Chapter 5

Patterns of English scientific writing in the 18th century

Adjectives and other building-blocks

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1. Introduction

It is often claimed that the written register tends to reflect a nominal style, in which nouns, phrases and adjectives abound, whereas a verbal style, containing higher proportions of verbs, complement clauses and adverbs, among others, is typical of the oral register (Sager et al, 1980; Biber, 2008). Another feature of the written register, and particularly of scientific writing, is that the vocabulary is in general characterised by its specificity and a tendency to have non-Germanic, classical origins (Moskowich, 2008). These two factors, the nominal style and the nature of the vocabulary, may be said to be typical of English scientific writing. This observation is usually made of present day English. It is the aim of this study to ascertain whether written scientific texts adhered to such a pattern in the past, looking at English astronomy texts produced throughout the 18th century and contained in *CETA* (*Corpus of English Texts on Astronomy*). My specific focus will be on attributive adjectives as elements indexical of that nominal style.

At the same time, I will try to explore how this nominal style is reflected in the nature of adjectives as regards adjectival suffixation and the etymological origin of suffixes in scientific writing, as well as in the genres to which the different text samples have been assigned.

Some background issues and questions will first be addressed in Section 2, after which Section 3 will deal with the description of the data used, *CETA* (*Corpus of English Texts on Astronomy*); several variables, including etymological origin and the genre to which the sample belongs, will be taken into consideration for the analysis. Section 4, by way of conclusion, will attempt to describe the use of adjectives as a feature characteristic of texts arising from the new observational sciences.

2. Some background issues

Four main difficulties exist in the general consideration of adjectives, irrespective of the language concerned. Although some of these, such as the question of adjectives as a separate word-class, will not be touched upon directly in the present paper, such difficulties must be at least briefly mentioned.

The first problem regards the nature of adjectives as part of a particular taxonomy. In the western linguistic tradition, there have been different attitudes regarding the existence of the word-class "adjective" as such. Whereas some authors view this class as one of the ways in which human beings categorise the world, such as Dixon (1994: 2), who affirms that adjectives, together with nouns and verbs, constitute one of the three word-classes implicit in human language, others deny its existence as an independent entity. Thus, Halliday (1994: 85) includes "adjectives" as a subclass of "nominal". The position that I adopted here is, of course, that of Dixon.

If we accept that the class or lexical category exists, as most linguistic frameworks do (Trask, 1993: 155), a second problem arises. The classification of the different elements within the class is not always straightforward, mainly because it is an open word-class[1]. The semantic content, as well as other formal characteristics traditionally attributed to adjectives, are not in evidence to the same degree in all adjectival items: some seem to fulfil more of the requirements necessary to be considered an adjective than others, in this sense the former seeming to be more central to the class and the latter more peripheral. For the present paper, adjectives have been considered in a narrow sense, concentrating on central or prototypical (Rosch, 1978) elements of the class, that is, descriptive adjectives. Other forms, such as deverbal adjectives (-*ed* and –*ing* forms), have been excluded from the general count in the analysis of the data. Similarly, examples such as the one below, containing *captaine-general,* will be considered elements of compound nouns and therefore excluded:

> tho' one would think the god of war or <captain-general> of heaven might command a few guards or followers but … (Harris, 1719: 52)

I have also disregarded other cases in which nouns function as adjectives, taking into consideration only adjectives that are central to the word class. Therefore, the first elements in forms such as *south-pole, south-side* and *summer-solstice,* though functioning as modifiers, have not been included. Similarly, elements such as *cometic-moon,* which are formally adjectives but appear as part of compound nouns (even indicated by hyphens), have not been included in my survey.

