Mapping Attribution across Texts: the Particle 'according to' in Science Popularizations and editorials from *The Guardian*

El análisis de la atribución en diversos textos: la partícula «according to» en textos de divulgación científica y en editoriales de The Guardian

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Abstract: The confluence of new technologies and the necessity to reach mass audiences have driven the genre of science popularization to unprecedented levels of dissemination. The popularization of science is normally carried out by journalists who write in scientific sections of newspapers and other written media and act as mediators between scientists and lay people (Gil Salom 2000-2001, 443). They achieve this aim by elaborating discourse through a series of linguistic and discursive choices that transform raw scientific facts into easily comprehensible texts (McCabe and Heilman 2007, 139). In the contrastive study we present here, we aim to contribute to a better characterization of one of these discursive choices, namely explicit attribution, and, at the same time, to identify the elements which most frequently accompany the discourse

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69

marker 'according to'. For these purposes, we have analyzed a corpus of science popularizations and a corpus of editorials from the newspaper *The Guardian*, comparing the frequency of appearance of this attributive particle both in the first paragraphs, and throughout the rest of the text.

Key words: explicit attribution; science popularization; corpus analysis; *The Guardian*.

RESUMEN. Ha sido realmente la unión de las nuevas tecnologías y la necesidad creciente por popularizar la ciencia lo que ha hecho que la divulgación científica alcance un nivel de difusión hasta ahora insospechado. La divulgación científica normalmente se lleva a cabo por una serie de periodistas que publican en secciones científicas de los periódicos y actúan como intermediarios entre los científicos y la sociedad (Gil Salom 2000-2001, 443), elaborando su discurso mediante una serie de elecciones lingüísticas y discursivas que transforman en texto los eventos reales (McCabe y Heilman 2007, 139). En el análisis contrastivo que aquí se presenta, tratamos de contribuir a una mejor caracterización de una de esas elecciones discursivas; la atribución explícita, al mismo tiempo que intentamos identificar cuáles son los elementos que más frecuentemente acompañan al marcador discursivo '*according to*'. Para ello, hemos analizado un corpus de artículos de divulgación científica y un corpus de editoriales del periódico británico *The Guardian*, comparando las diferencias en frecuencia de aparición de la citada partícula tanto en primeros párrafos como en el resto del texto.

Palabras clave: atribución explícita; divulgación científica; análisis de corpus; *The Guardian*.

1. INTRODUCTION

Press discourse is a fruitful and reliable source of information about language (Biber 1988; Bell 1991; Fowler 1991; Mahlberg and O'Donnell 2008; among others). However, what has enabled the study of large collections of newspaper texts is the development and application of new technologies within corpus linguistics as well as a consequent increased awareness of the widespread availability of press discourse. Corpus linguistics, which has been described as «[…] a way of investigating language by observing large amounts of naturally-occurring, electronically-stored discourse, using software which selects, sorts, matches, counts, and calculates» (Hunston and Francis 2000, 14-15), has led to a qualitative change in the understanding of language (Tognini-Bonelli 2001, 1). The scientific analysis of spoken and written discourse has enabled analysts to conduct studies on large amounts of data of different language varieties and has provided them with a much more objective perspective of language. The methodology of corpus linguistics makes it possible to surpass formerly subjective assertions based mostly on small-scale samples of text and invented examples (McEnery and Wilson 2001, 103) and replace them instead with computer-based analyses which enable new outlooks with which to analyze real data extracted from

large collections of texts that «look rather different when you look at a lot of [them] at once». Since the beginning of computerized corpus studies, a discipline that has helped raise interest in how language is used in different ways in different types of texts across different popular genres, has become the focus of many recent studies. One of the text types in which discourse analysts and corpus linguists have focused their attention is the popular genre of newspaper discourse.

The discourse of news media is now widely studied using computerized research tools and is considered a productive source of information about language both for discourse analysts and corpus linguists, yet not many studies have focused their attention on the exact ways in which scientific knowledge in these texts is presented and how this knowledge may be presented differently in specialized texts versus texts for popular audiences. There do exist contrastive analyses between scientific texts and science popularizations in an attempt to clearly differentiate both text types; for instance, Myers studied narrative techniques used in specialized and popular scientific texts (1990). A number of other studies have concentrated on the analysis of a single feature of one text type or the other; for instance, William analyzed metaphorical expressions for cancer (2009).

