Essay is the genre with the highest number of suasives, followed by treatise, where the author's concerns about being credible and presenting actual facts or theories when addressing the reader are clearly important. Although Table 6 indicates the presence of suasive verb tokens, the abundance of types must be noted.

Thus, 23 different types have been found in the essay, the sample by Astell (1700). Justice, meanwhile, uses some of the types that no other author employs in her travelogue (*prays*).

Our sample of textbook writing, from Bryan, contains 15 different types. It might be noted that certain types such as *allowed* present 30 tokens in the text sample from the observational sciences Bryan represents. Other types, however, are only represented by two tokens. This is the case of *recommend*, for example. Treatises belong to the best represented genre in my corpus since there are four authors writing treatises (Blackwell, Scott, Macaulay, and Wollstonecraft). In them, automatic searches yielded 64 different types. Several types that are *hapax legomena* (see section 4.1), some are very common (*asks*, *decides*), but others are less so (*decreed*, *entreat* or *stipulated*). This argues in favour of the lexical variety of female writing, as mentioned above.

The wide variety of types is reflected in the use of tokens. Essays come first here, with 3.47, followed by treatises (3.15), textbooks (2.82) and, finally, other (travelogue) with 2.19. The lower number of suasive verb forms to be found in textbooks and travelogues may be due to the fact that authors, when writing textbooks (informative) and travelogues (other) do not have to convince or persuade but rather to describe or inform their audience. Similarly, in essays and treatises, as pieces addressed to the same epistemological community as the writer, these features seem to be more pervasive. Normalised rates might suggest a direct relation between the type of genre selected by the author and the greater or lesser presence of these features.

The last variable to be examined concerning this parameter is discipline. Table 9 illustrates how the 213 tokens are distributed according to discipline.

**Table 9.** Suasive verbs per discipline

Discipline	Suasive verb tokens	Nf/1,000
History	65	3.23
Astronomy	29	2.82
Life Sciences	17	1.69
Philosophy	102	3.37

Philosophy (3.37) occupies the top position here, which is what might be expected, especially when considering the content of the analysed samples. History follows with 3.23 tokens belonging to very different types. The type appearing most often is *agreed* with 8 tokens (Scott) followed by *allowed* with 5 instances, in Justice. Nevertheless, *hapax legomena* proliferate in the samples by both authors. Not surprisingly the descriptive extract by Blackwell contains just a few

instances of suasive verbs (1.69), three of which are forms of the same lemma (*recommend, recommended, recommends*) and with only one token from a different type (*resolved*).

There is not a striking difference, however, between those disciplines belonging to what nowadays we would call “the Humanities” and Astronomy. The reason for this could lie in the fact that the genre of the astronomy sample, textbook, is one in which it is not so rare to find suasive forms (see Table 8 above). Discipline results may sometimes be biased by the text-types or genres of the samples under study.

### 4.3. Conditional subordinators

The two types of conditional subordinators analysed are *if* and *unless*. The 197 tokens found are very irregularly distributed, since 191 correspond to *if* whereas only 6 correspond to *unless*. Conditional clauses are used for discourse framing and for authorial positioning in terms of an “assessment of the advisability or likelihood of an event presented to persuade the addressee” (Biber 1988, 111). Conditional constructions are said to be influenced by the speaker’s physical involvement, the personal experience or direct participation of the speaker in a particular situation (Nikiforidou and Katis 2000).

*If* forms have been found in all genres in our samples. However, *unless* was only recorded in an essay and in a treatise (see Table 9). Some examples are presented in (15) and (16):

(15) has been dogmatically asserted by the tribe of misanthropical writers **if** there is any immutability in truth. (Macaulay 1789, 16)

(16) a reason will never hold in respect of men’s commands **unless** they can prove themselves infallible and consequently impeccable too. (Astell 1700, 87)

**Table 10.** Conditional tokens per genre

Genre	Number of conditional tokens	Nf/1,000
essay	61	6.05
other	19	1.89
textbook	17	1.65
treatise	100	2.48

*Unless* is used only on 6 occasions, four by Mary Astell in *Some Reflections upon Marriage* and the remaining two by Mary Wollstonecraft in *A Vindication to the rights of women*. This use is related to the argumentative nature of their work, in which they make an effort to shake the collective consciousness of women in order to make them wake up from their lethargy regarding the position of women in society. The topicalisation provoked by the use of *unless* has evident pragmatic, even socio-political intentions.