A third issue is also related to the semantics of adjectives. If "the semantic resource associated with adjectives is primarily concerned with Qualities of Things", (Tucker, 1988: 57), they should be abundant in texts dealing with the observational sciences such as astronomy, where a descriptive rather than a narrative style is required. We also know that, from a morphological point of view, although the class adjective is

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[1] Even pre-nominal adjectives, which seem to have a greater cohesion as members of one and the same group, have been classified in various ways in the literature (Warren, 1984: 7)

normally smaller than that of nouns and verbs (Dixon, 2004: 10), a higher proportion of adjectives than nouns or verbs are derivative forms (Givón, 1970: 816). Bearing both these ideas in mind we should be able to find a good number of adjectives in our samples, and many of them should be derivative rather than simple forms.

The fourth and final question to be borne in mind here is the claim of some authors that the creation of new words from native word stock has not played a very great part in the development of scientific writing (Halliday, 1978: 195). The etymological origin of the adjectival suffixes analysed in *CETA* will be revealing here, one way or another, even though our sampling is restricted to the eighteenth century section of the corpus.

3. An analysis of attributive adjectives in *CETA*

As already mentioned, the data for my study have been extracted from the *Corpus of English Texts on Astronomy*. Astronomy texts written throughout the 18th century have been selected to look at suffixation processes in adjectives, as a means of seeing to what an extent these texts adhere to the characteristic pattern claimed for present-day scientific writing, in which more Latinate forms are, *a priori*, expected. The early Modern English period saw the emergence of a need for new words to denote and describe new realities. Such a need implied an increase in affixation and in other devices to enlarge the lexicon (Adams, 1973; Nevalainen, 1999). This tendency seems to be reinforced by "an atmosphere favouring linguistic experiments" (Görlach, 1991: 138) throughout the sixteenth and seventeenth centuries that had observable effects in the eighteenth century.

The etymological origin of words or word constituents has been taken into consideration as one of the features characteristic of texts about the new observational sciences. In line with Halliday (1978), my starting point is that, roughly speaking, texts containing such specific language will prefer elements of a Romance or Latinate[2] origin, or even a classical one, rather than elements from a native stock. We assume that the same principle can be applied to word formation processes and that in the particular case of adjectival formation, non-Germanic affixes will probably be preferred to Germanic ones (Crespo & Moskowich, 2005). Going one step further, we might also assume that the more technical and specialised a text is, the greater use of Latinate adjective suffixes will be observed.

For the purposes of assessing the relative frequency of non-Germanic origin, two adjective suffixes have been chosen: -*al* (of Romance origin) and -*y* (of Germanic origin). Although these two will be compared, it is not my intention to analyse them as competing forms in the way that Gries (2001) and Kaunisto (2007) have done. Also, I

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[2] Harley (2006: 165) affirms that "When an affix is described as being "Latinate", that doesn't necessarily mean it was borrowed directly from Latin. It might also have been borrowed from any of the daughter languages of Latin that are the modern descendants of the Italic branch of Proto-Indo-European, such as Italian, Spanish, Portuguese, or, and most importantly, French".

will not use any quantitative methods, such as the approach devised by Cowie and Dalton-Puffer (2002), to measure productivity. My analysis here does not seem to require such methods, since productivity is not my main concern.

Samples extracted from *CETA*, part of the *Coruña Corpus of English Scientific Writing,* have been selected as my source of data. The eighteenth-century section of the corpus contains 208,079 words, these not being equally distributed as regards authors' regional origin or the genre of the texts. I have analysed twenty-one samples by different authors, none of them being translations (cf Chapter 3), which will serve to minimise interference from Latin or other learned languages. That is to say, the forms found in my analysis will not be the result of a defective translation or any sort of linguistic interference but rather that of the authors' effort to be precise. We must, however, bear in mind that many of the authors of scientific texts in the eighteenth century were members of the clergy or of universities, institutions in which Latin was the "official language". This fact, together with the undeniable prestige that Latinate forms carry, may be operating to some extent in authors' minds during the process of writing. The fact that *CETA* contains only one sample per author also guarantees that linguistic idiosyncrasies are avoided.