Authors such as Calsamiglia and López Ferrero (2003) and Myers (2003) have centered their attention on what they call 'science for the general public' or 'popular science,' thus making the object of analysis the semi- or non-specialized texts which are normally written by specialized journalists for scientific sections of newspapers and who act as mediators between scientists and non-experts (Gil Salom 2000-2001, 443). In this text type, scientists have a mediated relationship with the audience, who reads about the latest scientific and technical advances and discoveries not through the words of expert scientists but through those of the specialized journalists reporting them. This type of text has emerged from a significant increase in the number of new technological breakthroughs and the necessity to popularize the science behind them in mainstream periodicals. As Hyland states, readers of magazines and newspapers are now used to science sections heretofore absent in publications for general readerships:

> While many popular science books are written by scientists for an elite educated audience, the public gets most of its information about science from specialized magazines like *New Scientist* and *Scientific American*. Most daily newspapers now have specialized science sections and the number of science articles in the press has been increasing. (Hyland 2010, 3)

In these specialized sections, journalists try to fill the traditional gap between the scientific community and non-specialist audiences by writing articles about science that all readers can understand (Calsamiglia and López Ferrero 2003, 174).

Science popularizations soon became a main object of study for linguists, and as García Riaza and Elorza (2010) state, they «started to draw the attention of linguists

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71

because of their relationship to scientific discourse and their potential to compare different recontextualizations of scientific knowledge». Science popularizations, also called popular science, scientific popularizations or popular science writings are defined as science writing for the general public and inform this non-specialized audience about advances in scientific conceptualizations and theories but also about discoveries and inventions (Kim and Thompson 2010, 54). As McCabe and Heilman state, events that take place in the world are expressed through a series of linguistic choices that journalists make to reshape real events into text and discourse (2007, 139).

In this respect, and as Calsamiglia and López Ferrero state, «[…] bridging the two worlds, the world of the specialist and the world of lay people remains a problem, not only from the cognitive perspective but also from the perspective of the representation of science and scientists outside their own domain» (2003, 148). Outside of an expert-to-expert communicative domain the discourse of science has to be adapted to non-specialized audiences. The specific register used by scientists when writing scientific articles or journals must be re-adapted to suit the conventions that the general reader expects and can comprehend.

From this perspective, the journalist writing science popularization articles is an intercultural mediator who serves not only as a conveyor of content, namely specialized knowledge transmitted from scientists to lay people, but also as a rewriter of the linguistic forms chosen by scientists, namely by adapting scientists' words into a specific, popular register with its own norms and conventions. The intercultural mediation which specialized scientific journalists bring to their task of expert-to-nonexpert communication is the main focus of this contrastive study.

2. REPORTING SCIENTISTS' VOICES IN POPULAR SCIENCE JOURNALISM

One of the linguistic choices that journalists have to make when writing a science popularization article is that of reporting scientists' voices. Science popularization articles are characterized by a multiplicity of voices that are normally conveyed through reported speech in its direct and indirect forms, and which fulfil the function of giving authority to the words reported. In other words, these forms of attribution legitimize the journalist's right to write about facts that have been revealed to him or her directly from the scientists. As Calsamiglia and López Ferrero state, «this is one of the procedures by which to obtain credibility for the facts under comment as well as one of the means of certifying knowledge of what is being said» (2003, 153).

The observation of the language forms used for reporting in science popularization articles shows that there is a multiplicity of ways to convey scientists' discourse and integrate it into the unfolding of the message. This variety of formulas was classified

into a taxonomy of styles by Calsamiglia and López Ferrero (2003, 155). The following table is reproduced verbatim:

Citation formulae	Characteristics
Direct citation	There is a fracture between the syntax of D12 and D2 because it entails the maintenance of two different deictic centers (affecting tense, space and time adverbs and person-reference words), as a result of the two different enunciations being put in relation one to another; the two segments are connected through juxtaposition and they are signaled by graphic markers such as (:)
Indirect citation	There is only one discourse, D1, with a single deictic centre, a subordinate clause introduced by a conjunction, and the correspondent agreement of tenses.
Inserted citation	Words of W2 are brought into the main discourse by means of markers such as '*según* X' or '*para* X', 'in the words of X', 'according to X' which have the function of assigning explicit words to a particular agent (literal or non-literal, depending on the use of graphic signs of quotation) without any communicative verb.

