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The effects of revolution and war on academic discourse, 1785-1835

20 June 2019.

David BANKS

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PREO

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1. Introduction and historical background

- 1 The first ever periodical of an academic nature was the *Journal des Sçavans*, which first appeared on 5 January 1665 in Paris. It was edited by Denis de Sallo at the instigation of Colbert, Louis XIV's *Contrôleur général des finances* (the most powerful position after that of the king himself), with the objective of controlling new knowledge, which he perceived as being a potential danger to the State. It covered the whole range of academic disciplines of the period, and was made up mainly of book reviews (Banks 2015, 2017a, Morgan 1928). Only two months later, on 6 March 1665, the first issue of the *Philosophical Transactions* appeared in London. It was edited by Henry Oldenburg,

and although it had the imprimatur of the Royal Society, it remained the personal property of Oldenburg, who retained full editorial and financial responsibility for it. In addition to being one of the secretaries of the Royal Society, he was the centre of a network of scientific correspondence, and he hoped that the creation of a bulletin of scientific information would be a source of extra income. Its contents was restricted to science and technology and depended largely on the contents of his postbag (Banks 2017a, Hall 2002, Bluhm 1960). The Royal Society had been created in 1660, but, despite having royal patronage, did not receive any official funding and depended on the subscription fees of its members for its income. This meant that many members were elected because of their ability to pay, rather than for any scientific ability (Lyons 1944, Bluhm 1958, Hunter 1982). The Académie Royale des Sciences was created in 1666, but unlike its English counterpart was created and maintained by the state which also provided premises in which to carry out their activities, and its members were paid a retainer by the crown (Hahn 1971, Hirschfield 1981). Although the Académie did publish its *Mémoires*, this was done only in luxurious limited editions which were considered the personal property of the King, who frequently used them as gifts for illustrious visitors. The fact that this was seen to be part of the glory and aura of the French monarchy meant that it was felt that wider distribution was unnecessary (Licoppe 1994). This situation lasted until the end of the century which meant that during this period the *Journal des Sçavans* and the *Philosophical Transactions* remained the two major scientific periodicals publishing in vernacular languages.

- 2 It was only after the reorganization of the Académie in 1699 that this situation changed radically. It was then decided that the *Mémoires* of the Académie should be published on a much more regular basis, and the volume for 1699 actually appeared in print in 1702 (Hahn 1971, McClellan 2001, Banks 2017b). The *Philosophical Transactions* remained the personal property of its successive editors until 1752. However, from 1730 onwards, it did not make a profit and the Royal Society eventually took over responsibility for the publication in 1752. The Royal Society continued to run it at a loss because it enhanced its reputation and was important in its reciprocal relations with groups and individuals abroad. From that date the *Philosophical Transactions* was run by an editorial committee, who decided what to publish; all

papers published after this date had been previously read at a Royal Society meeting (Fyfe 2015, Fyfe *et al.* 2015, Fyfe & Moxham 2016).

- 3 In the 1790s France underwent the trauma of the French Revolution. From the end of 1792 scientific activity was greatly reduced. There was great suspicion of intellectuals, and, despite the efforts of Lavoisier, all académies, including the Académie Royale des Sciences were abolished in 1793. Lavoisier himself, despite being at the forefront of scientific activity and with an international reputation, was arrested in November of that year, and executed a few months later, a victim of Marat's vindictiveness as much as any misdemeanours related to his tax-gathering activities. In 1779 Lavoisier had been instrumental in discrediting Marat's scientific pretensions (Bell 2005, Hahn 1971). Marat believed that he was the greatest scientist of his age, and that he was even greater than Newton.

Having made his office in the rue de Bourgogne into a laboratory, he carried out numerous experiments on light, fire and electricity, and soon convinced himself that he was the man promised to Science to revolutionize the whole of physics and relegate Newton to the domain of illusion. (Fayet 1960: 29)¹

- 4 The backlog of volumes of the *Mémoires* continued to appear: the volume for 1789 was printed in 1793, but not distributed until 1796, with the word "Royale" still present in its running head since it would have been too expensive to alter the presses; the volume for 1790 appeared in 1797 (Hahn 1971).
- 5 The abolition of the académies created a vacuum, which was filled in 1795 with the creation of the Institut National des Sciences et des Arts. This had three classes, the first of which dealt with physical and mathematical sciences, thus providing a replacement for the defunct Académie Royale des Sciences, and they began publishing *Mémoires* from 1798. In 1816, the Académie regained its independence, and its name (Académie des Sciences), within the Institut de France. By this time France had undergone not only the Revolution, but also the rule of Napoleon, both during the Consulat, 1799-1804, and the Empire, 1804-1814, and the Restoration of the Monarchy under Louis XVIII in 1814. Nevertheless, according to Brockliss the Revolutionary and Na-

