



ASp
La revue du GERAS

7-10 | 1995
Actes du 16e colloque du GERAS

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Electronic version

URL: <https://journals.openedition.org/asp/3702>

DOI: 10.4000/asp.3702

ISSN: 2108-6354

Publisher

Groupe d'étude et de recherche en anglais de spécialité

Printed version

Date of publication: December 1, 1995

Number of pages: 3-11

ISSN: 1246-8185

Electronic reference

David Banks, "There is a cleft in your sentence: Less common clause structures in scientific writing", *ASp* [Online], 7-10 | 1995, Online since 24 July 2013, connection on 21 November 2024. URL: <http://journals.openedition.org/asp/3702> ; DOI: <https://doi.org/10.4000/asp.3702>

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There is a cleft in your sentence: Less common clause structures in scientific writing

David Banks

Introduction

Introduction

- 1 When the features of scientific writing are mentioned, the first thing that springs to most people's minds is voice, the active/passive distinction. Explanations of this phenomenon are frequently given in terms of information structure, that is of theme and rheme, and of given and new. To the extent that this sort of explanation is valid, however, active and passive are just two of a wide range of possible choices. Consider 1a-1g (throughout this paper examples followed by the letter a are corpus examples; other letters indicate intuitively reconstructed examples):
 - 1a The ends of a spindle are suspended by rigid side-arms from a bracket protruding to one side of the sledge frame.
 - 1b We suspended the ends of a spindle by rigid side-arms from a bracket protruding to one side of the sledge frame.
 - 1c It is the ends of a spindle that are suspended by rigid side-arms from a bracket protruding to one side of the sledge frame.
 - 1d It is by rigid side arms that the ends of a spindle are suspended from a bracket protruding to one side of the sledge frame.
 - 1e It is from a bracket protruding to one side of the sledge frame that the ends of a spindle are suspended by rigid side-arms.
 - 1f What is suspended by rigid side-arms from a bracket protruding to one side of the sledge frame is the ends of a spindle.
 - 1g What the ends of a spindle are suspended from by rigid side-arms is a bracket protruding to one side of the sledge frame.

- 2 1b is the active cognate of the passive corpus example. 1c, 1d and 1e are cleft sentences encoding the same proposition. 1f and 1g encode the proposition using pseudo-cleft sentences. Moreover, these do not exhaust all the possibilities. Obviously, these are not all equally likely to be selected, but they are possible selections (Banks 1994). In this paper I shall consider the occurrence of these phenomena in scientific writing, and possible reasons for their selection. In addition to cleft and pseudo-cleft constructions, I shall consider inversion, extraposition, and existential sentences.

Cleft Sentences

- 3 In a cleft structure, the theme and given position (Halliday, 1985 ; Downing & Locke, 1992) is filled by an expletive *it*, that is one which is semantically empty. This allows the cleft item to be understood as new information ; the information following the cleft item may be new or given depending on the context.
- 4 In my corpus of scientific journal articles, with a total of 2452 clauses (Banks, 1993) there are only three examples of cleft constructions, so in a sense they can be said to be not particularly significant. The three which occur are 2a, 3a and 4a ; 2b, 3b and 4b give the non-cleft equivalents for comparison :
- 2a ... it is their relative downstream change that are [sic] pertinent.
 2b Their relative downstream change is pertinent.
 3a ... and in this paper it is the area of agreement that is emphasised.
 3b In this paper the area of agreement is emphasised.
 4a The slope undercurrent occurs in an area of unusually low static stability for the upper 300m layer and it is this which appears to allow the development of turbulence.
 4b ... and this appears to allow the development of turbulence.
- 5 In 2a and 3a, I would take it that *that is pertinent* and *that is emphasised* are probably to be included in the new. 4a is a different and rather interesting case : *development of turbulence* is given in the previous co-text ; *this* occupies the new position but is anaphoric. In a sense, this might be considered as contradictory : how can something which is anaphoric be new ? What I would suggest is happening here is that although technically given, because it is anaphoric, the writer is inviting the reader to look at this item again, as if it were new. The effect of this is to give extra emphasis ; it seems to me natural to read the phrase with a strong tonic on *this*.

Pseudo-cleft Sentences

- 6 Pseudo-cleft constructions seem to be even rarer than cleft constructions since there are none at all in my corpus. Pseudo-cleft constructions cleave an item using a WH-word. Unlike cleft constructions, pseudo-cleft constructions do not alter the ordering of the information structure, all they do is make it more precise. In an unmarked non-cleft sentence the boundary between given and new information may occur at several places. A reader will usually do this on the basis of contextual information. The pseudo-cleft structure fixes the position of this boundary. It is perhaps the fact that this construction does not alter the information structure which leads the scientific writer to use it so rarely. It might be that the gain in precision does not warrant the extra processing that would be involved.