The material in the corpus, reflecting the production of texts in the eighteenth century, is not homogeneous at all, neither in terms of content nor in terms of style. The samples correspond to eight different genres, as shown in Figure 1 below. Each of the genres identified reflects a different level of technicality not necessarily related to its scientific content but to the intended readership of the text. The eight genres are not equally represented in terms of word counts, since *CETA* aims at representing the linguistic and textual reality of eighteenth-century astronomy in English, when textbooks (104,125 words) were more abundant than articles (4,240 words) as a consequence of a strong desire at the time to spread and popularise knowledge to almost all social ranks. The distribution of genres to be found in the eighteenth-century section of *CETA* is represented in Figure 1.
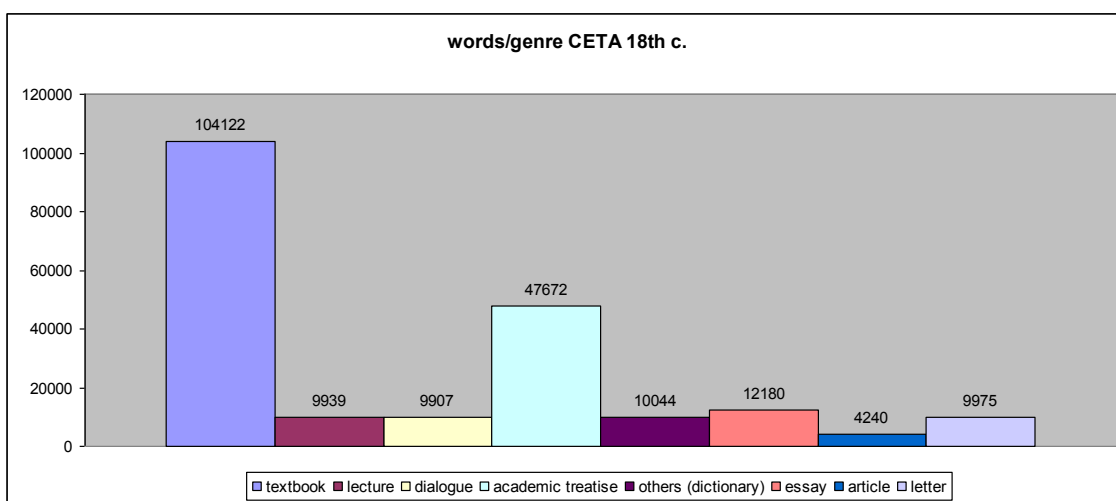

Figure 1. Distribution of words per genre in *CETA*

I have found, as noted by Dixon (2004) when referring to English in general, that of the total number of words in my data from *CETA* only a small proportion are adjectives (see Figure 2, below). The proportion seems to be very low indeed for texts in which descriptions, and therefore passages containing adjectives, might be expected to be numerous. The total number of adjective tokens found in these text extracts is 13,724, only 6.59% of all the word forms contained in *CETA* for the eighteenth century. Moreover, they are very irregularly distributed in different types, so that we can find on the one hand a case such as the type *equal* with 407 tokens, and on the other a total of 424 hapax legomena[3] (representing 25% of all occurrences). Such types range from the very frequent ones, like *sure, slow, blue* and *little*, to the very infrequent, like *latudinarian*, *irrefragable* or *magellanik*. Of particular interest is the fact that the adjective *scientific* occurs only once over the course of the century in these samples, in a text by Samuel Vince dated in 1790, in the following context:

> And as this inftrument is fo frequently neceffary for thofe who may not have much theoretical knowledge, and may alfo afford amufement to others under the fame circumftances, no apology will be neceffary to the more **fcientific** part of my readers for being fo particular in its defcription and ufe. It was thought proper alfo, for the fame reafon, to add the rules for the computations from the obfervations, and to illuftrate them by examples, that the obferver might be enabled to deduce the concluſions for which his obfervations were intended. (Vince, 1790: 7)

Figure 2 below illustrates just how small the proportion of adjective tokens (only 13724 representing 6% of all forms) found in my material is compared to the total number of forms. Such a small proportion does not seem to sit well with the idea of a nominal style, in which adjectives might be expected to abound as a feature typical of the written register.