- poleonic eras were accompanied by an “explosion of scientific creativity” (1992, 79).
- 6 The *Journal des Sçavans* also fell foul of the French Revolution. It disappeared in 1792. There was an unsuccessful attempt to revive it in 1796. It appeared regularly for a few months, but then disappeared again. It was only in 1816, after the Restoration of the monarchy, that the *Journal des Sçavans* was finally re-established on a more solid and lasting basis (Cocheris 1860, Paris 1903).
 - 7 England was not, of course, directly affected by the French Revolution. The Royal Society was dominated during this period by Joseph Banks, its longest serving President, who was elected in 1778, at the relatively early age of 35, and remained in control till his death in 1820 (Lyons 1944, Cameron 1952, O’Brian 1987). He had come to fame as the botanist who had accompanied Captain Cook on his first circumnavigation of the world (Beaglehole 1962a, b, Banks 1996). He is frequently seen as being an autocratic ruler who directed the Royal Society with an iron hand, but while Valle (1999) finds that botany and zoology were dominant in the period 1760 to 1820, Banks does not seem to have given special favour to his own subject, biology, although he did have a preference for the applied sciences (Gascoigne 1994). England and France were intermittently at war from the middle of the eighteenth century until the Battle of Waterloo in 1815; this included the Seven Years War (1756-1763), the American War of Independence (1777-1783) in which the French actively supported the Americans, and the period of the French Revolution and the Napoleonic Wars (1793-1815). In spite of this the Royal Society and the Académie remained in contact. Banks himself claimed that science was above politics, and is credited with the quote that the “sciences were never at war” (Crosland 2005). He became a corresponding member of the Académie in 1772, and in 1802, he was elected to the Institut National (Gascoigne 1994, 1998). Throughout this period the situation of the *Philosophical Transactions* remained stable, and while the Royal Society went through an unstable period following Banks’ death, this does not seem to have affected the *Philosophical Transactions* itself (Atkinson 1999).
 - 8 It has been shown that text is very closely related to, and to some extent caused by, the context in which it is produced (Halliday 1978,

Banks 2005, 2017a, c). In Banks 2017a, I showed that there were differences in the linguistic features used in the writing of the early issues (1665-1700) of the *Journal des Sçavans* and the *Philosophical Transactions*. These differences can be traced to the different editorial decisions made by de Sallo and Oldenburg in relation to the genre to be used (mainly book reviews or extracts from letters), and the field to be covered (all known knowledge or only science and technology). These decisions themselves can be seen as a function of the very different historical situations of France and England in the late seventeenth century. The object of this paper is to attempt to see to what extent (if any) scientific writing was affected by the turbulence of this period: the French Revolution in France, and the wars between England and France.

2. A corpus

- 9 There seem to be three main contenders for consideration in this study: the *Journal des Sçavans*, the *Mémoires* of the French Académie, and the *Philosophical Transactions*. This does not mean that no other periodicals were created; on the contrary there were vast numbers of publications devoted to scientific subjects. However, many of these were short-lived. Kronick (1962) indicates that of almost 500 scientific periodicals in the period 1670 to 1700, only 31% lasted more than five years, and only 18% more than ten. In contrast, the *Journal des Sçavans* and the *Philosophical Transactions* still exist, and the *Mémoires* continued to be published until 1936.
- 10 I have selected the years 1785 and 1835 for analysis. This is motivated by the fact that this gives us a round 50-year period, 1785 precedes the French Revolution, and 1835 is 20 years after the Battle of Waterloo; there is also the practical reason that the issues of the periodicals for these years are easily accessible.²
- 11 In its issues for 1785 the *Philosophical Transactions* printed 25 items. Of these, 20% were in the field of astronomy, and a further 20% in the field of physics, with 12% of the items being devoted to biology and 12% to chemistry. In the same year, the volume of the *Mémoires* contained 49 items, 28% of which concerned chemistry, 22% astronomy, 12% physics, and 10% biology. Hence, for that year, 64% of the items printed in the *Philosophical Transactions* and 72% of those in

the *Mémoires* were devoted to the four main fields of astronomy, chemistry, physics, and biology. With the possible exception of two papers devoted to philosophical subjects in the *Mémoires*, all of the items can be considered as being within the general field of science and technology. The full details are given in Table 1.

Table 1. Subjects in Philosophical Transactions and Mémoires, 1785.

	Phil Trans		Mémoires	
	1785		1785	
Astronomy	5	20%	11	22%
Archaeology	-	-	-	-
Biology	3	12%	5	10%
Botany	2	8%	4	8%
Chemistry	3	12%	14	28%
Geography	1	4%	-	-
Geology	2	8%	1	2%
Mathematics	1	4%	1	2%
Medicine	-	-	2	4%
Meteorology	1	4%	1	2%
Physics	5	20%	6	12%
Philosophy	-	-	2	4%
Technology	2	8%	2	4%
	25		49	

- 12 The *Journal des Sçavans*, on the other hand, published 148 items during this period, of which 16% were of a general nature or covered more than one subject area. History accounts for 11% of the items, geography for 10% and meteorology for 9%. Indeed, all scientific subjects taken together account for only 37% of the total, the most important being geography, 10%, and meteorology, 9%; these two subjects are quite marginal in the *Philosophical Transactions* and the *Mémoires*. I shall take it then that the *Journal des Sçavans* is not directly comparable to the other two publications and it will not be considered further here. The full details are given in Table 2, where scientific subjects (i.e. those that are represented in the *Philosophical Transactions* and the *Mémoires*) are indicated by an asterisk.

Table 2. Subjects in *Journal des Sçavans*, 1785.