Table 1. Citation formulae and their characteristics presented in Calsamiglia and López Ferrero (2003, 155)

As Caldas-Coulthard (1994, 295) asserts, the reporting of what other people say is a major feature of different text types, including news in press and narratives. What is said in the texts by a teller who is in charge of selecting both content and the organization of that content can be attributed to the information sources in either a direct, explicit way, or in an indirect, implicit way. The focus of this study is *explicit attribution*, a term that corresponds to what Calsamiglia and López Ferrero call 'inserted citation' (see above), and which can be defined as the presentation of discourse deriving from someone different from the journalist (Hunston 1999, 178), or as an explicit mark that identifies the source of information (Conrad and Biber 1999, 67). In this study, we will focus our attention on the discourse marker 'according to' when used in an 'inserted citation' context, conveying the attribution of part of the article's discourse to a person different from the journalist, mainly the authors of the newsworthy scientific discovery reported in the text. We have also identified the collocates of this discourse marker in the corpus of popularized texts that we have studied.

By studying the usage of the attributive 'according to' and the other language usage immediately adjacent to them, we have observed behavioral regularities that help us understand exactly *how* specialized journalists, when shaping and tailoring their texts for new audiences, conduct the important function of intercultural mediation. In order to gain an even clearer picture of how this communicative model looks in comparison to

purely non-expert written communication, we have compared and contrasted the use of attribution and its collocates in the popular science corpus with a corpus of editorials, i.e. a general, non-specialized text type which is comprised of argumentative texts. In these texts, the authors are also expected to attribute many facts and arguments to external entities or people and to reputed voices that reinforce the position taken. We will describe our methodology in the following section.

3. OBJECTIVES AND HYPOTHESES

This discourse analysis and corpus linguistic study has the main aim of contributing to a better understanding of explicit attribution, or what Calsamiglia and López Ferrero have called 'inserted citation' (2003, 155), in the context of British press discourse.

Likewise, we want to obtain reliable data on the discourse marker 'according to', a particle mostly used to express inserted citations in science popularization articles from the newspaper *The Guardian*. To achieve this purpose, we have created a main corpus, which includes the whole texts for a four-year period, then we have divided this corpus into two different subcorpora containing the first paragraphs in one and the rest of the text in the other. Ho-Dac claims that first paragraphs are important initial sections of texts where relevant information for discursive organization tends to be placed (2008). We have also created a corpus of editorials from the same newspaper and from a three-year time span for the purpose of comparing popularizing texts with texts written for a general audience. This corpus was also subdivided so as to be able to analyze the first paragraphs independently from the remainder of each text.

Our main goal is to test if explicit attribution, conveyed through inserted citations in the texts, is present in the corpus of science popularizations in a higher degree than in the corpus of editorials from the same newspaper. If our analysis confirms this, it will mean that the particle is not genre-dependent but text-type dependent and strongly associated with popularization in the contemporary press. Listed below are the three central hypotheses formulated:

- A greater number of occurrences of the discourse marker 'according to' will concentrate in the first paragraphs of science popularization articles, according to Ho-Dac's (2008) theory of initial sections being a highly informative part of texts.
- The discourse marker 'according to' can be firmly associated with science popularization text type in the contemporary British press.
- A personal reference will typically follow 'according to' in right one position, referring to the author or authors of the discovery popularized, and to whom the facts narrated are attributed.

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74

We will also identify the elements that most frequently accompany the discourse marker 'according to' and that collocate with it in the corpora studied. A number of authors have shown that certain forms in the right one position of the node particle 'according to' are dependent on the section of the text where they are located (Sinclair 1991; Stubbs 1996; Hoey 2005; Mahlberg and O'Donnell 2008). These authors based their methodology on the classification of transitivity as itemized in three different notions (process, circumstance and participant) established by Halliday (1985, 101) and Halliday and Mathiessen (2004). Based on the assumption that this pattern may also be observed in our corpora, we have paid special attention to right one position of the concordance lines obtained in the analysis.