As in previous features, the next variable to be scrutinized is the scientific domain or discipline to which samples belong.

**Table 11.** Conditional tokens per discipline

Discipline	Number of conditional tokens	Nf/1,000
Astronomy	17	1.65
History	33	1.64
Life Sciences	1	0.09
Philosophy	146	4.83

Table 11 shows the normalised figures for the occurrence of the conditional subordinators under examination. Subordinators clearly predominate in Philosophy, the argumentative discipline *par excellence*. Samples from other disciplines only contain instances of *if*. Once more, it seems the case that topicalisation may be playing a part as a rhetorical device typical of this particular field.

#### 4.4. Necessity modals

Contrary to the case of predictive modals, the number of total possible tokens and tokens found coincide, as can be observed in Table 12. There are three necessity modals, *must*, *ought* and *should*, as also mentioned by Biber, and these constitute another linguistic feature that forms part of dimension four.

**Table 12.** Necessity modals types and tokens

types	3
total tokens (possible forms)	281
tokens found	281

As in the case of predictive modals, some contracted forms (*shou'd*) have been found as variants or alternative spellings. Table 13 below sets out the number of tokens found for each type.

**Table 13.** Occurrences per type in necessity modals

Necessity modals	Tokens
must	124
ought	32
should	125

The number of occurrences shows a clear tendency towards the use of strong modality forms, with *must* and *should* prevailing over *ought*. This may be related to a stronger authorial presence (Von Fintel and Iatridou 2006) in texts where the intention is to move or influence the addressee as in the examples below:

- (17) mixture of political reflections in a moral treatise yet it **must** be acknowledged that the annals of this age have ... (Macaulay 1783, 15)
- (18) depends and is always calculated in proportion allowing something I **should** suppose for the difference of refraction in reference to the (Bryan 1797, 108)
- (19) the menstrual evacuations the seed of this plant is what **ought** to be used in the theriaca & mithridate (Blackwell 1737, 17)

This, of course, contradicts the apparent objectivity of scientific discourse, as described, for example, by Vassileva (2000, 9) when she states that the author “is expected to remain hidden behind facts, research results, tables, formulas and the like.” As will be observed later, it seems that the use of necessity modals is also clearly subject-matter dependent.

The presence of necessity modals in the different genres is manifested in Table 14 below.

**Table 14.** Necessity modals per genre.

Genre	Number of necessity modals found	Nf/1,000
essay	74	7.34
other	16	1.59
textbook	38	3.7
treatise	153	3.79

Normalised figures show that more formal ways of conveying scientific information, such as essays or treatises, occupy the first and second position on the scale respectively. Nonetheless, occurrences in essays almost double those in treatises. A possible explanation of this is that essays are more restricted in scope and that authors may feel the need to convince their audience of the very specific issue they are dealing with. However, treatises, frequently containing a general treatment of a topic, tend to present information with a more descriptive and informative purpose and have a weaker argumentative force, exerting less of an influence on their interlocutor in the communicative process.

As for discipline, the analysis reveals that Philosophy (6.06) contains the highest number of occurrences (normalised), followed by Astronomy (3.7) and History (2.88). Not surprisingly, Life Sciences comes last with only 0.19 occurrences in normalised figures.

It is interesting to note that not all types are equally represented in the disciplines under examination. The imbalance in frequency of occurrence is shown in Table 15:

**Table 15.** Types of necessity modals per discipline

Discipline	Type	Number of tokens	Nf/1,000
Philosophy	Must	70	2.31
	Should	84	2.78
	Ought	29	0.96
6.06			
Astronomy	Must	30	2.92
	Should	8	0.77
	Ought	0	0
3.7			
History	Must	23	1.13
	Should	33	1.62
	Ought	2	0.098
2.88			
Life Sciences	Must	1	0.09
	Should	0	0
	Ought	1	0.09
0.19			

As normalised figures reveal, the presence of necessity modals in this corpus follows the stronger to weaker scale, *must* interchanging the highest



position with *should*, especially in Philosophy and History. *Ought* hardly occurs in these samples except for Philosophy texts. In principle one might think that the argumentative character of Philosophy as a discipline would lead it to be first in its use of modals indicating strong necessity. Normalised figures, however, show that it is the discipline of Astronomy that contains the greatest proportion of *must* forms. The author Margaret Bryan had to convey the idea of Laws governing the Universe, general truths. Also, her work, a collection of lectures that she had given to students, was transcribed in the form of a textbook, and the written version may have preserved some of the argumentative and persuasive features of her oral delivery. The rest of the findings in Table 15, above, are to be expected, and are in keeping with authors' intention and epistemological constraints, clearly illustrated by the very low use of *must* in Life Sciences.

