CONSTRUCTING THE SCIENTIFIC SELF: A CORPUS-BASED ANALYSIS OF METADISCOURSE AND AUTHORIAL PRESENCE IN 19TH-CENTURY TEXTS*

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Abstract

This study examines how nineteenth-century English scientific and instructional texts construct persuasion and authorial identity using interactional metadiscourse features, namely boosters, self-mentions, and modal verbs. Drawing on two historical corpora, the Corpus of English Texts on Physics (CETePh) and the Corpus of Women's Instructive Texts in English (CoWITE19), comprising over 726,000 words, the analysis identifies significant contrasts in the frequency, distribution, and rhetorical function of these features. Physics texts exhibit a higher density and lexical diversity of these features, reflecting the persuasive, competitive, and epistemologically assertive nature of scientific discourse. Conversely, instructional texts employ more restrained linguistic choices, privileging impersonality, clarity, and procedural authority. These differences reveal how genre and disciplinary conventions mediate the negotiation between objectivity and individuality in nineteenth-century prose.

Keywords: Nineteenth-century English Scientific Discourse, Metadiscourse, Persuasion, Authorial Identity, Corpus Linguistics, Self-mentions, Modal Verbs

LA CONSTRUCCIÓN DEL YO CIENTÍFICO: ANÁLISIS BASADO EN CORPUS DEL METADISCURSO Y LA PRESENCIA AUTORAL EN TEXTOS DEL SIGLO XIX

Resumen

Este estudio examina cómo los textos científicos e instructivos del siglo xix escritos en inglés construyen persuasión e identidad autorial mediante el uso de rasgos de metadiscurso interaccional, en particular, intensificadores, autorreferencias y verbos modales. Basándose en dos corpus históricos, el Corpus de Textos en inglés sobre Física (CETePh) y el Corpus de Textos Instructivos Femeninos en inglés (CoWITE19), que comprenden más de 726 000 palabras, el análisis identifica contrastes significativos en la frecuencia, distribución y función retórica de estos rasgos. Los textos de física presentan una mayor densidad y diversidad léxica de estos rasgos, lo que refleja la naturaleza persuasiva, competitiva y epistemológicamente asertiva del discurso científico. Por el contrario, los textos instructivos emplean opciones lingüísticas más restringidas, destacando la impersonalidad, la claridad y la autoridad procedimental. Estas diferencias revelan cómo el género y las convenciones disciplinares median en la negociación entre objetividad e individualidad en la prosa del siglo xix.

Palabras clave: discurso científico en inglés del siglo xix, metadiscurso, persuasión, identidad del autor, lingüística de corpus, autorreferencias, verbos modales

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1. INTRODUCTION

Persuasion in nineteenth-century English scientific texts is a rich and evolving topic that intersects with rhetoric, epistemology, and the history of science. Earlier traditions of natural philosophy in the sixteenth and seventeenth centuries had already established that scientific authority depended not only on empirical demonstration but also on rhetorical strategies designed to cultivate credibility. As Serjeantson (2008) observes, reliability–or what he terms "proof"–was achieved through a combination of mathematical or experimental demonstration, appeals to authority, analogy, and credibility. These strategies, rooted in classical rhetoric, derive from three sources: the character of the speaker or writer, the emotions of the hearer or reader, and the logical structure of the argument itself (Whately, 1963). Building on this view, Yearley (1981) maintains that scientific writing cannot be regarded as a neutral transmission of facts but should be understood as a persuasive act in which authors seek to convince readers of the validity of their claims. In this respect, textual strategies function as resources for constructing trust, establishing authority, and shaping scientific identity.

The social dimension of scientific discourse remains a key concern in modern scholarship. Hyland (2011: 194), for instance, notes that "academic writing provides an objective description of what the natural and human world is actually like and this, in turn, serves to distinguish it from the socially contingent." Academic writing does more than represent the natural or human world objectively; it is also a social practice shaped by disciplinary norms and community expectations: objectivity is therefore not absolute but mediated by the author's rhetorical choices, through which identity, stance, and credibility are negotiated. The nineteenth century offers a particularly fertile ground for exploring this interplay between knowledge and the rhetorical strategies of persuasion. At this time, science was undergoing a process of professionalisation and specialisation, and authors had to balance the projection of authority with accessibility, adapting their rhetoric to both scholarly peers and broader readerships. In this sense, the author's linguistic choices are key tools in the construction of the scientific self. By projecting authority, credibility, and responsibility, nineteenth-century authors shaped their identities as legitimate contributors to knowledge, negotiating their place within both their disciplinary community and the broader intellectual landscape.

This study examines how such authorial and persuasive strategies are linguistically realised in two distinct corpora: CETePh, which contains nineteenth-century physics texts, and CoWITE19, which includes domestic instructional texts, particularly recipes. The comparison between these corpora allows us to investigate how disciplinary stance and certain genre conventions shape the use of interactional metadiscourse features such as boosters, self-mentions, and modal

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verbs. More specifically, this research is guided by several key questions. How do physics and instructional texts differ in their use of these features? What rhetorical purposes underlie these differences, particularly in relation to persuasion and authorial presence? To what extent do genre conventions influence the frequency, distribution, and lexical diversity of these linguistic forms? And finally, how do these strategies reflect broader epistemological values–such as authority, credibility, and universality–within their respective discourse communities? In addressing these questions, this paper argues that linguistic markers of persuasion and authorial presence provide critical insights into how scientific identity was constructed in the nineteenth century. The analysis demonstrates that while physics texts foreground authorial responsibility and the assertion of claims, instructional texts rely on clarity, impersonality, and procedural authority. The paper is organised as follows: Section 1 provides an overview of the context of science in the nineteenth century; Section 2 addresses the concepts of metadiscourse, persuasion, and their linguistic manifestations; Section 3 presents the material and methodology used; Section 4 offers a corpus-based analysis accompanied by discussion of the findings; and finally, Section 5 presents concluding remarks.

2. OVERVIEW OF SCIENCE IN THE NINETEENTH CENTURY

The nineteenth century marked a pivotal era in which scientific advancement became deeply intertwined with imperial expansion and the professionalisation of knowledge. Science served not only as a practical tool for exploration and control but also as a powerful narrative that justified empire-building and reinforced ideological goals, including racial classification and cultural domination (Qureshi, 2017; Gascoigne, 2011; Bennett, 2011). Emerging disciplines such as anthropology, botany, cartography, and geology often facilitated the classification and domination of colonised peoples and territories, later employing scientific research for military and political purposes.