	JdS	
	1785	
Agriculture	2	1%
Anthropology	3	2%
Archaeology*	1	1%
Astronomy*	1	1%
Bibliography	1	1%
Biology*	1	1%
Botany*	2	1%
Chemistry*	3	2%
Classics	4	3%
Edition	2	1%
Education	1	1%
General	23	16%
Geography*	15	10%
History	17	11%
Language	1	1%
Law	9	6%
Mathematics*	3	2%
Medicine*	9	6%
Meteorology*	13	9%
Music	2	1%
Numismatics	1	1%
Obituary	3	2%
Physics*	2	1%
Technology*	5	3%
Theology	8	5%
Technology*	5	3%
Theology	8	5%
Total	148	

- 13 In its issues for 1835, the *Philosophical Transactions* printed 21 items, of which 32% were devoted to physics, and 18% each to biology and geography. The volume of the *Mémoires* for that year has only 12

items, 25% of which deal with biology, 25% with chemistry, and 17% with botany. Interest in all the main areas seems to have been maintained, but with changing focus. Chemistry has about the same degree of interest; interest in biology has increased, while that for astronomy seems to have decreased; interest in physics and geography has increased for the writers in the English publication but not in the French, while the opposite is true of botany. The full details are given in Table 3.

Table 3. Subjects in *Philosophical Transactions* and *Mémoires*, 1835.

	<i>Phil Trans</i>		<i>Mémoires</i>	
	1835		1835	
Astronomy	1	5%	1	8%
Archaeology	-	-	1	8%
Biology	4	18%	3	25%
Botany	-	-	2	17%
Chemistry	1	5%	3	25%
Geography	4	18%	-	-
Geology	1	5%	1	8%
Mathematics	1	5%	-	-
Medicine	2	9%	-	-
Meteorology	1	5%	-	-
Physics	7	32%	-	-
Technology	-	-	1	8%
Total	21		12	

- 14 For the purposes of analysis a number of articles were selected for each of the two periodicals at each of the two time points. An attempt was made to include the scientific fields which were most commonly represented in the periodicals in question, but articles of more than 12 pages were excluded. This gave, for the *Philosophical Transactions* 1785, three articles totalling 27 pages, for the *Philosophical Transactions* 1835, five articles totalling 26 pages, for the *Mémoires* 1785, six articles totalling 24 pages, and for the *Mémoires* 1835 three articles totalling 28 pages. The only one of these which causes any real difficulty is that for the *Mémoires* 1835. The articles in this sample are considerably longer than in the other sub-corpora, which meant that

many were excluded on grounds of length. Of the three selected, two are by the same author (Becquerel). While this is not ideal, the results do not seem to indicate any particular skewing due to this feature. Details of the corpus are given in Appendix 1.

3. A linguistic framework

- 15 I intend to look at two features in these texts, the nature of themes, and process types. The analysis is based on the principles of Systemic Functional Linguistics (Halliday 2014, Banks 2005, 2017c). Systemic Functional Linguistics sees the clause as embodying three types of meaning, or metafunctions: ideational, which deals with processes, the participants involved in them, and their associated circumstances; interpersonal, dealing with the relationships established by the speaker with his addressees, and with his own message; and the textual, which deals with the organization of the message.
- 16 Theme is a component of the clause and is defined as the speaker's starting point. It constitutes part of the thematic structure and falls within the domain of the textual metafunction. In both French and English it occurs in initial position. Each clause has a topical theme, which is the first major component of the clause (subject, circumstantial adjunct, complement or predicator). This may be preceded by an interpersonal and/or textual theme, though neither of these is necessarily present. In this study the term "theme" without further specification should be taken to mean topical theme. Hence in (1) *For some years past* functions as circumstantial adjunct and is the theme of the clause. If *Dear Sir* is considered to be part of this clause it functions as an interpersonal theme.

(1) DEAR SIR, For some years past I have been employed in verifying all the stars suspected to be variable, in order that hereafter we may know with certainty what to depend upon. (Pigott, PT 1785)³

- 17 In (2), *Les veines principales de la grenouille* is the subject and functions as theme.

(2) Les veines principales de la grenouille ont donc un mouvement ou battement propre. (Flourens, *Mémoires* 1835)⁴

- 18 Transitivity concerns processes, participants and circumstances, and is the major component of the ideational metafunction. For process types, I shall consider the processes encoded by the finite verbs. To the extent that the interpretation of process types can vary from grammatical to conceptual (O'Donnell *et al.* 2008), my view is towards the conceptual pole of this cline. I use a system which has five process types (Banks 2005, 2017c). Material processes are actions or events of a physical nature.

(3) Such observations were accordingly made at all the Preventive Service stations on the coasts of England, Ireland, and Scotland, from June 7 to June 22 inclusive, and the registers of the observations were sent to the Admiralty, where they now are. (Whewell, PT 1835)

(4) Dans les poissons, la circulation ne s'opère pas de la même manière que dans les animaux qui respirent de l'air. (Broussonet, *Mémoires* 1785)⁵

- 19 Mental processes are activities of a cerebral type; these can be cognitive, affective, or processes of perception.