4. CORPUS COMPILATION AND DESCRIPTION

The different corpora used in this study were compiled in different ways, according to the different nature of the media in which each article appeared. On the one hand, the science popularizations corpus was manually retrieved and compiled from the webpage of *The Guardian* newspaper in its electronic printable version. The corpus is comprised of all science popularization articles released between 2003 and 2007. The corpus underwent a double process of cleaning and filtering in which some articles were deleted from the corpus for various reasons; some were repeated, some were blog entries on science rather than newspaper articles, and some that had been found in the science section were general texts.

On the other hand, the editorials corpus was retrieved from the complete annual editions of *The Guardian* available on CD. Using the search engine that the CD runs automatically, and therefore relying on the efficiency of this interface, we extracted all editorials published between 2006 and 2008.

The first of the corpora studied, referred to below as the *Sci_TG corpus*, contains a total of 1,534 science popularization articles with a total of 711,988 words. As can be seen in the table below, this corpus does not present a very homogeneous distribution of articles over time. This occurred especially in 2006, when it can be assumed that much more scientific news was generated or that a change in editorial policy triggered greater coverage of science that year.

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75

Sci_TG Corpus			TOTAL
Number of texts	2003	252	1,534
	2004	309	
	2005	239	
	2006	455	
	2007	279	
Number of running words	2003	138,174	711,988
	2004	160,793	
	2005	87,759	
	2006	208,193	
	2007	117,079	

Table 2. Number of texts and running words in Sci_TG Corpus

As mentioned above, the first paragraphs of the *Sci_TG Corpus* were collected in a separate corpus. The *Sci_TG_P1 Subcorpus* is made up of only the first paragraphs of the articles compiled. This represents 7.737% of the whole corpus of science popularizations and contains 55,089 words.

Sci_TG_P1 Subcorpus	
Number of texts	1,534
Number of running words	55,089

Table 3. Number of texts and running words in Sci_TG_P1 Subcorpus

The corpus of editorials, referred to below as the *Editorials_TG Corpus*, contains all editorials published by *The Guardian* between 2006 and 2008. This corpus contains a total of 1,065,533 words in 1,876 texts. Items from this subcorpus are often abbreviated below as P1.

Editorials_TG Corpus			TOTAL
Number of texts	2006	616	1,876
	2007	632	
	2008	628	
Number of running words	2006	346,304	1,065,533
	2007	358,280	
	2008	360,949	

Table 4. Number of texts and running words in Editorials_TG Corpus

As we did with *Sci_TG Corpus*, we have also compiled a corpus of first paragraphs of the editorials corpus. The *Editorials_TG P1 Subcorpus* has a total of 216,174 words, which represents 20.29% of the total word count in *Editorials_TG Corpus*. As with the *Sci_TG Subcorpus*, items from this subcorpus are often abbreviated as P1.

Editorials_TG_P1 Subcorpus	
Number of texts	1,876
Number of running words	216,174

Table 5. Number of texts and running words in Editorials_TG Subcorpus

4. ANALYSIS AND RESULTS

The analysis of the two main corpora has been carried out as a comparative study that contrasts data obtained from the individual analysis of each of the corpus. In this sense, we can state that the *Editorials_TG Corpus* has been taken as a reference corpus against which we can compare and contrast results from the analysis of the *Sci_TG Corpus* and highlight specific features of science popularization articles encountered in the analysis.

The analysis was carried out in three consecutive phases, each of them basing its procedures on outcomes obtained from the previous one. The first phase analyzed the characteristics of the corpora, namely the number of running words and texts in each of them, as well as obtaining frequencies of the discourse marker 'according to' in both corpora. This first phase has enabled us to obtain a general idea of how frequent this particle is in both the whole of science popularization articles and editorials and also in the first paragraphs of the texts. The second phase of this study entailed the use

77

of *WordSmith Tools* 4.0 (Scott 2004-2005), a tool which allowed us to obtain reliable data on the behavior of the node particle 'according to' by extracting concordance lines with a span of fifteen words on the right of the node word. In the third phase of the analysis we carried out a detailed manual analysis of concordance lines obtained and we observed repeated patterns and frequent collocations of the discourse marker 'according to' (Scott and Tribble 2006, 31).

Figure 1. Concordance lines on the node 'according to' from the Editorials_TG Corpus

Despite the fact that both corpora have a similar number of texts in them, we found that they have a surprisingly different number of running words. With respect to the whole text, we found that on average the editorials contain roughly a hundred words more than the science popularization articles. This pattern also remains true in the analysis of the first paragraph subcorpora, where we find approximately eighty words less in science popularization articles than in editorials. From this early data, we can conclude that science popularization articles are a shorter text-type than editorials.