The nineteenth century also attested for the popularisation of science through museums, exhibitions, and literature, shaping public understandings of empire and progress. Institutions such as the Royal Society, the Great Exhibition of 1851, and the Paris Exposition of 1900 showcased the marvels of scientific progress, attracting audiences across social classes and reinforcing imperial ideologies. In Britain, as the first industrial nation, the availability of cheap publications and public lectures made science broadly accessible, while cementing its cultural authority. From the 1860s to the 1880s, popular science magazines flourished, driven by increased literacy and reduced printing costs. In contrast, the proliferation of specialised journals signalled the professionalisation of science which subsequently narrowed public participation (Lightman, 2016). By the end of the century, science had transitioned from an amateur pursuit to a structured, career-based enterprise. The establishment of societies, journals, and university departments consolidated disciplinary boundaries and fostered a sense of professional identity among researchers. As Shapin (2008) observes, science became not only a method of inquiry but also a profession governed

by its own norms, hierarchies, and gatekeeping mechanisms. While this institutional framework provided scientists with platforms to disseminate their work and claim authority, it also imposed expectations on how knowledge was to be produced, presented, and validated, underscoring the dual processes of expansion and exclusion that defined nineteenth-century science. In this context, scientific writing served a dual function: it was both epistemic and social. On one hand, it aimed to report empirical findings with precision and clarity; on the other, it sought to persuade peers and broader audiences of the credibility and significance of those findings. The rhetorical dimension of scientific discourse became increasingly important as scientists needed to secure recognition, funding, and consensus. Charles Bazerman's seminal study The Languages of Edison's Light (1999) illustrates this dynamic vividly. Bazerman shows how Edison's success was not solely due to technological innovation but also to his ability to frame his work persuasively within the social and institutional contexts of the time. Language, in this sense, was instrumental in shaping public perception and institutional acceptance of scientific advancements. Similarly, Zappen (1997) explores the rhetorical shifts that accompanied the professionalisation of science. He argues that as science became more specialised and institutionalised, its rhetoric evolved from broad philosophical inquiry to more practical and disciplinary-specific forms of communication. This shift often led to a narrowing of rhetorical scope, distancing scientific discourse from broader societal concerns. Yet, even within these constraints, persuasion remained central. Scientists had to navigate the expectations of their communities, using linguistic strategies– such as boosters, expressions of modality, and self-mentions, to assert authority, align with disciplinary norms, and construct a credible scientific self.

3. THEORETICAL FRAMEWORK: METADISCOURSE AND PERSUASION

In scientific discourse, authors have historically needed to defend their findings, opinions, and positions, even when overt manifestations of authorial presence were discouraged by stylistic conventions rooted in the Baconian and Boyleian traditions. Despite this, writers employed subtle rhetorical strategies to persuade their readership. Such texts, aimed at shaping reader attitudes, are inherently audience-oriented and structurally organised, relying on mechanisms of persuasion and argumentation, whether explicit or implicit. This aligns with the concept of authorial self as discussed by Ivanić (1998) and Hyland (2002) which was moulded by the principles of logic and deduction. As Crespo (2011) notes, logic appealed to reason by presenting an opinion as the most rational solution, while deduction involved a justified method that builds claims from general principles to specific conclusions, thereby foregrounding shared assumptions and values. The ultimate aim of such language use was to effect a shift in the audience's perspective.

Hyland's (2005) model of metadiscourse has become a central framework for examining how writers construct meaning and negotiate relationships with readers in academic and professional texts. Building on earlier approaches, Hyland distinguishes

between two broad dimensions of metadiscourse: interactive features, which organise discourse and guide readers through the text, and interactional features, which explicitly involve readers and signal the writer's stance. Interactional resources play a particularly important role in projecting authorial presence and aligning with audience expectations. Among these, boosters or emphatics, lexical items that express certainty and reinforce the truth-value of propositions, (e.g., *clearly*, *undoubtedly*) allow writers to assert the strength of their claims. Boosters serve to persuade readers by signalling confidence and aligning claims with shared disciplinary knowledge. For example, a statement such as "Clearly, the results support the hypothesis" not only presents a conclusion but also invites the reader to accept it as self-evident within the disciplinary framework. Self-mentions or person markers (e.g., "I argue," "we propose") highlight the writer's identity and responsibility for the argument. These features contribute not only to the persuasive dimension of academic writing but also to the negotiation of authority and solidarity with the audience (Hyland, 2005; Hyland, 2019). Such person markers enable authors to establish their presence in the text, claim responsibility for findings, and position themselves within the scholarly community. Closely related to boosters is modality, which encompasses expressions of possibility, necessity, or obligation (e.g., *may*, *must*, *should*). Modality allows writers to calibrate their claims, balancing assertiveness with caution depending on the epistemic status of the information.

By foregrounding the interpersonal dimension of discourse, Hyland's model highlights that academic writing is not such a neutral medium for presenting facts but a social act in which authors manage both the credibility of their arguments and their relationship with readers. He argues that "academic writing provides an objective description of what the natural and human world is actually like and this, in turn, serves to distinguish it from the socially contingent." (Hyland (1998: 73). However, he also emphasizes that this objectivity is not absolute; it is shaped by disciplinary norms and the expectations of academic communities. Therefore, the features before mentioned collectively contribute to the construction of the scientific self, a rhetorical persona that blends authority, credibility, and engagement.

4. MATERIAL AND METHODOLOGY

This study employs a corpus-based approach, using texts from the *Coruña Corpus* and *COWITE* as primary data sources. The *Corpus of English Texts on Physics* (CETePh)[1] constitutes the seventh subcorpus of the *Coruña Corpus of English Scientific Writing* (CC). It includes samples of late Modern English texts on physics published between 1700 and 1900, covering areas such as mechanics, hydraulics, electricity, magnetism, and related fields. CETePh is designed to trace both the evolution of the language of physics and the variation within it. Each sample is paired with a metadata file containing details about the text (publication date, genre) and the

[1] The samples collected in CETePh are displayed in the appendix.

author's sociolinguistic background (place of origin, age, sex). As part of the CC, it contains 10,000-word samples (two per decade per discipline) of works originally written in English by English-speaking authors. To ensure representativeness, only one sample per author is included across the entire corpus. Compilation follows widely accepted principles in corpus linguistics such as external dating and sampling criteria, supplemented by the project's own parameters. Text and discipline selection is guided by UNESCO's classification of scientific and technological fields (1978, 1988). All CC subcorpora share common structural and editorial principles.