(5) The refrangibility was seen to vary considerably and irregularly for each ray and each medium; and when FRAUNHOFFER had assigned serieses of numbers as the accurate expressions of the varying refractive powers throughout the several spectra, the apparent absence of any law connecting these numbers was only rendered more palpable. (Powell, PT 1835)

(6) Je présume que telle a été la marche du tonnerre, d'après l'inspection du local & l'examen des effets. (Tessier, *Mémoires* 1785)⁶

- 20 Relational processes link an entity to another entity or one of its own characteristics. These can be attributive, identifying or possessive.

(7) A very brief examination of its optical was sufficient to indicate its more obvious peculiarities, and a short notice was published at the time. (Brewster, PT 1835)

(8) Ces deux actions sont d'autant plus grandes que l'on a diminué davantage la force d'agrégation. (Bequerel, *Mémoires* 1835)⁷

21 Verbal processes are processes of communication.

(9) The extension of such results as have been stated in the present paper to other coasts, and the discovery of other similar laws, cannot but be looked upon as a valuable and interesting addition to our knowledge. (Whewell, PT 1835)

(10) Un caractère que l'on distingue plus fortement encore est celui que je vais indiquer. (Flourens, *Mémoires* 1835)⁸

22 Existential processes simply state the existence of an entity.

(11) ... and therefore there is no reason to think, that the precipitate, which our salt occasioned with a solution of silver, proceeded from any other cause than its being phlogisticated. (Cavendish, PT 1785)

(12) Dans la perche il n'y a qu'un seul ovaire, l'artère spermatique est unique ... (Broussonet, *Mémoires* 1785)⁹

23 I do not use the category of behavioural process proposed by many working within the Systemic Functional framework (Banks 2016).

4. Theme

24 As stated above, Systemic Functional Linguistics analyses the thematic structure of a clause in terms of a theme and a rheme. The theme is the speaker's starting point and in languages like French and English is placed in initial position. Thematic structure has been seen as the driving force of scientific writing (Banks 2008a,b, Halliday & Martin 1993). Halliday (1988) has noted the importance of thematic structure in the construction of the argument of a scientific text, whereby the rheme of one clause is taken up as the theme of a subsequent clause. This is particularly significant when the theme nominalizes a segment which appeared in a non-nominalized form in the preceding rheme. I shall look first at the grammatical functions of the themes in the corpus, and then at the semantic categories that they represent.

25 The unmarked grammatical function of a theme is subject, and this is borne out in the corpus. The results for the *Mémoires* are given in Table 4.

Table 4. Grammatical function of themes in *Mémoires*.

	1785		1835	
S	243	76%	135	70%
Adj	62	19%	47	24%
P	2	1%	4	2%
C	-	-	-	-
Extra	10	3%	6	3%
Cleft	2	1%	1	1%
Total	319		193	

- 26 As can be seen, the vast majority of themes function as subject, 76% in 1785 and 70% in 1835. The only other function of any note is that of adjunct, which accounts for 19% of themes in 1785 and 24% in 1835. The other categories never account for more than 3%, and there are no examples of complement themes in the *Mémoires* corpus. There is little change over time other than a slight reduction in the percentage of subject themes balanced by a similar rise in adjunct themes.
- 27 The corresponding results for the *Philosophical Transactions* are given in Table 5.

Table 5. Grammatical function of themes in *Philosophical Transactions*¹⁰.

	1785		1835	
S	122	54%	290	66%
Adj	88	39%	127	29%
P	1	*	1	*
C	5	2%	2	*
Extra	11	5%	17	4%
Cleft	-	-	-	-
Total	227		437	

- 28 In the *Philosophical Transactions* the subject themes are still by far the largest category, but rather less so than in the *Memoires*, accounting for 54% in 1785 and 66% in 1835. Once again, the only other function of note is that of adjunct, which accounts for 39% of the

themes in 1785 and 29% in 1835. The other categories never account for more than 5%, and there are no examples of cleft structures providing themes in the *Philosophical Transactions* corpus. Here, there is an increase in the percentage of subject themes at the expense of adjunct themes. Moreover the increase (12 percentage points) is rather greater than the decrease in the *Mémoires* (6 percentage points). So, the change in the *Philosophical Transactions* is greater than that in the *Mémoires*, although the *Philosophical Transactions* might be seen as moving towards the profile provided by the *Mémoires*.

29 The semantic categories of themes which I shall use are based on those developed in Banks 2008a. At the risk of being fastidious, I shall give a brief outline of the categories, with examples from the corpus. They are as follows:

30 Obj. The object of study or experimentation.

(13) The non-conducting power of a perfect vacuum is a fact in electricity which has been much controverted among philosophers.
(Morgan, PT 1785)

(14) Le pouls veineux dont il s'agit ici est un phénomène d'un tout autre ordre. (Flourens, *Mémoires* 1835)¹¹

31 Exp. The experiment or the experimental process.

(15) These experiments, however, belong to another subject, and may possibly be communicated at some future time. (Morgan, PT 1785)

(16) Cette opération, dans laquelle j'ai employé quatre onces d'acide marin concentré & une once de manganèse, étant finie, je n'ai point trouvé que l'esprit-de-vin eût l'odeur d'acide marin déphlogistiqué.
(Berthollet, *Mémoires* 1785)¹²

32 Equip. The equipment used.

(17) Diaphragms were attempted; but besides other difficulties, they did not efface stars of the first magnitude. (Pigott, PT 1785)