Corpus	Number of texts	Number of words	Number of words per article/P1
Sci_TG Corpus	1,534	711,988	464.14
Sci_TG_P1 Subcorpus	1,534	55,089	35.9
Editorials_TG Corpus	1,876	1,065,533	568
Editorials_TG_P1 Subcorpus	1,876	216,174	115.23

Table 6. Size of corpus in the research in terms of number of texts, running words and words per article

The discourse marker 'according to' appears a total of 562 times in the *Sci_TG Corpus* versus a total of 116 times in the *Editorials_TG Corpus*. Contrary to expectation, we found many fewer occurrences of this particle in the editorials corpus, which is almost double the size of the science popularization corpus. To mitigate differences derived from the difference in size of both corpora, and better observe the differences, we have calculated occurrences of the discourse marker per 1,000,000 words, noting that 'according to' is seven times more frequent in science popularization articles than in editorials.

	Editorials_TG Corpus	*Sci_TG Corpus*
Number of words	1,065,833	711,988
Particle *according to*…	116	562
Occurrences per 1,000,000 words	108.83	789.34

Table 7. Occurrences of 'according to' in both corpora per 1,000,000 words

Insofar as the place in the texts where these occurrences were located, we found that 194 of the 562 occurrences in the corpus of science popularization articles are present in the first paragraphs. In other words, 34.519% of the total occurrences were observed in P1. Similar results can be found in the *Editorials_TG Corpus*, where we found a total of 116 occurrences were located in the first paragraph. This proportion of 17.241% is moderately lower than the percentage of occurrences in the *Sci_TG Corpus*.

Interestingly, we can conclude that one out of every five occurrences of 'according to' in science popularization articles will presumably be located in the first paragraph. We have detected that the tendency to explicitly reveal an attribution source in the first paragraph of the text is stronger in science popularization articles than in editorials.

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79

	Science Popularization Corpus		Editorials Corpus	
	According to…	*, according to…*	*According to…*	*, according to…*
P1	4	190	6	14
REST OF THE TEXT	149	219	31	65
WHOLE TEXT	153	409	37	79
TOTAL	562		116	

Table 8. Compared occurrences of the discourse marker 'according to' in first paragraphs and the rest of the text in the corpus studied

Taking into account the place of the text where this particle can be located, in the *Sci_TG Corpus*, we observed 149 occurrences in paragraph or sentence initial position and 219 where the discourse marker 'according to' was located in medial or final position of the paragraph or sentence. We found 31 occurrences of 'according to' in paragraph or sentence initial position (also called thematic position) while it is located in medial and final paragraph position (also called rhematic position) a total of 65 times in the *Editorials_TG Corpus*. Real examples from the different locations of the discourse marker in different paragraphs (P1 vs. the rest of paragraphs of the text) of the scientific popularization corpus can be found below:

In P1

- According to *research published today outbreaks in England and Wales have grown since 1998 as more parents have refused the triple-jab MMR vaccine for their babies. (TG0368, P1)*
- *Mysterious tremors deep in the Earth's crust could provide a way to predict future catastrophic earthquakes,* according to *scientists. (TG07214, P1)*
- *Surgical instruments should be tracked to reveal how often they are used in different operations,* according to *scientists who say the information is crucial to predict the risk of future outbreaks of variant Creutzfeldt-Jakob disease, the human form of BSE. (TG06178, P1)*

In the rest of paragraphs of the text

- According to *a report by the Arthritis Research Campaign, which helped fund the latest study, arthritis and its related conditions cost the NHS about pounds 5.5 bn in 1999-2000. (TG 0736, P4)*
- *In one study, patients treated with the water plus an antibiotic healed, on average, in 43 days,* according to *New Scientist magazine. (TG07157, P2)*

- *But this is at least several decades away and,* according to *Jonathon Weber, an HIV specialist at Imperial College London, there is not even a leading candidate. (TG0429, P12)*

Moving on now to the analysis conducted on the different positions of the discourse marker 'according to' in the first paragraphs of the two corpora studied, we found only 4 occurrences of it in thematic position of the *Sci_TG Corpus* versus 28 occurrences in medial position and 162 in rhematic position. With respect to the second corpus studied, we did not find such a clear tendency of the discourse marker towards the rhematic position. Six are the occurrences of 'according to' that were found in thematic position, 9 in medial position and 5 in rhematic position. What we found was a more balanced placement, with a slightly stronger predominance in rhematic and thematic positions.