The *Corpus of Women's Instructive Texts in English* (CoWITE) is an annotated collection of instructional writing authored or compiled by women in the eighteenth and nineteenth centuries. Its primary scope includes texts produced in both British and American English, focusing on areas central to domestic life and reform: cookery, domestic medicine, household management, hygiene (female), nutrition, beauty, moral guidance, cultural transmission and social improvement. The corpus brings together a wide range of genres, including recipes, manuals, guides, and other instructive prose. CoWITE is organised into two historical subcorpora. CoWITE18 spans the period 1700–1799 and consists of 22 texts totalling approximately 542,000 tokens. CoWITE19 covers the nineteenth century (1800-1899), with 33 texts amounting to around 503,000 tokens. All texts are part-of-speech tagged using TreeTagger to facilitate linguistic analysis. Each text in the corpus is accompanied by metadata including the author's identity and gender, the exact or approximate date of publication and genre classifications, among others.

In both cases, only the texts belonging to the nineteenth century have been analysed as Table 1 shows.

TABLE 1. CORPUS MATERIAL

Corpus	Word number
CETePh_19 (beta version)	223,946
CoWITE19	502,680
Total	726,626

The specific composition of the corpora under analysis is relevant as various scientific genres possess distinct formal and functional taxonomies that shape their rhetorical conventions (Hyland, 2005; Crespo and Moskowich, 2020). The CETePh corpus comprises texts from the domain of Physics, including treatises, textbooks, essays, lectures and research articles. Genres in scientific discourse are characterized by their persuasive and explanatory functions (Moskowich and Crespo, 2016). In contrast, the CoWITE19 corpus consists of instructional texts, specifically recipes, whose primary communicative goal is "to guide readers in the preparation of certain products (Quintana Toledo, 2024, p. 167). This fundamental difference in genre, between the argument-driven discourse of physics and the directive, procedural discourse of recipes, provides the essential context for analysing their divergent use of boosters, modals, and self-mentions in the pages that follow.

The analysis integrates several computational tools, including frequency counts to quantify occurrences of specific features and concordance analysis to explore their contextual usage, and collocation analysis to identify lexical associations. Such analysis has been carried out using AntConc (4.3.1) as released from Lawrence Anthony's webpage: https://www.laurenceanthony.net/software/antconc/. Figures have been normalised to 10,000 when necessary for the sake of comparison.

The methodology adopted in this study focuses on linguistic features widely recognized as vehicles of persuasion (Biber 1988, 1995; Biber & Conrad 2009; Atkinson 1999; Hyland, 2005; Mischke 2006; Nesi 2009; Moskowich & Crespo 2012, Vázquez & Giner 2009), enabling an exploration of authorial presence and the extent to which writers influence readers in a largely unidirectional communicative process.

According to the theoretical framework explained in section 2, three different features will be analysed: boosters, modals (predictive and necessity) and self-mentions (first person pronouns and possessive determiners and pronouns). To investigate the use of boosters, first, I have used the Word tab in the AntConc retrieval tool to list all the types contained in both corpora in order of frequency. I then proceeded to manually check in context those forms which were likely to be considered boosters. Next, I compared those items with the set of forms proposed by Hyland (2005) thus enlarging the original list of items boosting the scientific and instructional narratives from 64 to 203 types (Table 2).

TABLE 2. BOOSTERS

Absolute, absolutely, abundant, abundantly Accuracy, accurate, accurately, acknowledge, actually, advisable, always, amply, ascertain, assert, beautiful, beautifully, best, brilliant, certain, certainly, certainty, clearly, complete, completely, conclusive, conclusively, confidentially, confirm, confirmation, considerable, conspicuous, constantly, convenient, conveniently, correct, correctly, correctness, crucial, decidedly, decisive, definitively, demonstrate, demonstration, determination, determine/determinate, devotedly, diammetrically, direct, doubtless, effective, effectual, effectually, efficient, emphatic, empirical, energetically, engage, enormous, enormously,entire, entirely, essential, essentially, evidence, evident, evidently, exact, exactly, exceedingly, exclusively, exhaustive, experimental, experimentally, extensively, extremely, fact, favourably, firm, firmly, fully, fundamental, fundamentally, glorious, great, greatly, highly, honor, immediate, immediately, immense, immensely, important, impossible, incomparably, indeed, indefinitely, indisputably, infinite, infinitely, intense, intensified, judicious, justly, lowest, magnificent, manifest, manifestly, maximum, mere, mostly, necessarily, necessary, never, no doubt, noticeable, noticeably, numerous, obstinately, obvious, obviously, of course, perfect, perfectly, permanent, permanently, perpetually, plausibly, possible, possibly, powerful, powerfully, precise, precisely, primordial, primordially, principal, principally, probable, probably, proof, prove, purely, really, reliance, remarkable, remarkably, rigurously, satisfaction, satisfactorily, satisfactory, satisfy, show, significant, singular, singularly, specially, specific, specifically, splendour, strong, strongly, stupendous, sublime, successful, successfully, sufficient, sufficiently, superabundant, tenacious, thorough, thoroughly, total, totally, tremendous, tremendously, true, truly, trustworthy, truth, unavoidably, undoubtedly, universal, universally, utmost, vast, vehemently, very, well, wholly, wide, widely, wonderful, wonderfully	Actually, always, believe, believed, believes, beyond doubt, certain, certainly, clear, clearly, conclusively, decidedly, definite, definitely, demonstrate, demonstrated, demonstrates, doubtless, establish, established, evident, evidently, find, finds, found, in fact, incontestable, incontrovertible, incontrovertibly, indeed, indisputable, indisputably, know, known, must, (possibility), never, no doubt, obvious, obviously, of course, prove, proved, proves, realize, realized, realizes, really, show, showed, shown, shows, sure, surely, think, thinks, thought, truly, true, undeniable, undeniably, undisputedly, undoubtedly, without doubt

As for modals, the forms under scrutiny are shown in Table 3.

TABLE 3. MODAL VERBS	
Necessity modals	Predictive modals
must	will
should	shall
ought to	would

Self-mentions include *I*, *we*, *me*, *my*, *mine*, *our*, *us*, *ours*. No further discrimination of data has been applied to these two last bundles of features, but for their belonging to a different word category (must and will could also act as nouns with a different referential value). Finally, the study also compares the distribution and rhetorical function of these features across the two corpora, highlighting differences in linguistic strategies and disciplinary or genre conventions.