(18) La lunette de cet instrument est foible, & le micromètre dont elle est garnie est de beaucoup inférieur à ceux qu'on a construits depuis. (Jeaurat, *Mémoires* 1785)¹³

33 **Obs. The process of observation.**

(19) Such observations were accordingly made at all the Preventive Service stations on the coasts of England, Ireland, and Scotland, from June 7 to June 22 inclusive, and the registers of the observations were sent to the Admiralty, where they now are. (Whewell, PT 1835)

(20) L'OBSERVATION du passage de la Lune, par la constellation des Pléiades, est une de celles qui peuvent être les plus propres à fixer, pour nos tables de la Lune, nombre de secondes d'erreur, dont elles sont encore susceptibles. (Jeaurat, *Mémoires* 1785)¹⁴

34 **Auth. The author of the text in question or a group of which he is a member.**

(21) I accordingly made some experiments to determine what degree of purity the air should be of, in order to be diminished most readily, and to the greatest degree. (Cavendish, PT 1785)

(22) Nous avons fait saigner du bras les deux 'premiers', & le troisième du pied, environ six heures après l'évènement. (Tessier, *Mémoires* 1785)¹⁵

35 **Oth. Humans other than the author.**

(23): Sir EVERARD HOME has given a very good representation of them, at this stage of their progress, in his Lectures on Comparative Anatomy, from the elegant pencil of Mr. BAUER. (Thompson, PT 1835)

(24) M. PRIESTLEY a retiré du gaz inflammable de l'esprit-de-vin, par le moyen de l'étincelle électrique. (Berthollet, *Mémoires* 1785)¹⁶

36 **Inter. Documents other than the present text.**

(25) For instance, in a paper published in the *Philosophical Transactions* for 1819, it is taken for granted, that when the two tides meet which come up the British Channel and down the German Ocean there must be a visible and marked conflict of opposite currents of water. (Whewell, *PT* 1835)

(26) De plus, les tables du Soleil de l'Abbé de la Caille, donnent 3,5" de plus que celle de Mayer. (Jeaurat, *Mémoires* 1785)¹⁷

37 **Meta. Reference to other parts of the same text.**

(27) My next illustration will show that a similar fact has been observed among the bivalves. (Gray, *PT* 1835)

(28) Les figures (1), (2), (3) montrent ce qui se passe dans l'arrangement des atomes pendant les premiers moments de la cémentation. (Bequerel, *Mémoires* 1835)¹⁸

38 **Exist. Existential themes.**

(29) There are some circumstances which we can readily imagine may produce such an effect, though awe should probably not succeed in guessing what the effect would be. (Whewell, *PT* 1835)

(30) ... il n'y en a eu que deux qui soient restés sur leurs pieds. (Tessier, *Mémoires* 1785)¹⁹

39 **Ment. Mental processes or elements of argumentation.**

(31) But this conclusion has not been universally admitted, and the following experiments were made with the view of determining its truth or fallacy. (Morgan, *PY* 1785)

(32) En continuant le même raisonnement, on arrivera à l'arrangement de la figure 3, et ainsi de suite. (Becquerel, *Mémoires* 1835)²⁰

40 **Time. Temporal expressions.**

(33) In 1778 I had small pieces of fine glass stained with different shades, which being applied to the eye end of a telescope, I could easily find what degree of shade was requisite to efface stars of different brightness. (Pigott, PT 1785)

(34) Le 13, à 11 heures 52 minutes du soir, des nuages s'élevèrent du sud, couvrirent la Lune, de manière que toutes les étoiles qui étoient autour d'elle disparurent. (Messier, *Mémoires* 1785)²¹

41 **Sit. Geographical or spatial location.**

(35) From the Scilly Islands to Portland Bill, most of the stations exhibit this inequality operating upon the greater part of the tides. (Whewell, PT 1835)

(36) Vers le nord, le tonnerre a cassé des tuiles, depuis le faite jusqu'à l'égout, & a réduit en copeaux un chevron dans toute sa longueur. (Tessier, *Mémoires* 1785)²²

42 **Math. Mathematical expressions.**

(37) And the variation in the value of this ratio, and consequently in that of μ , for a given variation in λ , is greater when the arc is greater, this, when λ is less. (Powell, PT 1835)

(38) A ce résultat j'ajoute, pour dernière remarque, qu'à cette époque, 13 décembre 1785, & pour 9h 59' 7", temps vrai, les tables du Soleil de Mayer & de l'Abbé de la Caille diffèrent entr'elles seulement de 3,5". (Jeaurat, *Mémoires* 1785)²³

43 **Table 6 gives the distribution of these categories for the *Mémoires*.**

Table 6. Semantic categories of themes in the *Mémoires*.

	1785		1835	
Obj	191	60%	119	62%
Exp	9	3%	8	4%
Equip	4	1%	-	-
Obs	5	2%	3	2%

Auth	59	18%	31	16%
Oth	17	5%	7	4%
Inter	1	*	4	2%
Meta	-	-	1	1%
Exist	6	2%	-	-
Ment	10	3%	19	10%
Time	14	4%	-	-
Sit	2	1%	1	1%
Math	1	*	-	-
Total	319		193	

44 There is a striking similarity between the results for the two dates. Hence over this 50-year period there seems to have been virtually no change in the way these writers choose their themes. The only relatively small difference is the 7 percentage point rise for the Ment category. Otherwise none of the categories change by more than 4 percentage points, and most of them by only one or two. By far the largest category is Obj, showing the importance of the object of study for these writers, who place it in thematic position in almost two out of three clauses. The second most frequent category is that of Auth, making the author himself the second most important type of theme, and accounting for almost one in five of the clauses. No other category accounts for as many as 10% of the themes, except Ment in 1835.