adjective tokens in 18th-c. CETA

6%

94%

☐ adjective tokens
☐ total tokens

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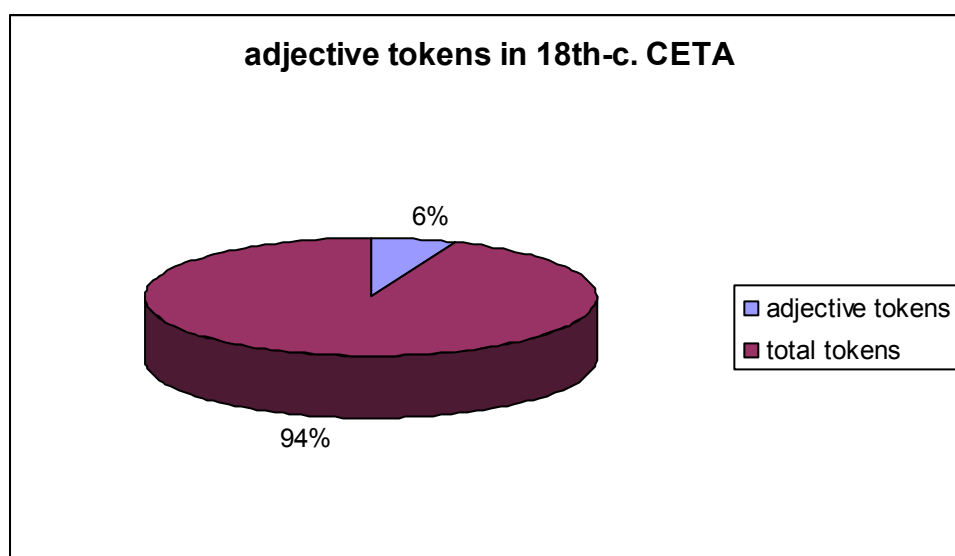
[3] It might be noted that one of the many hapax legomena found in our corpus is in fact the form *adjective*, recorded only once, in the sample by Hill (1754).

Figure 2. Proportion of adjective tokens in *CETA*.

Numbers are further reduced if we consider not all 13724 adjective tokens, but only attributive derivative adjectives formed with the suffixes –*y* and –*al*. These together represent only 15% of all adjective tokens, and 1.18% in the whole corpus. Total numbers are given in the table below as well as in Figure 3:

	tokens	%
-*y*	472	3.44%
-*al*	2002	14.59%
Others	11250	81.97%
Total	13724	

Table 1. Proportion of derivative adjectives under study

Consequently, my analysis will involve only a small proportion of *CETA*, limited to the derivative adjectives whose distribution is clearly displayed in Figure 3 below:
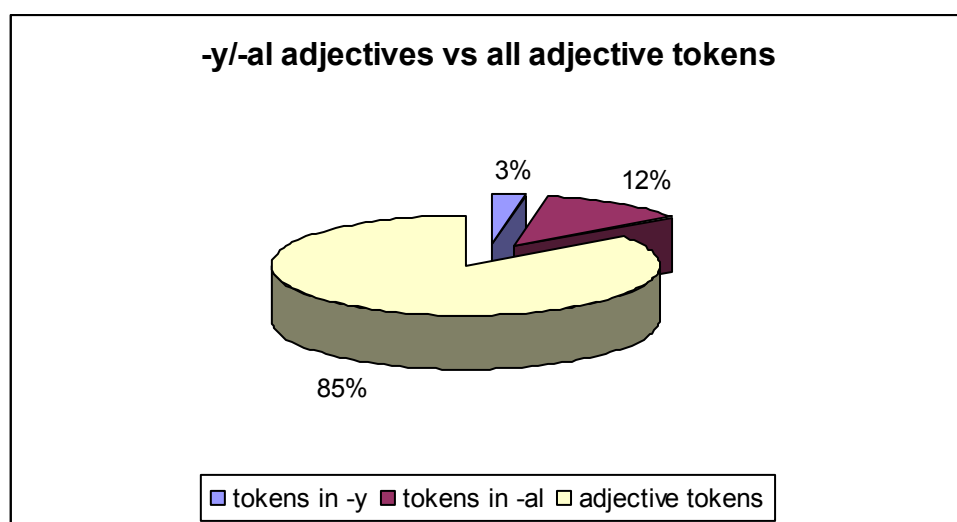