5. CORPUS-BASED ANALYSIS AND DISCUSSION

From the total number of 726,626 words that have been analysed combining both corpora, CETePh and CoWITE19, 14,830 forms or tokens represent linguistic elements such as boosters, self-mentions and modal verbs indicating persuasion and authorial presence. This represents 2.04% of the whole number of words. In addition, results are not homogeneous in both collections of samples: the frequency of occurrence of each feature varies from one corpus to other, this variation being connected with the purpose of the interaction and the field or domain discussed. To account for these findings it is necessary to consider, first, that in CETePh, the scientific texts on Physics, a variety of genres have been collected, namely, lecture, textbook, essay, article and treatise while "the texts in CoWITE19 belong to the recipe genre" (Quintana Toledo, 2024: 167) (See Figure 1 below).

As we can see, in Physics, a hard science, although, in principle, it might be common to find an impersonal baseline, the density of interactional strategies (189.46/10,000 words) surpasses that of a standard instructional genre like a recipe (40.96/10,000). The reason may lie in their diverse rhetorical purposes: a recipe's goal is simple, universal instruction; a physics text's goal is to persuade the audience of a new claim.

If we break down the data by linguistic element and we normalise figures to 10,000 words, the results are as shown in Figure 2.

Boosters and modal verbs indicating prediction and necessity are the most abundant features. Curiously enough, their frequency of occurrence is nearly the same (boosters, 86.73/10,000; modals, 86.47/10,000). However, self-mentions are less abundant, with their frequency decreasing to 30.89 forms per 10,000 words. Both physics and instructional texts require reliability and precision, and this can be achieved using boosters, asserting certainty and persuading peers of objective facts, and modal verbs, expressing logical predictions and necessary conditions. As

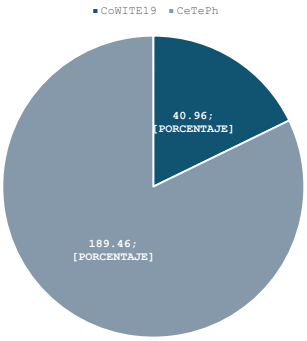

Figure 1. Interactional strategies in CETePh and CoWITE19.

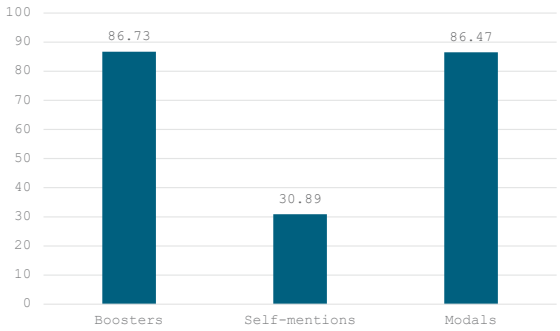

Figure 2. General occurrence of linguistic features in the material analysed.

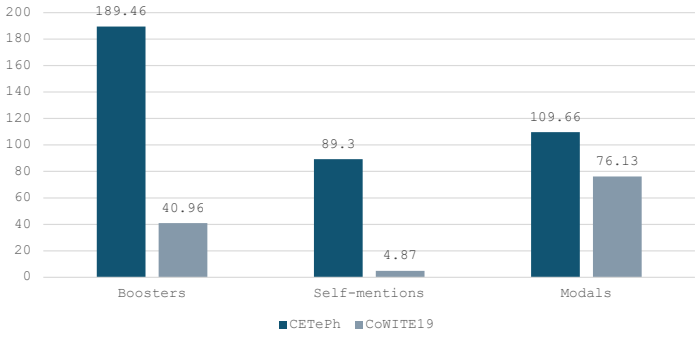

Figure 3. Linguistic elements per corpus (tokens).

a result of this interplay of forms, a tone of authority is created. In comparison, the lower number of self-mentions (first-person forms) could be explained on the grounds of avoiding a subjective touch that could undermine the samples' main goal of presenting a universal method or an objective truth.

Despite these general results, major differences emerge when the linguistic features under scrutiny are analysed independently in each corpus. Figure 3 shows these differences.

a) Boosters

The texts on hydrostatics, optics, magnetism, aerostatics, material science, gravitation, acoustics, electricity, thermodynamics, heat and mechanics in the Physics corpus contain an extraordinary number of boosters when compared to

the recipes collection: authors use this rhetorical mechanism to emphasise the strength, novelty and certainty of their own contributions. Examples (1) to (5) illustrate this usage:

(1) The effect is *always* measured by the product of the velocity of the load into its weight. (Playfair, 1812: 52)
(2) but a mere inspection of the figure, with a mental reference to the actual experiment, is sufficient to show the fallacy of such an hypothesis: *in fact*, in every experiment that I made, after the complete fracture in the middle, the two fragments had been so little strained at the points of fixing, that they soon after recovered their correct rectilinear form. (Barlow, 1817: 107)
(3) Under the same circumstances, the south pole of the magnet rotates from right to left. It is *evident* from this experiment, that the wire may also be made to perform a rotation round the magnet, ... (Sommerville, 1835)
(4) We have just stated that it is a fundamental *truth* that water presses equally in all directions: let us not, however, be misunderstood. (Zornlin, 1843: 49)
(5) But whereas, as has been previously stated, hydrogen produced a distinct hissing of its own when blown down the positive carbon in the open air, it produced none when used in the same way with the arc enclosed in the crucible. To *prove* that, in order to produce the sudden diminution of [P].[D]. under discussion, it was necessary for the active gas to actually touch the crater, a tubular negative carbon was used, and each gas was blown up through it in turn, gently enough not to force the gas directly against the crater. (Ayrton, 1899: 304)

These examples represent the five main categories (four lexical and one syntactic) that are used to reinforce reliability: adverbs, verbs, adjectives, nouns and prepositional phrases. They are typically employed when writers feel confident that their audience has been sufficiently guided through the argument and is likely to accept the conclusion (see example 5). As Mur (2007: 355) explains, "writers may be categorical in their phrasing of propositional content when they believe readers have been led throughout the argument and have been convinced of it." Boosters thus serve to enhance the strength of a claim and instil conviction and trustworthiness in the reader's mind.