From the data obtained in this phase of the analysis, we can conclude that the discourse marker 'according to' can be said to have a tendency to occupy the rhematic position of first paragraphs in science popularization articles from the British newspaper *The Guardian*. Because this tendency cannot be as clearly observed in the corpus of editorials, this data set shows that the behavior of the discourse marker is different depending on the text-type where it is located.

	Position of the particle *according to*	Frequency in *Editorials_TG_P1 Subcorpus*
According to…	Thematic	6 (30%)
…, according to…	Rhematic	5 (25%)
	Medial position	9 (45%)

Table 9. Different positions where the discourse marker 'according to' has been found in the Sci_TG_P1 Subcorpus

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© Ediciones Universidad de Salamanca

81

	Position of the particle *according to*	Frequency in *Sci_TG_P1 Subcorpus*
According to…	Thematic	4 (2.061%)
…, according to…	Rhematic	162 (83.505%)
	Medial position	28 (14.432%)

Table 10. Different positions where the discourse marker 'according to' has been found in Editorials_TG_P1 Subcorpus

Turning our attention now to the elements that most frequently accompany 'according to' in right one position, we found that 58 out of 194 occurrences encountered in the science popularization corpus involve a personal reference, mainly to 'scientists' or 'researchers', whereas 136 of those occurrences refer to material entities such as journals where researchers publish their results or projects in which scientists to whom the scientific discovery is attributed are immersed in. In the editorials corpus there are 8 occurrences which refer to people or groups of people and 12 occurrences which refer to a material entity in right one position (figure, poll, media…). This classification of references in right one position of the discourse marker 'according to' were conducted following Halliday's definition of participant (1985, 101). Participant, together with processes and circumstances, constitute Halliday's notion of transitivity. We have divided the category of participant into people and material entities, though for sake of clarity we will use the term *attributees* rather than participant.

Attributees	Frequency in *Editorials_TG_P1 Subcorpus*	Frequency in *Sci_TG_P1 Subcorpus*
People	8 (40%)	58 (29.9%)
Entities	12 (60%)	136 (70.1%)
TOTAL	20 (100% in P1)	194 (100% in P1)

Table 11. Attributees in P1 of science popularizations and editorials corpus from The Guardian

Real examples of the different references to attributees of the discourse marker 'according to', in the first paragraph of each of the corpus studied can be found below:

according to ...

- *... Ole Peterson, a psychologist at the University of Liverpool. (TG0594)*
- *... Prof Dwight Barkley, by a piece of simple mathematics which in itself should keep a bored child quiet for a decent spell. (TG06198)*
- *... Salvatore Crisafully, 38- year-old Italian man who has recently awoken after a two-year coma following a road accident in 2003. (TG05136)*
- *... the father of genetics, James Watson. (TG07142)*
- *... the UK government's chief scientist. (TG06324)*

according to ...

- *... a team of British scientists. (TG 07259)*
- *... a team of scientists. (TG 03175)*
- *... an influential group of MPs. (TG06303)*
- *... a committee set up in the aftermath of the drug trial at Northwick Park Hospital which left six men seriously ill. (TG06194)*

according to ...

- *...a leading science journal. (TG0749)*
- *...a computer model predicting the effects of global warming on tourism. (TG06168)*
- *...a comprehensive survey of school-age children published today. (TG06206)*
- *...an IVF league table published yesterday. (TG06246)*
- *...and editorial in yesterday's British Medical journal by fertility specialists including Susan Bewley, a consultant obstetrician at Guy's and St Thomas' hospital in London. (TG05186)*

In the case of right one position elements, both popular science texts and general editorials tend to refer to material entities more often than to personal entities (70.1% and 60% respectively).