Figure 3. Distribution within adjective tokens

I will now offer some brief notes on the suffixes under consideration. We must not confuse the suffix –*ic*, which began to be used in English around the year 1600 (Kaunisto, 2007: 10) with –*y*, which derived from OE –*ic* and developed a weakened form coinciding with the one to be found in Modern English. The former does not have a Germanic origin at all but one related to –*ical*, a compound suffix (Ramsey, 1892: 290). According to the *OED* many forms added –*al* to Latin and Greek adjectives ending in –*icus* or -*ikos*, and Kaunisto (2007: 295) confirms that this process took place during the sixteenth century. In the seventeenth century derivative adjectives ending in –*ic* gained ground and those ending in –*ical* were less frequently used. This can be observed in rival pairs such as *domestic/domestical* and *heroic/heroical* (Kaunisto,

2007: 296). Similar pairs appear in my corpus, though infrequently. In the following examples *mechanick* and *mechanical* are used in successive periods:

> Thefe Plains fome Denominate from the fight or Pofitions of their Axis in the Heavens, others denominate them from the Circles of the Sphære in which they lye. Of all which Plains and how to draw the Hour Lines thereupon with other their **Mechanick** operations in that Art, you may read in Authors at large, but it is not my meaning to defcribe them here. (Curson 1702: 366)

> The mechanical Caufe of the Earth's North and South Declination, arifes from the aforefaid Syftem of the Sun's projecting the Matter of Light in tranfverfe Lines on the Surface of the Earth. (Lacy, 1779: 8)

As regards the adjectives used to refer to the sciences themselves, it seems that the oldest forms tend to resort to –*ical* (Kaunisto, 2007: 297), as in *logical* and *mathematical*, whereas others, such as *linguistic, phonetic*, appeared as late as the nineteenth century[4].

The fact that we are not including all adjectives ending in –*y* in Modern English, but only those with a suffix derived from OE –*ic,* may also account for the low incidence observed in Figure 3. This incidence is lower still due to the exclusion of all adjectives ending in –*ory* which, according to the OED, is an Anglo-Norman suffix (formerly -*orie*) that can be traced back through Old French to Latin -*ori-us*, -*a*, -*um*, itself a compound suffix. I have also excluded adjectives ending in –*ary* (from Latin –*arius*) because they too were already imported into the language, not derived later on.

One grammarian of the period, Elphinston, seems to have been the only one to comment on the use of adjectives in the language and their suffixes. He notices that foreign terminations are used on solemn occasions whereas what he calls "domestic terminations" are used in familiar ones (1765: 323-324). In this case we could say that –*y*, as a Germanic suffix, and therefore domestic, should be used less frequently than –*al*, a Romance suffix, since astronomy demands seriousness and solemnity. However, given the fact that textbooks as a genre appear most often in my samples, and that they are often not very "solemn" (in terms of technical level), -*y* adjectives could be expected to be found more frequently in our extracts.

Of all –*y/-al* adjectives, those ending in –*y* (from OE) represent 3% of the total and those ending in –*al* 12%. This seems to be in accordance with the fourth issue mentioned in Section 2 above, and also the idea posited by Halliday (1978: 195) when he claims that "Creating new words out of native word stock [...] has not played a very great part in the creation of technical registers in English (an early example of it is *clockwise*) but recently it has come into favour with words like *shortfall, feedback,*

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[4] There is a correlation between a lesser degree of productivity and a higher mean token frequency (Bauer, 1991: 809)

output". The preponderance of *–al* suffixes over *–y* suffixes may also be caused by the fact that the presence of the former is favoured by its complementary distribution with *–ar*, mainly when u-epenthesis is present.