Inversion

- 7 The phenomenon of inversion occurs when the verb or auxiliary inverts with the subject. This is also rare in the corpus, which provides only one example, which is given as 5a; 5b is the uninverted variant:
- 5a Also are 10 m averages of the Brunt-Vaisala values...
- 5b 10m averages of the Brunt-Vaisala values are also shown.
- 8 This allows inversion of both theme and rheme and of given and new. In 5a, *shown*, which would normally have been within the rheme and given, is treated as theme and new.

Extraposition

- 9 In extraposition, the clause begins with an *it* which is cataphoric, referring to a clausal item which follows outside of the clause structure proper. This clausal item is the conceptual subject, and may be finite (*that*-clause, *WH*-/*if*-clause, clause with zero-conjunction) or non-finite (*-ing*, infinitive). Extraposition of a clausal complement may also occur, in which case the cataphoric *it* is not in initial position, but no examples of this occur in my corpus.
- 10 There are 52 examples of extraposed subjects in my corpus. Of these, 33 are the *that*-clause type:
- 6a When the values of chi squared for each cell of the table are compared... it is evident that the greatest variation occurs amongst oocytes...
- 6b ... that the greatest variation occurs amongst oocytes is evident.
- Infinitive clauses account for 15:
- 7a It is therefore of some interest to investigate the dynamic stability of the steps.
- 7b To investigate the dynamic stability of the steps is therefore of some interest...
- 11 A further 3 are of the zero-conjunction type. It would seem that these are in fact a variant of the *that*-clause type, since the reconstitution of the non-extraposed sentence requires the insertion of *that*:
- 8a It is evident there was little variation in the depth of structures.
- 8b (That) there was little variation in the depth of the structures is evident.
- 12 There was a single example of a *WH*-clause:
- 9a It is not clear whether these features occurred as a surface manifestation of internal waves or by variations in the warming of the upper few meters.
- 9b Whether these features occurred as a surface manifestation of internal waves or by variations in the warming of the upper few meters is not clear.
- The corpus has no examples of *-ing* clauses as extraposed subjects.
- 13 In a recent article, Collins (1994) notes that in his corpus of general English with equal proportions of written and spoken English, the extraposed clauses divide almost equally into finite (51%) and non-finite (49%) clauses. It will be noticed that in my corpus, 37 (71%) of the examples are finite, while only 15 (29%) are non-finite. This would seem to indicate that where extraposition occurs in scientific articles, there is a bias towards the finite type.

- 14 In these sentences, the theme position is occupied by the cataphoric pro-form *it*. Being cataphoric, it is initially semantically empty; its content is postponed, and is contained in the extraposed item. However, as some commentators have pointed out (Quirk *et al.* 1985), the extraposed version is often felt to be more natural than the canonical (i.e., non-extraposed) form in these cases. The “end-weight principle” is sometimes invoked to explain this, although what precisely constitutes weight is difficult to establish. My suggestion is that the complexity of a clausal subject makes it less likely that it will be totally given; the more complex it is, the greater the likelihood that it will contain some element that is new. Hence it is more natural for it to take up the new position at the end of its clause.
- 15 A certain number of collocations seem to be of interest. Extraposition occurs frequently with verbs of mental or verbal process in the matrix clause. There are 18 examples of this in the corpus. The commonest verbs which occur are *suggest*, *show*, *note* and *estimate*:
- 10a It has been suggested ... that a sufficiently high level of velocity shear may disrupt or prevent the formation of step structures.
- 11a Since it was shown in a previous section that the salinity minimum was situated close to the depth of the core of the slope undercurrent...
- 12a It will be noted that the best fit was obtained for a heteroscedastic mixture...
- 13a ... it is estimated that most of the surface water warming through this glacial/interglacial transition occurred within a period of approximately 2,500 to 3,000 years.
- 16 It will be noted that in all these examples the verb is in the passive voice. This follows automatically from that fact that the canonical form has a clausal subject. Consequently the senser or sayer cannot fill this slot and the verb must be passive.
- 17 Extraposition also seems to be associated with periphrastic modals. The corpus provides 17 examples of this type. Of these, *is/seem/become possible* account for 8. *Evident* (see example 6a) and *necessary* also account for more than one example:
- 14a While it is possible to determine detection limits in terms of signal to noise ratio and minimum absorbance measurements...
- 15a ... and it was necessary to rely on the almost simultaneous STD data for hydrographic information.
- 18 All of the examples not already accounted for, with one exception, could be said, at least intuitively, to be concerned with thinking about or evaluating the experiment. The sorts of phrases which occur in more than one example are *is clear*, *of interest*, *follow*, *appear*:
- 16a ... it is clear that there existed a strong relation between shear and other variables on longer depth scales.
- 17a It is of interest to find thermohaline steps at such shallow levels.
- 18a ... it follows that there is an overall forcing into the channel...
- 19a It would appear that under such conditions the exchange process tends to be limited to the upper few meters of the ocean...
- 19 It will be noted that most, if not all of these examples (10a-19a) can be conceived of in terms of hedging. Collins (1994) expresses this as presenting something which is essentially a matter of opinion in an objectified manner. There are even a number of examples of what I have elsewhere (Banks 1994) called “fertilized hedges”. A fertilized hedge is one which combines more than one hedging technique. For example *it is possible* and *it seems* both constitute hedges; *it seems possible* is a fertilized hedge. Even

without considering the possibility of a further hedge in the extraposed subject, the corpus has 7 examples of fertilized hedges:

20a ... it seems unlikely that smaller animals would have been undetected if they had been present on the surface of the sediment.

Existential clauses

- 20 The last phenomenon I will consider is that of existential clauses. An existential clause begins with a *there* which is semantically empty and is followed by the verb *be*. Since the theme and given position is occupied by a semantically empty item, this allows the whole of the propositional content to be treated as new:

21a There is no evidence of an amphidrome within the area although one may exist further south.

22a There was not always good agreement between the peaks in the observed and calculated flow...

- 21 Unlike the other phenomena that have been considered, existential clauses do not have an obvious canonical form to which they can be related. However, any other formulation in a non-existential form would involve treating some element as theme and given:

21b No evidence exists of an amphidrome within the area although one may exist further south.

22b The peaks in the observed and calculated flow did not always agree well...

Significance

- 22 Of the phenomena that have been considered here, cleft and pseudo-cleft constructions, and inversion seem to be relatively unimportant, or their significance lies in their comparative absence. On the other hand extraposition and existential clauses account for roughly 2% each of the clause in the corpus (extraposition: 2,12%, existential: 1,96%). This means that on average for every 50 clauses there will be one example of extraposition, and one existential clause. Nevertheless, this must be understood in a situation where there is considerable variation from author to author. There are 11 articles in my corpus, and the incidence of extraposition varies in individual articles from 12.5% to 0.3%. The incidence of existential clauses varies from 3.9% to 0, one article having none at all. Despite this variation it still seems reasonable to say that an article of more than 50 clauses which does not contain examples of these two phenomena is in danger of becoming atypical. Moreover an article of less than 50 clauses would be particularly short; the shortest in my corpus has 64 clauses, and it is considerably shorter than most of the others. At all events it seems reasonable to say that systematic non-use of these forms would be atypical, which implies that they are constructions which need to be mastered by those who draft scientific journal articles. While they obviously do not have the same priority as forms used extensively in scientific writing, such as the passive, they do have pedagogical significance. (See Appendix)

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APPENDIXES

Appendix

In the discussion which followed the oral presentation of this paper, a question concerning the rhetorical distribution of these factors was asked. I did not have the figures available at that time, so here they are for information:

	extraposition	existential
Introduction	3	6
Description/Method	11	2
Results/Discussion	37	37
Conclusions	1	3
Acknowledgements	-	-
Total	52	48

However, consideration of these raw figures needs to be tempered by two facts: 1) the results/discussion section is usually by far the longest, 2) a number of these articles have no separately distinguishable conclusions section. If these figures are expressed as percentages of the total number of clauses in each section, the results are as follows:

	extraposition	existential
Introduction	1.3	2.5
Description/Method	2.8	0.5
Results/Discussion	2.3	2.3
Conclusions	0.7	2.0

ABSTRACTS

Information structure can be invoked to explain the choice of voice in the scientific research article. However, manipulation of information structure can give rise to clause forms other than simple active/passive structures. The main candidates are cleft and pseudo-cleft sentences, inversion, extraposition and existential sentences. Study of a corpus shows that while the first three seem insignificant in the research article, cases of extraposition and existential sentences account for a significant minority of examples. This fact must be taken into account by non-anglophone scientists required to write in English.

On peut utiliser le concept de la structure informationnelle afin d'expliquer les choix de voix dans l'article de recherche scientifique. Cependant, le maniement de la structure informationnelle peut donner des formes phrastiques autres que les simples structures active ou passive. Les candidats principaux sont les propositions clivées et pseudo-clivées, l'inversion, l'extraposition, et les phrases existentielles. L'étude d'un corpus révèle que les trois premiers semblent de moindre importance dans l'article de recherche, tandis que les exemples d'extraposition et de phrases existentielles constituent une minorité significative. Cette donnée doit être prise en compte par les scientifiques non anglophones appelés à rédiger en anglais.

INDEX

Mots-clés: discours scientifique, extraposition, inversion, proposition clivée, proposition existentielle, pseudo-clivée, structure informationnelle

Keywords: cleft sentence, existential sentence, extraposition, information structure, inversion, pseudo-cleft, scientific discourse

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