## 5. Final remarks

The eighteenth century was a crucial time in the development of science in the Anglophone world, and especially so for the involvement of women in intellectual work. Their need for society's recognition can be inferred from the way they used language. The difficulty that women had in the eighteenth-century in being taken seriously as scientists accounts for the relatively low number of words in our corpus, but this should not invalidate the findings here relating to female strategies in the writing of science.

The analysis of persuasive markers may be interpreted in terms of function and context or situation. The strategies of dimension four that have been studied are not equally used by all the female authors in our corpus. Predictive modals are the most frequent linguistic device, followed by another class of modals, those referring to necessity. Hence, the expression of modality is the mechanism to which our female authors recur with greatest frequency. Contrary to what might be expected, it is not suasive verbs that come next, but conditional subordinators. This may be accounted for by the fact that eighteenth-century society compelled women to behave in certain ways and men to behave in others. To the well-known principles of scientific writing in the Restoration period, objectivity, clarity and conciseness, women had to add subtlety to their discourse. The avoidance of suasive verbs highlighted this necessary subtlety.

In this work I have analysed two variables, genre and discipline, as possible factors in the characterisation of female scientific discourse. The features examined here occur mainly in essays, the genre in which they intended to exert the same kind of pressure on readers as is the case in science writing by men. I have also observed that the way in which the different linguistic features under study appear in essays and textbooks (in their use of predictive modals) and treatise

and essay (in their use of suasive verbs, conditional subordinators and necessity modals) has a more or less parallel behaviour.

Disciplines have also been seen to behave differently, with Philosophy containing more strategies for the overt expression of persuasion, as expected. Even though philosophy texts are the ones with the highest indicators for this dimension, and given that it is a vindicative genre *par excellence*, suasive verbs are the least represented linguistic feature, which leads us to believe that the expression of persuasion is not in itself an overt feature of female scientific writing in the eighteenth century.

It will be interesting to see in a future paper if the same strategies are used with similar frequencies in male scientific writing to go deeper into the probable social causes of women scientific language.

## Notes

- 1 By way of summary, three main parameters of compilation have been followed: classification, time-span and degree of representativeness. No random selection has been made but this has been based on certain external parameters to ensure fruitful linguistic analyses. From the point of view of thematic grouping, we have adhered to the current UNESCO classification of science as a starting point, although I have borne in mind important differences in how science was viewed before and after Empiricism, which is especially visible in eighteenth century samples. Indeed, we have and still are compiling independent sub-corpora which share a similar structure, organisation and mark-up (Moskowich and Crespo 2007): CETA, CEPhiT, CELiST, CHET.

One of the peculiarities of these corpora is that, apart from the texts themselves fulfilling the same external criteria for the purpose of representativeness, they include metadata files with information about the author and the text itself to which the sample belongs. In addition, a corpus management tool has been implemented to facilitate the use of different kinds of searches of all the sub-corpora. It works like most concordance programmes, but the *Coruña Corpus Tool* incorporates special features adapted to the characteristics of the *Coruña Corpus* (Crespo and Moskowich 2010).

- 2 I understand linguistic features in the same sense as Reppen, Fitzmaurice and Biber (2002, viii): “a single word, a set of related words, a grammatical construction, or the interaction between particular words and grammatical structures”. It is used in the same sense by McEnery and Hardie (2011).
- 3 Taken from Barker-Benfield (1992, 154).
- 4 For more information on these writers, consult the metadata included in CETA.

- 5 Edited by Adriana Craciun, Anne Irmen Close, Megan Musgrave, and Orianne Smith, *A Romantic Circle Electronic edition*.
- 6 For the type/token distinction in corpus linguistics see <http://wmtang.org/corpus-linguistics/glossary-of-corpus-linguistic-terms/>.