Moreover, as Hyland (1998b: 368) notes, "Boosters are then rhetorical, persuasive strategies which function to mark, or rhetorically manipulate, consensual understandings based on shared community membership." In other words, boosters help writers align their claims with the expectations and values of their disciplinary audience (see examples 2 and 3). Koutsantoni (2004: 172) further supports this view, stating that the use of boosters "can be motivated by epistemological reasons and be based on the results and findings themselves, and combined with social goals in scientific communities, such as gaining agreement and consensus by appealing to common knowledge and shared understandings." All these expressions help authors assert confidence and persuade readers of the reliability of their conclusions, especially when backed by data and logical reasoning. Below (examples 6 to 14) you can find

some of the concordance lines for the word *accuracy* which testify to the persuasive and social dimension of boosters:

(6) phys 1851 Hunt 104-150_20250609.xml and materials. [Fig. 84.] A very simple means for testing the *accuracy* of the above statements, is afforded by an arrangement
(7) phys 1812 Playfair 215-279_20241020.xml within which the same quantity of it is contained. The *accuracy* of this definition is known from experience. The weight
(8) phys 1820 Watts 27-32 2024 12 17.xml part of an inch, or to such a degree of *accuracy* as had not hitherto been attained; for the length
(9) phys 1865 Maxwell 459-484_20210627.xml electrical measurement, and by actually determining electrical quantities with an *accuracy* hitherto unknown. (2) The mechanical difficulties, however, which are involved
(10) phys 1817 Barlow 110-51_20250613.xml and in order to measure the deflections with the greater *accuracy*, I procured an ivory scale very accurately graduated into 40
(11) Phys 1827 Arnott 5-33 2024 12 31.xml by the tendency downward of a certain sized solid; the *accuracy* of modern science has sought some fixed and natural
(12) phys 1817 Barlow 110-51_20250613.xml his or my experiments, and thus satisfy themselves of the *accuracy* or inaccuracy of our results. It may not be
(13) phys 1851 Hunt 104-150_20250609.xml of mercury (Fig. 112). This form is, however, wanting in strict *accuracy*, owing to the smallness and unequal shape of the
(14) phys 1812 Playfair 215-279_20241020.xml the first case, and 268 in the second. Nevertheless, from the *accuracy* which the rule for barometrical measurement possesses, it may

From a persuasive dimension, the term *accuracy* is used to assert the precision and reliability of scientific methods and findings. For instance, in Watts (1820), the phrase "to such a degree of accuracy as had not hitherto been attained" emphasises the novelty and advancement of the measurement technique, persuading the reader of its scientific value and progress. On the other hand, the social dimension reflects the communal norms and practices of the scientific community. In Barlow (1817), the statement "satisfy themselves of the accuracy or inaccuracy of our results" invites peer verification, enhancing the collaborative and transparent nature of scientific inquiry. This usage reinforces the expectation that scientific claims should be open to scrutiny and reproducibility, aligning with the ethos of shared responsibility in empirical validation.

In instructional texts, boosters are used for emphasis on critical steps, but the range and rhetorical purpose are not the same as in the case of Physics texts. Here the certainty they express is related to a fixed process and not to a novel claim:

(15) Blend the eggs with the water, by stirring gently (not beating), and add half a teaspoonful of sugar or half a saltspoonful of salt, to make it palatable.

Time required, about five minutes.
N. B.–This is *highly* recommended by physicians for children with diarrhoea, while teething. (Pye, 1880)

(16) For liquid preserves the fruit should not be perfectly ripe, but nearly so. It is *essential* that the quantity of sugar should be neither too much nor too little. In the first case the preserves will candy, in the second they will not keep. (Mrs. Toogood, 1866)

(17) ... and bear in mind that vinegar should always be boiled in unglazed earthenware; though, *in fact*, it ought never to boil at all, but be made just scalding hot, for boiling causes much of its strength to evaporate. (Corbett, 1835)

(18) if you do not *find* it sour enough, after it has stood two or three days and shaken freely, add more of the acid. (Mrs. Child, 1841)

(19) The principal *excellence* of this method is, that the paper receives the impression of the most minute veins & hairs; so that you may take the general character of most flowers much superior to any engraving. (Bird, 1825)

(20) Set to rise again half an hour; form into rocky buns; put them on a floured tin with a few pieces of sugar upon each bun; *prove* fifteen minutes; bake in a hot oven. (Everard, 1890)

Note the use of the verb *prove* in example (20). In the culinary and domestic advice literature of the 19th century, the use of *prove* operates as a rhetorical tool, the term invokes the idea of testing and validating, a persuasive strategy that assures the reader of the method's reliability and effectiveness.

Figure 4 shows the frequency of use of types expressing certainty and reinforcing the truth-value of propositions. In terms of lexical variety, the range of boosters used is wider in the case of scientific authors than in the case of instructional texts writers.

The type–token ratio (TTR) calculated for each corpus provides insights into the lexical richness of boosters. A TTR of 0.0009 in CETePh compared to 0.0002 in CoWITE19 suggests that physics texts employ a moderately more diverse range of booster forms than recipe texts. The lower variation in CoWITE19 likely reflects the constraints imposed by the genre, where authors tend to rely on a more limited and conventionalised set of expressions. The relatively higher diversity of boosters in CETePh can be interpreted as a reflection of disciplinary stance: physics authors often need to assert the certainty of their claims and strengthen their authority within a highly competitive knowledge domain. In contrast, the limited range of boosters in CoWITE19 aligns with the instructional and procedural nature of recipe writing, where clarity and precision take precedence over overt stance-taking. This contrast illustrates how boosters function not just as linguistic resources but also as markers of disciplinary values and rhetorical expectations.

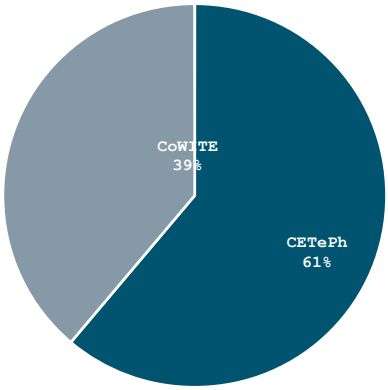

Figure 4. Proportional use of boosters in both corpora (types).

b) Self-mentions

The normalised figures for self-mentions in the two corpora indicate a clear disciplinary difference. In CETePh (physics texts), the frequency of self-mentions is relatively high (89.3/10,000), which reflects the rhetorical need for physicists to project authorial presence, claim responsibility for findings, and strengthen the authority of their arguments (Tang and John, 1999; Hyland, 2002). In contrast, in CoWITE19 (recipe and domestic instructional texts), self-mentions occur far less frequently (4.87/10,000) (see Figure 3 above). This aligns with the genre's focus on procedural clarity rather than personal stance: the authority of the text derives from shared cultural conventions and practical reproducibility, not from the author's explicit presence. However, there are instances of such uses as can be seen in examples (21) to (23). As claimed by Alonso-Almeida (2023: 124) "Despite the instructional text type's inherent nature, which tends to focus on direct orientation and seemingly limits the use of complex structures and evaluative language, the findings indicate that this is not always the case." Women writers show how they take responsibility for their actions and are committed with their statements when using first person pronouns:

(21) Books of this kind have usually been written for the wealthy: *I* have written for the poor. *I* have said nothing about rich cooking (Mrs Child, 1841)
(22) Some people like it thicker than others; *I* should think three large spoonfuls of flour to a quart of milk was about right. It should always be seasoned with salt; (Mrs Child, 1841)
(23) If the fat of veal, mutton, lamb, or pork, have the slightest tinge of yellow, *I* avoid it as diseased. (Randolph, 1824)

Put it differently, on the whole, physics writing relies more heavily on self-mentions as a way to assert individual expertise and ownership of knowledge, while instructional domestic texts downplay the authorial voice in favour of an impersonal, directive style.