As regards the distribution of these derivative forms across genres, our data reveal that those forms ending in *–y* are irregularly represented in the eight genres, as shown in Table 2, in which the actual number of tokens found and normalised figures for those tokens are given (figures normalised to the number of words of textbook samples).

Genre	tokens	nf
textbook	211	211
lecture	24	262
dialogue	37	610
treatise	59	124
essay	41	172
article	29	712
letters	49	522
others	22	228

Table 2. adjectives with *–y* suffix per genre

Figure 4 shows unexpected results for the use of derivative attributive adjectives ending in *–y*. As domestic forms, they might be expected to appear more frequently in those genres with a lower technical level such as textbooks and dialogues, rather than in articles, as is the case here. However, these findings must be treated with care, since we have only one sample corresponding to the articles genre for the eighteenth century section of CETA and the use of the form here may be a matter of the particular writing style of the author, Alexander Wilson (1774).
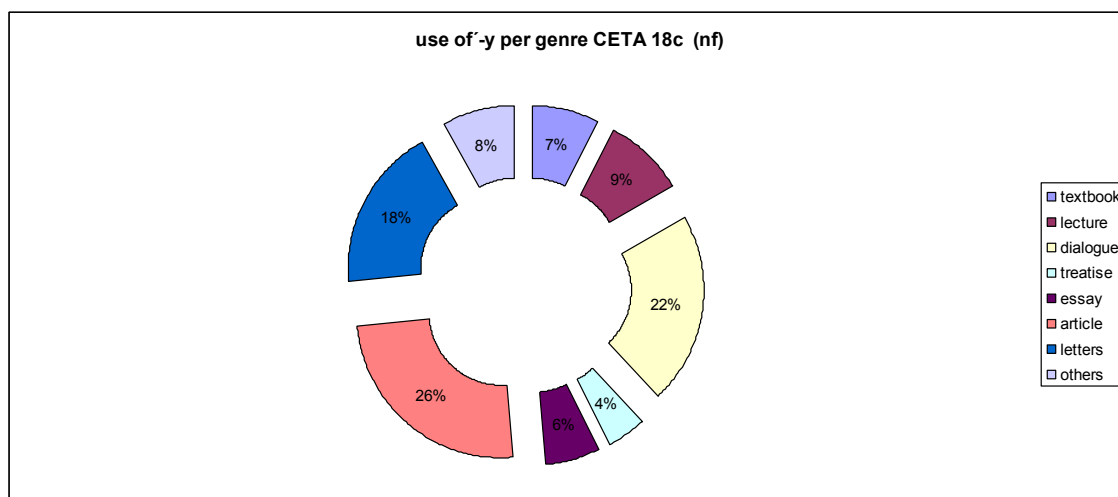

Figure 4. Distribution of *–y* adjectives per genre

As for the forms in –al, our counts have revealed quite different results. As a non-native suffix –al should be found to form derivative adjectives in texts whose technical level is more elevated. That is precisely the case with lectures, which, although devised to be transmitted orally, were generally addressed to an audience belonging to the same epistemic community as the author, accustomed to reading and listening to terms that could be considered specific or specialised. What is surprising, however, is that the second genre in which the suffix appears most often is textbooks. If textbooks are in the eighteenth century a means of spread knowledge in a more universal way, a language close to that of the layman should have been used, and this may have affected adjective choice too. However, it is again surprising to observe that essays, in principle aimed at a specialised readership, do not seem to contain a high proportion of these supposedly learned adjectives at all. All these findings are set out in Table 3 and Figure 5, below. In both cases, figures have been normalised.

genre	tokens	nf
letter	95	992
treatise	369	806
lectures	139	1456
textbook	1117	1117
others	90	933
dialogue	66	694
essay	169	452
article	25	614