5. CONCLUSIONS

The analysis presented in this article has greatly benefitted from a cross-disciplinary perspective, in which discourse analysis has provided tools for language analysis of authentic texts in use and corpus linguistics has provided the necessary computer tools to analyze a large volume of science popularization articles as sources of information about real language. The approach thus followed in this study attempts to bring to the fore the importance of text analysis for translators, who can follow a translation process in which every decision they make is informed by the observations made and the analyses conducted. As Pearson (1998, 44-45) stated, the only way of identifying

specific terminology is to analyze specialized or domain-specific corpora which contribute to the description of specialized language and the particular phenomena that take place in a particular text-type. As a corollary of this, the conclusions that are presented hereafter can be useful not only for translators, as they represent an example of how text patterns extracted by means of corpus linguistics can be helpful in serving as an intercultural analytical resource for determining how languages and cultures should communicate science to lay readers across languages.

The first conclusion drawn from this study is that science popularization articles are shorter both in their total length as well as in the extension of the first paragraph of the articles. Editorials have an average of 100 words more per text than science popularization articles, and roughly 80 if we restrict our scope to the first paragraphs only. From these data, we can state that the science popularization text-type is typically shorter than other text-types from the same publication. This first outcome regarding the characterization of science popularizations has opened a path towards the comparison with different text-types within the same newspaper (hard news, soft news…), as well as across different newspapers.

The discourse marker 'according to' was found to be a typical construction in English science popularization articles, characteristic of the plurality of voices and attribution of scientific facts present in the aforementioned text type. The frequency of occurrence of the particle 'according to' has revealed that it is much more characteristic of science popularization articles than newspaper editorials. We have found that there are 789.34 occurrences of the discourse marker in the corpus of science popularizations and only 116 occurrences in the corpus of editorials. With a frequency seven times greater in popularizing scientific texts, translators into English would be justified in consistently and frequently using 'according to'. It is likely that when translating the editorial text type, the use of a wider range of forms of attribution, such as 'as stated by', 'in the words of' and so on, may be recommended.

As Ho-Dac stated (2008), first sections concentrate relevant information in texts, because they serve as discourse organizing sections. This was our departure point to find that first paragraphs of science popularization articles concentrate a high number of occurrences of 'according to' in both corpora. First paragraphs of science popularization articles in particular are highly informative with respect to the rest of the text and, in consequence, contain on average one out of every five usages of 'according to' per text. Into-English translators would be advised to use 'according to' as an equivalent of the attribution forms in foreign language source texts in the leading paragraphs of the popular science articles they have been commissioned to work on.

Not only did we obtain reliable findings as to the frequency of 'according to' in paragraph 1 of science popularization texts, but we also found out about the sentence positions in which it tends to occur. In the *Sci_TG_P1 Subcorpus* it occurred in medial (mid-sentence) or rhematic (sentence-end) position much more frequently in popular science texts than in general texts. With nearly all occurrences in paragraph 1 in

Blanca García Riaza
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84

non-initial positions, this new insight seems to support translators into English in their use of '…, according to' rather than 'According to …'. Translators of general text types are not recommended to strictly mimic this pattern, as the occurrence of 'according to' in initial position occurs approximately one third of the time in initial position and the distribution of the other positions is similarly distributed between medial and rhematic.

Contrary to expectation, more occurrences of 'according to' in the *Sci_TG_Corpus* were found to collocate in right one position with a material rather than a personal reference. Attributees such as 'poll', 'figure', 'publication' or 'report' were more frequent than humans or groups of humans in scientific texts. This leads us to conclude that journalists writing science popularizations have demonstrated a tendency to relate scientific discoveries to the publications where they appeared or to data which made the invention reliable rather than to attribute scientific developments to specific researchers or to teams of scientists. In terms of specific language choices, into-English translators can consider themselves justified in using "shifts" in which the attributee is referred to as the source of data or the media of publication rather than to the individuals or groups of individuals, who may not be as widely known to their target readers.

The preliminary results we present here are a first step towards the characterization of news discourse started by Bell (1991) and focused on science popularization by authors such as Calsamiglia and López Ferrero (2003). But they can also serve to raise awareness of the necessity to carry out a deeper analysis in British press discourse that could solve some questions that remain unanswered. In the subsequent stages of this research, we will try to decipher other words that this particle usually collocates with, providing statistical data on the strength and frequency of each of them. We will also continue to make our research findings directly useful to specific areas of knowledge such as English for Specific Purposes (ESP), scholarly publication, journalism studies and, of course, Translation, Interpreting and Intercultural Communication.

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Blanca García Riaza
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85

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86