45 Table 7 gives the corresponding distribution for the *Philosophical Transactions*.

Table 7. Semantic categories of themes in the *Philosophical Transactions*.

	1785		1835	
Obj	101	44%	257	59%
Exp	26	11%	2	*
Equip	15	7%	-	-
Obs	5	2%	13	3%
Auth	31	14%	31	7%
Oth	4	2%	33	8%
Inter	5	2%	12	3%

Meta	-	-	3	1%
Exist	4	2%	5	1%
Ment	29	13%	58	13%
Time	7	3%	6	1%
Sit	-	-	8	2%
Math	-	-	9	2%
Total	227		437	

46 Here, there seems to be rather more change over time than was the case in the *Mémoires*. The Obj category is again by far the largest, though not to the same extent as in the *Mémoires*. Moreover, the frequency of the category increases from 44% to 59% (15 percentage points) over the period 1785 to 1835. However, this apparently large increase must be tempered to some extent. If one takes as a group Obj + Exp + Equip + Obs, which might be thought of as those categories directly connected to the study itself, then we have 65% for 1785, compared with 62% for 1835. The corresponding figures for the *Mémoires* are 66% in 1785, and 67% in 1835. Hence although the Obj category is less frequent in the *Philosophical Transactions* and increases over time, the study group as a whole changes little, and has similar frequencies in the two periodicals. The Auth category in the *Philosophical Transactions* falls from 14% to 7% (7 percentage points), while the Oth category increases by almost the same amount from 2% to 8% (6 percentage points). These two categories hardly changed at all over time in the *Mémoires*. It is possible that what was to come to be seen as the impersonal nature of scientific discourse was beginning to be felt in the early nineteenth century, leading to a reduction in the use of Auth themes in English. Similarly it is possible that the need to reference the work of others was beginning to be felt, leading to an increase in the use of Oth themes.

5. Process types

47 The categories of process types were outlined above. The distribution of the processes of finite verbs for the *Mémoires* is given in Table 8.

Table 8. Process types in the *Mémoires*.

	1785		1835	
Mat	323	53%	181	40%
Ment	71	12%	63	14%
Rel	183	30%	170	38%
Verb	22	4%	29	6%
Exist	7	1%	10	2%
Total	606		453	

- 48 The percentage of material processes falls from 53% in 1785 to 40% in 1835 (seven percentage points). This is paralleled by a corresponding rise in the rate of relational processes, which rises from 30% in 1785 to 38% in 1835 (eight percentage points). Material processes encode actions and events of a physical nature, while relational processes encode static relationships, and hence state what is the case. So, there seems to be a movement from interest in dynamic physical happenings to the static nature of the world as it is. By 1835, interest in relational process has risen to be almost on a par with that for material process.
- 49 Table 9 gives the corresponding distribution for the *Philosophical Transactions*.

Table 9. Process types in the *Philosophical Transactions*.

	1785		1835	
Mat	268	47%	261	28%
Ment	100	18%	181	20%
Rel	176	31%	385	42%
Verb	20	4%	78	9%
Exist	7	1%	12	1%
Total	571		917	

- 50 Here the same changes are in evidence, but the degree of the change is considerably greater than in the *Mémoires*. The percentage of material processes has decreased by 19 percentage points from 47% to 28%, while the rate of relational processes has increased by 11 percentage points from 31% to 42%. Hence, in the *Philosophical Transactions* there seems to be a relatively strong movement towards a static

descriptive style, so that by 1835 relational process is clearly the dominant process type. It might also be noticed that the frequency of material process is less in the *Philosophical Transactions* than in the *Mémoires* at both of the dates: 6 percentage points in 1785 and 12 in 1835. At the same time the frequency of mental process is greater in the *Philosophical Transactions* than in the *Mémoires*: 6 percentage points at both dates. This seems to indicate that the writers of the *Philosophical Transactions* attach more importance to mental processes than their French counterparts do.

6. Final thoughts

- 51 If we consider the changes over time indicated by these results, a number of conclusions seem to follow. In the *Mémoires*, there is little change in the grammatical functions of themes, other than a small reduction in subject themes and rise in adjunct themes. In the *Philosophical Transactions*, there is also a reduction in subject themes and corresponding rise in adjunct themes, and the degree of change is greater than in the *Mémoires*. In the *Mémoires* there is hardly any change in the semantic categories of themes, other than a small increase in the Ment type. There is rather more change in the *Philosophical Transactions*, where we find a significant increase in the use of Obj themes, though rather less if the study group is taken as a whole. There is also a decrease in the use of Auth themes, but an increase in the use of Oth themes. In terms of process types, there is a decrease in the use of material process, and an increase in the use of relational process in the *Mémoires*. These same changes are present in the *Philosophical Transactions*, where the degree of change is considerably greater than in the *Mémoires*.
- 52 Without having a control group, and to the best of my knowledge there are no studies which could be used for comparative purposes, it is difficult to know whether these results would be typical of a 50-year period. Intuitively, however, I must admit the changes are smaller than I expected. Nevertheless, there seems to be a general pattern, whereby there are a number of limited changes in the *Mémoires*; these same changes appear in the *Philosophical Transactions*, where the degree of change is systematically greater than in the *Mémoires*. One can only speculate as to why this should be the case, but I would