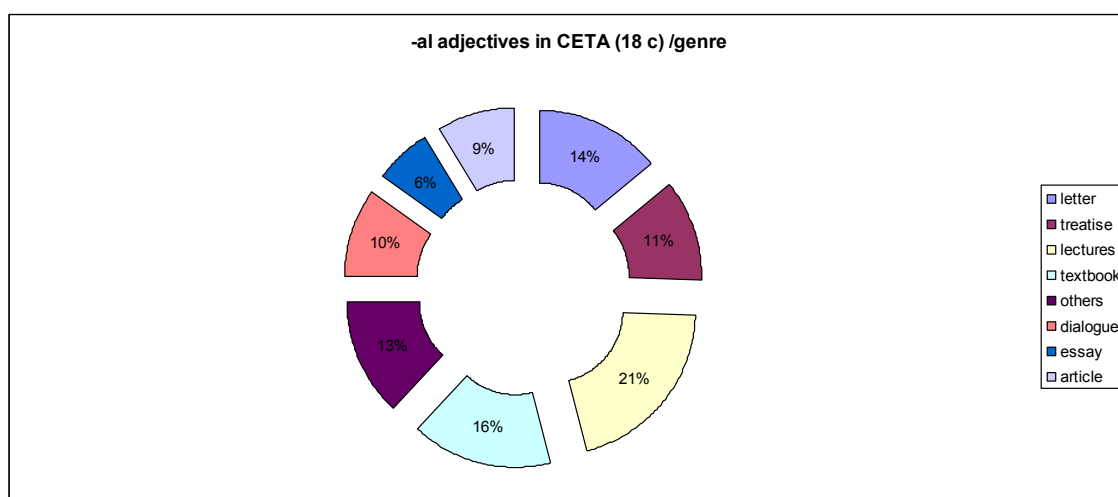Table 3. Adjectives ending in –al per genre

Figure 5. Adjectives in –al in 18th century *CETA*

Since the expected behaviour of attributive derivative adjectives is not observed in our two groups when looked at separately, a comparison between the two will be of special interest. The table below contains the normalised figures for both suffixes in all the genres in *CETA*. Should the initial claim to be tested here be true (that non-native word stock was preferred for the formation of scientific vocabulary), and should the claims of contemporary writers that domestic suffixes were preferred for less technical topics and that the language resorted to non-domestic ones for more technical also be true, then this would certainly imply that the suffixes –y and *–al* must be in complementary distribution as regards their use in the different genres. In other words, we should find that *–y* is more common in less technical texts whereas *–al* is more so in works addressed to a specialised readership. However, our findings show that these initial assumptions are not borne out in our data, since according to the starting hypothesis, adjectives formed by *–y* should be abundant in dialogues and textbooks, whereas the analysis here has shown is that they are present above all in articles for a specialised audience (Figure 6), although once again we must recall that only one sample of the genre of article is contained in this part of *CETA*.

However, a genre which is better represented is that of textbooks, where we should expect to find a higher proportion of *–y* adjectives than of *–al* ones. My findings, though, reveal exactly the opposite. A similar case is that of dialogues, again a genre in which works were written predominantly for non-specialists. The initial hypothesis seems to be true only for treatises (806 –al vs 124 *–y*), "others" which is in our case a specialised astronomy dictionary (933 al vs 228 *–y*) and essays (452 –al vs 172 *–y*)

genre	al	y
letter	992	522
treatise	806	124
lectures	1456	262
textbook	1117	211
others	933	228
dialogue	694	610
essay	452	172
article	614	712