## References

- Baayen, Harald R. 2001. *Word Frequency Distributions*. Dordrecht: Kluwer Academic Publishers.
- Barker-Benfield, G. J. 1992. *The Culture of Sensibility: Sex and Society in Eighteenth-Century Britain*. Chicago: University of Chicago Press.
- Biber, Douglas. 1988. *Variation across Speech and Writing*. Cambridge, UK: Cambridge University Press.
- Biber Douglas. 1995. *Dimensions of Register Variation: A Cross-linguistic Comparison*. Cambridge, UK: Cambridge University Press.
- Biber, Douglas, and Susan Conrad. 2009. *Register, Genre and Style*. Cambridge: Cambridge University Press.
- Colby, Frank Moore, and Talcott Williams. 1930. *The New International Encyclopædia*. New York: Dodd, Mead and Co.
- Crespo, Begoña, and Isabel Moskowich. 2010. “CETA in the Context of the Coruña Corpus.” *Literary and Linguistic Computing*, 25/2: 153–164.
- Garzone, Giulia. 2004. “Annual Company Reports and CEOs’ Letters: Discoursal Features and Cultural Markedness.” *Intercultural Aspects of Specialized Communication*. Ed. Christopher Candlin, and Maurizio Gotti. Bern: Peter Lang. 311–342.
- Halliday, Michael Alexander Kirkwood. 2013. *Introduction to Functional Grammar*. London: Routledge.
- Jacob, Margaret C. 2003. “The Scientific Revolution and the Industrial Revolution. The Cultural Origins of the First Industrial Revolution.” *The Scientific Revolution*. Ed. Marcus Hellyer. Oxford: Blackwell Publishing Ltd. 194–215.
- McEnery, Tony, and Andrew Hardie. 2011. *Corpus Linguistics: Method, Theory and Practice*. Cambridge: CUP.
- Moskowich, Isabel. 2013. “Eighteenth-Century Female Authors: Women and Science in the Coruña Corpus of English Scientific Writing.” *Australian Journal of Linguistics*, 33/4: 467–487.
- Moskowich, Isabel, Begoña Crespo, Camiña Gonzalo, and Inés Lareo. 2012. *Corpus of English Texts on Astronomy, CETA*. Amsterdam/Philadelphia: John Benjamins.
- Moskowich, Isabel, and Begoña Crespo. 2007. “Presenting the Coruña Corpus: A Collection of Samples for the Historical Study of English Scientific

- Writing.” *‘Of Varying Language and Opposing Creed’: New Insights into Late Modern English*. Ed. Javier Pérez Guerra et al. Bern: Peter Lang. 341–357.
- Nikiforidou, Kiki, and Demetra Katis. 2000. “Subjectivity and Conditionality: The Marking of Speaker Involvement in Modern Greek.” *Constructions in Cognitive Linguistics: Selected Papers from the International Cognitive Linguistics Conference*, Amsterdam, 1997. Ed. Ad Foolen, and Frederike van der Leek. Amsterdam: John Benjamins. 217–238.
- Olmsted, Denison. 1841. *Letters on Astronomy, Addressed to a Lady in which the Elements of the Science are Familiarly Explained in Connexion with its Literary History*. With numerous engravings. Boston: Marsh, Capen, Lyon and Webb.
- Oxford English Dictionary*. 1989. (2nd edition online version) November 2010. <http://www.oed.com> Accessed 15 December 2013.
- Reppen, Randi, Susan M. Fitzmaurice, and Douglas Biber, eds. 2002. *Using Corpora to Explore Linguistic Variation. Studies in Corpus Linguistics*. Amsterdam and Philadelphia: John Benjamins Publishing Company.
- Robinson, Mary. 1799. *A Letter to the Women of England, on the Injustice of Mental Subordination*. <<http://www.rc.umd.edu/editions/robinson/mrletterfrst.htm> Mary Robinson’s>. Accessed 9 December 2014.
- Sokól, Malgorzata. 2006. “Discoursal Construction Of Academic Identity In Cyberspace On The Example Of An E-Seminar.” Doctoral dissertation written in The Department of English, Szczecin University, Szczecin.
- Solsona i Pairó, Nuria. 1997. *Mujeres científicas de todos los tiempos*. Madrid: Talasa Ediciones.
- Von Fintel, Kai and, Sabine Iatridou. 2006. “How to Say *Ought* in Foreign: The Composition of Weak Necessity Modals.” Paper presented at *CUNY linguistics colloquium* in May 2006, and at the 6th Workshop on Formal Linguistics in Florianopolis, Brazil.
- Vassileva, Irena. 2000. *Who is the Author? A Contrastive Analysis of Authorial Presence in English, German, French, Russian and Bulgarian Academic Discourse*. Sankt Augustin: Asgard.