According to Hyland's (2005, 2019) model, self-mentions are an interactional metadiscourse feature, allowing authors to explicitly project their identity into the text and establish a relationship with readers. In scientific disciplines like physics, self-mentions signal credibility, accountability, and involvement in the research process–crucial for persuading peers of the validity of claims. By contrast, in domestic instructional texts, the scarcity of self-mentions, not their complete absence, reflects different rhetorical norms: here, the emphasis is on clarity, impersonality, and universality, with the text serving as a practical guide like in (24) rather than a space for negotiating epistemic authority.

(24) Cut up young and tender hares, using only the hind quarters, and reserving the rest for broth or fricassee. Lay the pieces in an earthen soup-kettle, and cover with three pints of water to which a teacupful of wine vinegar has been added, with a tablespoonful of salt, two teaspoonfuls of peppercorns, four white onions sliced and fried brown in butter, and half a lemon cut thin. Boil all for one hour. Then take out the meat, strain the broth through a gauze sieve, and add enough good beef broth to make two quarts. Soak a packet of gelatine in a cup of warm water, add to this and boil up once, setting aside to cool. While the hare is cooling, a farcie of calf's liver is to be made as follows: -Boil a calf's liver half an hour; chop it fine and rub it through a sieve. Add to it half a pound of finely chopped boiled ham, two hard-boiled eggs cut fine, a cupful of bread-crumbs or rolled zwieback, two tablespoonfuls of melted butter, and half a teaspoonful of pepper, with one of salt. Blend all thoroughly, put it in an oiled tin, and bake till brown in a steady oven.

Thus, the comparative figures illustrate how disciplinary stance and communicative purpose shape metadiscursive choices. Physics authors deploy self-mentions to construct an authoritative persona, while women's domestic writing relies on genre conventions that suppress individual voice in favour of communal, instructional authority.

Authorial presence and persuasion are manifested not only by means of direct personal references but also by personal pronouns, possessive determiners and possessive pronouns. The frequencies are set out in Figure 5.

We (43.04/10,000 words) and *I* (22.9/10,000) are the most abundant personal forms, especially in CETePh. An example from this corpus illustrates how such proforms link the flow of the argument and enhance credibility by supporting previous claims which are followed by the speaker's own ideas:

(25) I SHALL commence this afternoon by taking a few further consequences of the grand ideas of Carnot, which I developed at full length in my last lecture. Wherever, in fact, *we* meet with any one anomalous physical result, *we* almost

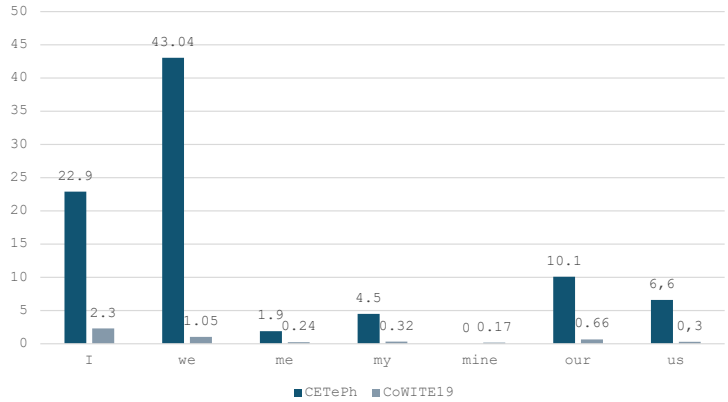

Figure 5. Normalised figures for self-mentions in CETePh and CoWITE19

> invariably find that it is associated with other anomalous results; and perhaps it is in this respect that Carnot's ideas have been of the greatest use in giving *us* new information. Let *us* take, for instance, what I incidentally mentioned in connection with thermometers in my last lecture, – the fact that water would be an exceedingly bad substance to employ for the purpose of filling a thermometer bulb (...). (Stone, 1898: 1)

The personal tone is also reinforced by the kind of genre of the example, a fragment extracted from a lecture. The OED, in its sense 4. a. of the term, defines a lecture as "A discourse given before an audience upon a given subject, usually for the purpose of instruction. (The regular name for discourses or instruction given to a class by a professor or teacher at a college or University.)" Recorded for the first time in the year 1536, in Act 27 of Henry XII, Acts of Parliament. (Moskowich and Crespo, 2016: 316). *We* is embracing the audience to make them participants of their reasonings, actions and knowledge. It is an engaging mechanism to attract attention and gain acceptance: "Wherever, in fact, we meet with any one anomalous physical result", "we almost invariably find", "giving us new information". The utterance also contains boosters which undermine the strength of the proposition: "in fact", "invariably", "exceedingly". The use of "I shall commence..." employs the modal verb shall, which signals authorial intention and commitment, reinforcing the speaker's control over the discourse and guiding the audience through the logical progression of ideas, which, in turn, projects confidence and authority. Over the whole paragraph, the pronoun works as a discourse marker, linking past claims ("developed at full length in my last lecture") with new ones. This modal choice enhances cohesion and certainty for the listener. Authorial presence is reinforced by a personal tone, appropriate for the lecture genre, the speaker's ownership of ideas and engagement with the audience through the creation of a dialogic environment. From a summary of

previous claims ("Carnot's ideas"), moving to a generalization ("we almost invariably find...") which is illustrated by a specific example ("thermometers and water"), these three stages result in scientific reasoning, where claims are supported by evidence and connected through inference. Self-mentions and, on occasions, modal verbs help navigate this flow, by making the argument coherent and persuasive and expressing assurance (Yamazaki, 2001).

We forms (e.g., we find, we meet) create a sense of shared inquiry, inviting the audience to participate intellectually. This personal tone is genre-appropriate and helps establish rapport and credibility, encourages collective reasoning by making the argument feel inclusive (Kuo, 1999) and softens assertions, turning them into shared observations rather than unilateral claims. The persuasive appeal increases by aligning the speaker with the audience. In nineteenth-century scientific discourse (as represented in CETePh), it was common for scholars to use *I* to narrate their scientific procedures, and we to align with the scientific community or readers. This reflects a time when scientific authority was often tied to individual reasoning and public demonstration, especially in lectures and treatises. CoWITE19, by contrast, contains instructional texts authored by women in domestic and semi-professional contexts which tend to be less self-referential.