Table 3. Presence of *–y/-al* per genres

Figure 6 illustrates the proportion of both *–y* and *–al* that could be accounted for, in my view, as related to the subject under discussion rather than being genre-dependant. Level of technicality, therefore, is a matter of what is being written about.
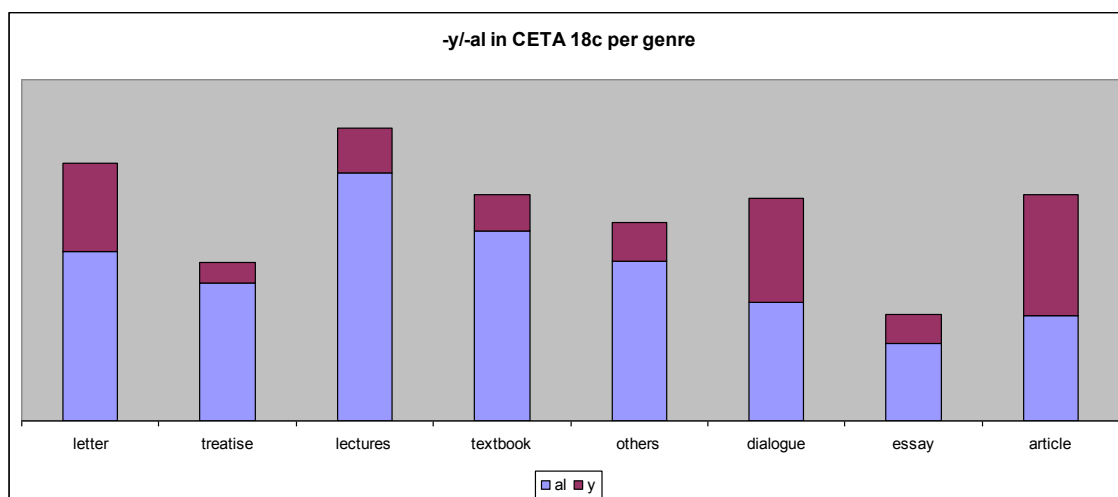
Figure 6. Presence of *–y/-al* per genres

4. Conclusions

This study has shown that many of the assumptions about English scientific writing that have been posited both in general and for the period under investigation here are at best problematical.

Some authors, such as Biber, have stated that scientific writing, as a written register and an example of a nominal style, should be characterised by the use of phrases, nouns and adjectives, and that in the observational sciences (such as astronomy) description full of adjectives might be expected. This seems to reflect my third starting point in Section 2, according to which a large number of adjectives should be contained in my samples (because of their descriptive character) and many of them should be derivative rather than simple forms (Givón, 1970: 816). However, my analysis has in fact shown that the samples contained a really low number of adjectives, of which an even smaller number of tokens were derivative forms.

Latinate affixes (*-al*) for the formation of adjectives are more numerous in the 18th century texts in *CETA* than native ones (*-y*). However, this may be due to at least two factors. On the one hand, I have restricted my analysis to those *–y* suffixes descending from OE *–ic* and have excluded all others, which lowers the initial count. On the other hand, *-al* is a frequent adjectival suffix because of its complementary distribution with *–ar*. Therefore, the fact that in my data there are more *–al* than *–y* tokens should not be, *a priori*, considered as indicative that texts on astronomy in the eighteenth century tended to resort to Latinate forms rather than to Germanic ones because it was already a highly specialised register.

Another claim that has not always proved to be the case is that scientific writing, or rather, writing about science, when addressed to specialists, tends to resort to Latinate affixes but prefers Germanic affixes when the addressees are not members of the author's epistemic community. According to this claim, we should have expected that of the eight genres in *CETA*, *-y* adjectives would clearly dominate as a word-formation device in textbooks, dialogues and perhaps also essays (since they were often

reported as some kind of exhibition (cf. Chapter 2). The other five genres, treatise, essay, article, others (specialised dictionary) and published letters to colleagues, should consequently contain a high proportion of –*al* and fewer of –*y*, especially if we consider that –*al* is more numerous in general. This may also be understood as an in-group communicative strategy (Scotton, 1983) by which non-initiated readers are not considered as members of the target audience, even though, as we have said, the eighteenth century was a period in which knowledge was more widely disseminated and when climbing the social ladder could be attained by means of education. In this sense, the use of –*al* as indexical of in-group markedness as claimed for code-switching by Scotton 1998.

This study has demonstrated that the three original assumptions or starting points are not at all demonstrated to be the case once a quantitative analysis is applied.

I would also like to note, as a final remark, that the fact that *CETA* contains samples of around 10,000 words each helps in arriving at these findings. If we had used 1000 word samples, as suggested by Biber (1988), the wide variation that we have observed here might have passed unnoticed.

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