suggest that in times of great turbulence there is a tendency to be more conservative than would normally be the case. In times of danger, people hang on to whatever they can preserve. So, my suggestion is that in times of great difficulty, scientists attempt to continue doing things as they have done, changing as little as possible. If this hypothesis is correct, it would explain why the French scientists, having gone through the upheaval of the French Revolution, combined with foreign wars, changed their writing style very little. The English scientists had gone through a series of wars, notably those with Napoleon, but were not directly affected by the French Revolution, and consequently their writing displays a rather greater degree of change than that of their French counterparts.

Appendix 1

Mémoires 1785.

M. Broussonet	Observations sur les vaisseaux spermatiques des poissons épineux.	170-173	biology
M. Jeaurat	Observation de la lune. Lors de son passage par le méridien, environ deux heures avant l'occultation d'un grand nombre des Etoiles des Pleïades, le 13 Décembre 1785.	229-232	astronomy
M. Sage	Procédé pour extraire de l'esprit-de-vin un acide concret, semblable à celui du sucre.	233-234	chemistry
M. Berthollet	Mémoire sur la décomposition de l'esprit-de-vin et de l'éther par le moyen de l'air vital.	308-315	chemistry
M. l'Abbé Tessier	Observation sur l'effet du tonnerre, à Rambouillet, le 2 août 1785.	361-363	physics
M. Messier	Occultation de quelques étoiles de Pleïades, les 11 avril et 13 décembre 1786. Observées à Paris, de l'Observatoire de la Marine	656-658	astronomy

Mémoires 1835.

M. Flourens	La force de contraction propre des veines principales dans la grenouille	1-7	biology
M. Bequerel	Des variétés de forme de chaux carbonatée observées dans le calcaire de Clamecy	31-37	geology

M. Bequerel	Considérations générales sur les changements qui s'opèrent dans l'état électrique des corps par l'action de la chaleur, du contact, du frottement de diverses actions chimiques, et sur les modifications qui en résultent quelquefois dans l'arrangement de leurs parties constituantes. Troisième partie. De la cémentation et des altérations que le fer peut éprouver avec le temps, dans la terre.	177-188	chemistry
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PT 1785.

Edward Pigott	Observations of a new variable Star. In a Letter from Edward Piggot, Esq. To Sir H.C. Englefield, Bart. F.R.S. and A.S.	127-136	astronomy
William Morgan	Electrical Experiments made in order to ascertain the non-conducting Power of a perfect Vacuum, &c. By Mr. William Morgan; communicated by the Rev; Richard Price, LL.D. F.R.S.	272-278	physics
Henry Cavendish	Experiments on Air. By Henry Cavendish, Esq. F.R.S. and A.S.	372-384	chemistry

PT 1835.

William Whewell	On the Results of Tide Observations Made in June 1834 at the Coast Stations in Great Britain and Ireland	83-90	geography
David Brewster	On certain Peculiarities in the Double Refraction and Absorption of Light exhibited in the Oxalate of Chromium and Potash	91-93	physics
Baden Powell	Researches towards establishing a Theory of the Dispersion of Light.	249-254	physics
John Edward Gray	Remarks on the difficulty of distinguishing certain Genera of Testaceous Mollusca by their Shells alone, and on the Anomalies in regard to Habitation observed in certain species.	301-310	biology
J.V. Thompson	Discovery of the Metamorphosis in the second type of Cirripedes, viz. the Lepades, completing the natural History of these singular Animals, and confirming their affinity with the Crustacea.	355-358	biology
William Whewell	On the Results of Tide Observations Made in June 1834 at the Coast Stations in Great Britain and Ireland	83-90	geography
David Brewster	On certain Peculiarities in the Double Refraction and Absorption of Light exhibited in the Oxalate of Chromium and Potash	91-93	physics
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1 Original French : Ayant transformé son cabinet de la rue de Bourgogne en laboratoire, il multiplie les expériences sur la lumière, le feu, l'électricité, et ne tarde pas à se convaincre qu'il est l'homme promis à la Science pour révolutionner toute la physique et reléguer Newton aux domaines des chimères.

2 These texts are available on the website of the Bibliothèque Nationale de France <gallica.bnf.fr//accueil/?mode=desktop>. Those for the *Philosoph-*

ical Transactions can also be found on the website of the Royal Society <<https://royalsociety.org>>.