The occurrence of the remaining forms is low except for *my* (4.5/10,000), *our* (10.1/10,000) and *us* (6.6/10,000) found in CETePh. The pronominal possessive plural *ours* was not traced at all in any of the corpus. In general, plural forms embracing author and readership predominate but the singular pronoun *I* is the most abundant in CoWITE19 (2.3/10,000).

c) Modal verbs

The selection of modals reflects the writer's confidence and a way of aiding the reader so that they can interpret the message correctly. Studies (Biber & Gray, 2011; Gardner, Nesi & Biber, 2019) show that modal usage varies across genres and disciplines, with scientific writing often favouring modals to express cautious claims. Modals help writers express epistemic stance, that is to say, degrees of certainty, possibility, and necessity. In particular, predictive modals (*will*, *shall, would*) allow writers to speculate or forecast outcomes while necessity modals (*must*, *should*, *ought to*) convey obligation or strong recommendation.

The frequency of occurrence of these items varies across the two corpora under study.

Figure 6 presents a comparative analysis of predictive and necessity modals across the CETePh and CoWITE19 corpora. The data reveal distinct patterns in modal usage between the two datasets. Predictive modals are markedly more frequent in the CETePh corpus, accounting for 88.14 cases every 10, 000 words of modal usage, compared to 37.69 in CoWITE19. This suggests that CETePh texts are more oriented towards expressing future possibilities, expectations, or hypothetical scenarios, features commonly associated with academic or scientific discourse (see examples 26 to 28).

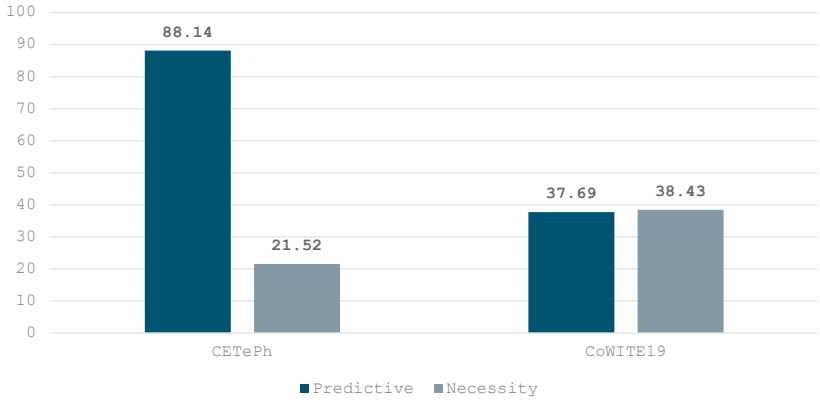

Figure 6. Predictive and necessity modals in both corpora

(26) Whenever such a change takes place in the atmosphere as will diminish its density, it *will* be less capable of supporting the quicksilver in the barometer which *will* of course descend, and when it is least capable of supporting the quicksilver, it *will* also be least capable of supporting aqueous vapours, clouds, and every thing else that may be floating in it: of course they descend, and if the clouds come into a sufficiently close aggregation to form drops, rain *will* be the consequence if in summer, or snow if in winter. (Millington, 1823: 112)

(27) Thus all these experiments depend upon the transference of energy in a kinetic form between two bodies, and the test of the capability of the one for receiving the energy which is sent out by the other is this, that the natural undisturbed times of vibration of the two bodies *shall* be as nearly as possible precisely the same. I have not time to enter more deeply into the subject today, but I *shall* endeavour, in the few minutes which remain to me, to sketch briefly what is to be our application, to modern science, of these purely mechanical Experiments. (Tait, 1876: 182)

(28) The usual mode of proceeding is to reduce all observed heights to what they *would* be at the freezing-point of water, the rule being to subtract the ten -thousandth part of the observed altitude for every degree of Fahrenheit's thermometer. (Hunt, 1851: 148)

In contrast, necessity modals are more prevalent in the CoWITE19 corpus, with a frequency of 38.43, compared to 21.52 in CETePh after having normalised frequencies to 10,000 words. This indicates a stronger emphasis on obligation, recommendation, or evaluative stance in the instructional texts, which may reflect its pedagogical nature as in examples (29) to (31):

(29) By keeping the water a certain time heating without boiling, the fibres of the meat are dilated, and it yields a quantity of scum, which *must* be taken off as

soon as it rises. You *should* never boil vegetables with meat excepting carrots or parsnips. (Corbett, 1835)

(30) Make it exactly as you do the dried pea soup, only in place of the celery-seed, put a handful of mint chopped small, and a pint of young peas which *must* be boiled in the soup till tender; thicken it with a quarter of a pound of butter, and two spoonsful of flour. (Randolph, 1824)

(31) For a day or two rub them well with it; afterwards they will only require turning. They *ought to* remain in this pickle for 3 weeks or a month, and then be sent to be smoked, which will take nearly or quite a month to do. (Beeton, 1875)

These examples align with deontic modality, where modal verbs express duty, obligation, or necessity. In historical instructional pieces of writing, the choice of modal verb serves as a rhetorical strategy that allows authors to position themselves as instructors and authorities. This positioning is often more subtle than the directness of imperatives, which can diminish the interpersonal tone. For instance, *should* conveys a strong recommendation rooted in experience rather than absolute necessity, establishing the author's authority and suggesting a sort of "best practice." *Ought to* frames the instruction within a context of tradition and normative expectations, reinforcing shared cultural or procedural knowledge. In contrast, *must* is reserved for steps that are foundational to the recipe's structural and chemical success, non-negotiable elements of the culinary process. Eventually, these findings reinforce the fact that modal usage varies significantly depending on the communicative purpose and genre of the texts. This variation offers valuable insights into the linguistic tendencies and pragmatic choices within each corpus.

6. CONCLUDING REMARKS

The findings of this study confirm and extend the view introduced earlier that nineteenth-century scientific writing was not merely a vehicle for transmitting knowledge but a rhetorical space in which authors constructed their scientific selves. As the corpus analysis demonstrates, interactional strategies such as boosters, self-mentions, and modal verbs, although quantitatively modest, representing only 2.04% of the data, play a decisive role in shaping persuasion and authorial presence. Their distribution across the two corpora, CETePh (beta version) and CoWITE19, reflects the distinctive rhetorical and epistemological aims of each domain. Physics texts display a far higher density of interactional features (189.46 per 10,000 words) than instructional recipes (40.96 per 10,000), highlighting the more explicitly persuasive and argumentative nature of scientific discourse. These differences in frequency correspond to contrasting rhetorical purposes. Physics authors aim to persuade peers of the novelty and validity of their findings, using language to construct authority and credibility. Boosters and modal verbs dominate their rhetorical repertoire, reinforcing certainty, logical projection, and confidence. The use of predictive modals such as shall, will, and would guides readers through hypotheses and causal reasoning, while self-mentions, though less frequent, enable scientists to claim

responsibility and engage directly with their community. By contrast, the writers of domestic instructional texts prioritise clarity, universality, and procedural accuracy. Their rhetorical aim is not to argue but to instruct, to ensure that processes are replicable by any reader. Necessity modals (*must*, *should*, *ought to*) therefore prevail, functioning as pragmatic directives that establish procedural authority rather than epistemic persuasion. Boosters in these texts reinforce precision and correct method rather than assertion or innovation, reflecting the genre's didactic ethos.

Genre conventions exert a strong influence on these linguistic patterns. The CETePh corpus comprises varied scientific genres, each demanding distinct forms of engagement and stance-taking. This diversity accounts for its richer lexical range and more subtle distribution of metadiscourse, with a type-token ratio (TTR) of 0.0009 compared to 0.0002 in CoWITE19. Instructional writing, by contrast, adheres to the highly formulaic conventions of the recipe, where imperatives and prescriptive structures dominate, leaving little room for explicit authorial self-projection. Authority is achieved through reproducibility and shared domestic expertise, not through overt claims of knowledge or self-assertion. These patterns of interactional metadiscourse reveal much about the epistemological values underpinning each discourse community. In physics, persuasion operates through the assertion of individual authority and rational credibility. The physicist's voice is both personal and institutional, confident, reasoned, and aligned with disciplinary norms. Here, linguistic strategies serve to enact the scientific self as an embodiment of trustworthiness and intellectual autonomy. In contrast, instructional texts reflect an epistemology grounded in collective knowledge and practical reliability. Authority derives not from innovation but from conformity to procedure and the implicit universality of the domestic task. Nonetheless, when women authors use self-mentions or modals to frame advice and justification, they subtly reclaim individual expertise within an otherwise impersonal genre, revealing the gendered negotiation of credibility in nineteenth-century authorship.

In both corpora, then, the shaping of the authorial voice mirrors broader epistemological and social dynamics of the nineteenth century: the tension between objectivity and individuality, between communal knowledge and personal authority. Persuasion reflects how writers positioned themselves as trustworthy knowers within their respective discourse traditions. The construction of the scientific self thus emerges at the intersection of rhetorical choice, disciplinary expectation, and social identity. Language, far from being a neutral medium, functions as a means through which authority, credibility, and belonging are negotiated. In this way, nineteenth-century authors, whether physicists or instructors, used interactional discourse to define what it meant to know, to teach, and ultimately, to be a credible author within the evolving landscape of scientific and instructional prose.

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APPENDIX

Date	Author	Title	Word count
1800	Young, Matthew	An Analysis of the Principles of Natural Philosophy. Dublin: Printed for the University Press by and for R.E. Mercier and co. Booksellers and printers to Trinity College: and for G.G. and J. Robinson	10,287
1808	Blair, David (Richard Phillips)	An Easy Grammar of natural and experimental philosophy:: for the use of schools. With ten engravings. A New Edition Corrected. London: Printed for Richard Phillips, no 6, Bridge Street (and to be had of all booksellers)	10,037
1812	Playfair, John	Outlines of natural philosophy : being heads of lectures delivered in the University of Edinburgh. Vol. I . Edinburgh: Printed by A. Neill & co. For Richard Constable and company, Edinburgh; and Longman, Hurst, Rees, Orme and Brown, Cadell and Davies, and John Murray.	12,751
1817	Barlow, Peter	An Essay on the Strength and Stress of Timber, grounded upon Experiments performed at the Royal Military Academy, on Specimens Selected from the Royal Arsenal, and His Majesty's Dock-Yard, Woolwich: preceded by an Historical Review of former Theories and Experiments, with Numerous Tables and Plates. Printed for J. Taylor, at the Architectural Library, No.59, High Holborn	10,383
1820	Watts, William	Art. III - On the Length of the Pendulum, in reply to a Letter contained in Nº XVI. Of the «Quarterly Journal of Science.» The Edinburgh Philosophical Journal, vol. III. Edinburgh: Printed for Archibald Constable and Company.	1,561
1823	Millington, John	An epitome of the elementary principles of natural and experimental philosophy. Part the first. Corresponding to the general properties of matter, mechanics, pneumatics, acoustics, hydrostatics, hydraulics. And a copious product of the invention, progress, and present state of the steam engine; being the substance of a course of lectures in these subjects, delivered at the Royal and London Institution, and AT GUY'S HOSPITAL, SOUTHWARK, BY JOHN MILLINGTON. London: printed for and sold by the author; and by Shrewood, Jones and co. Paternoster Row; Cox and Son, St. Thomas's Street, Borough; and all other booksellers.	11,782
1827	Arnott, Neill	Elements of physics, or Natural Philosophy, general and medical explained independently of technical mathematics. London: printed for Thomas and George Underwood, Fleet Street.	7,292
1832	Callan, Nicholas Joseph	An Abstract of a Course of Lectures on Electricity and Galvanism, delivered in the R. C. College, Maynooth. Dublin: printed by John Coyne, 24, Cooke Steet	10,588
1835	Sommerville, Mary (born M. Fairfax)	On the Connexion of the Physical Sciences. London: John Murray, Albemarle Street	10,057
1843	Zornlin, Rosina	The World of Waters; or Recreations on Hydology. London: John W. Parker, West Strand	10,388
1847	Cooper, William White	Practical remarks on near sight, aged sight, and impaired vision; with observations upon the use of glasses and on artificial light. London: John Churchill, Princess Street, Soho	10,012

Date	Author	Title	Word count
1851	Hunt, Robert	Elementary Physics, an introduction to the study of Natural Phislosophy (with 217 wood-engravings). London: Reeve and Benham. Henrietta Street. Covent Garden	10,008
1854	Hogg, Jabez	The microscope: its history, construction and and applications. Being a familiar introduction to the use of the instrument and the Study of Microscopical Science. London: Published at the office of the illustrated London Librarry, Milford House, Milford Lane, Strand: and «.S. Orr and co., Amen Corner, Paternoster Row.	10,028
1865	Maxwell, James Clerk	A dynamical theory of the electromagnetic field. Philosophical transactions of the Royal Society of London, v. 155	10,273
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