- 3 Relevant parts of examples are printed in bold.
- 4 The principle veins of the frog thus have their own movement or beat.
- 5 In fish, the circulation does not work in the same way as in animals which breath air.
- 6 I presume that this was what the thunder did, after inspecting the place and examining its effects.
- 7 These two actions are all the greater when the agregating force is decreased even more.
- 8 A characteristic which is even more noticeable is that which I am going to point out.
- 9 In the perch there is only one ovary, and a single spermatic artery.
- 10 An asterisk in a Table means that there are some examples but they account for less than 0.5%.
- 11 The venous pulse in question here is a phenomenon of a quite different order.
- 12 When this operation in which I used four ounces of concentrated marine acid air and one ounce of manganese was finished, I did not find that the spirits of wine had the smell of dephlogisticated marine acid air.
- 13 The lens of this instrument is weak, and the micrometer with which it is fitted is greatly inferior to those which have been made since then.
- 14 THE OBSERVATION of the passage of the Moon by the constellation of Pleiades is one of those which is the most proper for fixing, for our Moon tables, the number of seconds of error, to which they are still subject;
- 15 We bled the first two from the arm, and the third from the foot, about six hours after the event.
- 16 Mr PRIESTLY obtained inflammable gas from spirits of wine by means of an electric spark.
- 17 Moreover, the Abbé de la Caille's tables of the Sun give 3.5" more than those of Mayer.
- 18 Figures (1), (2) and (3) show what happens to the organization of the atoms during the first moments of cementation.
- 19 ... there were only two that remained on their feet.

20 Continuing the same line of reasoning, we get the arrangement of Figure 3, and so on.

21 On the 13th, at 11h35 in the evening, clouds arrived from the south covering the Moon, so that all the stars that surrounded it disappeared.

22 Towards the north, the thunder broke tiles, from the rooftop to the gutter, and reduced the full length of a rafter to shavings.

23 To this result I add, as a final remark, that at this time, 13 Dec. 1785, and for a real time of 9h59min7secMayer's Sun tables and those of the Abbé de la Caille differ by only 3.5 sec.

English

The Académie Royale des Sciences ceased publication of its *Mémoires* after 1786, and resumed (though no longer Royale) in 1798. The *Journal des Sçavans* ceased publication in 1792, and did not reappear until 1816. In its volume for 1785, the Académie Royale published 50 items in its *Mémoires*. In the decades which followed France was to undergo the trauma of the French Revolution, followed by the disruption of the Napoleonic Wars. Fifty years later, in 1835, the *Mémoires* of the re-established Académie des Sciences contained only 12 items. In comparison, the *Philosophical Transactions* published 25 items in its issues for 1785. England was obviously not directly affected by the French Revolution but it was by the Napoleonic Wars. The issues of the *Philosophical Transactions* for the year 1835 contain 22 items. The *Journal des Sçavans* appears to have continued the more generalist approach it had established by the beginning of the 18th century, with over 60% of its items relating to subjects outside the scientific area, and hence this publication will not be considered further here. The study looks at a sample of texts from the 1785 and 1835 issues of the *Mémoires* and the *Philosophical Transactions* to see to what extent, if any, the language of science altered in French and in English over this turbulent period. It transpires that the number of differences is less than might be expected, though rather more in the *Philosophical Transactions* than in the *Mémoires*. It is hypothesized that in times of great difficulty, academic writers tend to be conservative, and consequently the evolution of language is relatively slow. The theoretical background of the study is Systemic Functional Linguistics, and linguistic features such as thematic structure and process type are considered.

Français

L'Académie Royale des Sciences mit fin à la publication de ses *Mémoires* après 1786, et la publication reprit (bien que l'adjectif Royale ait disparu) en 1798. Le *Journal des Sçavans* cessa d'être publié en 1792, et ne réapparut qu'en 1816. Dans son volume pour l'année 1785, L'Académie Royale publia 50

items dans ses *Mémoires*. Dans les décennies suivantes la France dut affronter le traumatisme de la Révolution française, puis les bouleversements des guerres napoléoniennes. Cinquante ans plus tard, en 1835, les *Mémoires* de la nouvelle Académie des Sciences ne comportaient plus que 12 items. En comparaison, le *Philosophical Transactions* publiait 25 items dans ses numéros de 1785. L'Angleterre ne fut pas directement touchée par la Révolution française, mais elle le fut par les guerres napoléoniennes. Les numéros du *Philosophical Transactions* pour l'année 1835 comportent 22 items. Le *Journal des Sçavans* semble avoir poursuivi l'approche plus généraliste établie avant le début du dix-huitième siècle, avec plus de 60% d'items se trouvant en dehors du champ scientifique ; par conséquent cette publication ne sera pas traitée dans ce qui suit. Cette étude examine un échantillon de textes tirés des numéros des *Mémoires* et du *Philosophical Transactions* pour les années 1785 et 1835, afin de voir à quel point, si c'est le cas, la langue scientifique a évolué pendant cette période agitée. Il apparaît que les différences sont moins nombreuses que ce à quoi l'on aurait pu s'attendre, quoiqu'il y en ait plus dans le *Philosophical Transactions* que dans les *Mémoires*. Nous formulons l'hypothèse que, dans les périodes de grandes difficultés les rédacteurs savants ont tendance à faire preuve de conservatisme et que, en conséquence, l'évolution de la langue est plutôt lente. Le cadre théorique de l'étude est celui de la Linguistique Systémique Fonctionnelle, et des traits linguistiques tels que la structure thématique et les types de procès sont étudiés.

Mots-clés

diachronie, discours savant, guerres napoléoniennes, procès, Révolution française, structure thématique

David BANKS

Professeur émérite, Université de Bretagne Occidentale, 3 Rue des Archives,
29238 Brest – david.banks [at] univ-brest.fr