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Narrative voice in popular science in the British press: A corpus analysis on the construal of attributed meanings

Miriam Pérez Veneros

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Miriam Pérez Veneros

-Even the smallest person can change the course of the future-

J.R.R. Tolkien – The Fellowship of the Ring

To my sister

For her love and patience

-There is light and beauty up there
That no shadow can touch-
J.R.R. Tolkien – The Return of the King

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Abstract

This dissertation approaches the construal of attributed meanings in the dissemination of science in the British press by analysing the resources used by journalists to integrate in their narrations of scientific findings what other sources have said. Attribution in scientific, academic and media discourse has been previously described from an interpersonal viewpoint through the analysis of evaluation and appraisal. In addition, research has also addressed how experiential elements such as the source, the process (verbal and/or mental), and the structure (direct speech or indirect report) contribute independently to the construal of attribution. However, the approach followed in this dissertation attempts to provide a more comprehensive description of how attribution is construed experientially. The assumption made is that in polyphonic texts it is possible to analyse attribution comprehensively, by identifying to whom we can attribute each idea which is quoted, or reported, or narrated in the text. For this purpose, an analytical unit ('unit of voice') has been defined and studied, which distinguishes between external sources of attribution ('attribution') and the journalist's voice ('averral'). The aim in this dissertation is to explore how the experiential elements construing attribution co-occur in each unit of voice and contribute to the journalist's interaction with his/her readers as well as to his/her epistemological positioning with respect to the attributed information.

In order to obtain both quantitative and qualitative data, a corpus consisting of 180 popularizations has been compiled and 1,625 units of voice have been identified from the perspective of systemic functional linguistics. In addition, an annotation scheme for the comprehensive analysis of the three crucial components (processes, participants and

logico-dependent relations) of the units of voice has been proposed. Results point to the fact that the texts in the corpus show a high degree of polyphony, due to the fact that in the 1,625 units of voice, the cases of attributed information almost double the cases of information averred. When taking the analysed features of attribution in isolation, results suggest that attribution is construed in these texts mainly through a balance between reporting and quoting, through neutral projecting processes, and through Human participants. These results correspond to traditional expectations pointing to the objectivity of the journalists in science dissemination, and seem to suggest that the journalist represents his/her mediation role from an invisible or almost invisible position. However, the analysis has also revealed that, within the unit of voice, the often complex intertwining of attribution and averral shows sometimes an ambiguous blurring between the voice of the journalist and the voice of the external source of attribution, which seems to suggest that the journalist also positions him/herself as literally aligned with the external source, by making both voices literally undistinguishable. In addition, the processes used by the journalist for projecting what others have said are varied, also including stance processes which the journalist uses to construe his mediating role in a more visible way, not really showing his/her personal views or opinions on the narrated information, but rather contextualising and interpreting its significance for readers, which is consistent with the pedagogic function expected from these texts.

Results of the projection clusters considered show that journalist tend to construe the sources of attribution by labelling them either by their proper name or by their professional role when quoting them, whereas when reporting what they have said journalists show a much higher preference (up to one third of the total) to refer to material sources (e.g. the report, the study, etc.) instead. Preference is also shown to use projecting processes for quoting which are neutral together with participants construed

as Human Named, versus a higher tendency to rely on stance processes when the journalist is reporting, for which they rely more often on the construal of participants as Human Semi-named. The comparison of these shows a clear difference on how the journalist represents his/her mediating role in each case, by not showing any kind of mediating presence in the case of quotes, to presenting a sounder presence as mediator in the case of reports. Finally, the journalist's mediating role is also construed through embedding, particularly through the use of nouns of projection, which construe the journalist's mediation as packaged and, therefore, not open to question, and which can be linked to a more prominent role on the part of the journalist in the control of the information narrated. This experiential account of the construal of attribution in science popularizations shows, in sum, that the intertwining of attribution and averral in the text is used by the journalist to construe a representation of the scientific findings narrated which relies on a mediating role of the journalist in his/her aim to guide lay readers along the narration which is essentially much more dynamic than previous accounts have shown.

Resumen

Esta tesis doctoral versa sobre el estudio de la construcción de la atribución del significado en la diseminación de la ciencia en la prensa británica a través del análisis de los recursos utilizados por el periodista para integrar en su narración de los hechos científicos lo que otras fuentes externas han dicho. El fenómeno de la atribución en el discurso académico, científico y de los medios de comunicación se ha descrito previamente desde una perspectiva interpersonal mediante el análisis de la evaluación y de la teoría de la valoración ('appraisal'). Además, otras investigaciones previas se han centrado también en el estudio de cómo los elementos experienciales de la atribución, tales como la fuente de atribución, los procesos (verbales y/o mentales), y la estructura (estilo directo o indirecto) contribuyen de manera independiente a la construcción de la atribución. Sin embargo, el estudio llevado a cabo en esta tesis doctoral trata de proporcionar una descripción más exhaustiva y una visión global de cómo se construye la atribución desde una perspectiva experiencial. La hipótesis planteada es que en los textos polifónicos se puede estudiar la atribución de manera exhaustiva, identificando en todo momento en el texto la fuente de atribución de las citas literales, de los reportajes, o de la narración. Con este propósito, se ha definido y estudiado una nueva unidad de análisis ('la unidad de voz'), que permite distinguir entre fuentes externas de atribución ('attribution') y la voz del periodista ('averral'). El objetivo de esta tesis es explorar cómo los elementos experienciales que construyen la atribución coocurren en cada una de las unidades de voz identificadas y contribuyen tanto a la interacción del periodista con sus lectores como al posicionamiento epistemológico de dicho periodista con respecto de la información narrada.

Con el objetivo de obtener datos tantos cuantitativos como cualitativos, se ha compilado un corpus de 180 artículos de divulgación científica y se han identificado 1.625 unidades de voz desde una perspectiva sistémica funcional. Además, se ha propuesto un esquema de anotación para el análisis exhaustivo de los tres elementos cruciales (procesos, participantes y relaciones lógico-dependientes) de las unidades de voz identificadas. Los resultados indican que en los textos la polifonía se manifiesta en un alto grado, debido al hecho de que de los 1.625 casos de unidades de voz analizados, los casos en los que la información está atribuida a fuentes externas suponen más del doble de los casos en los que información está narrada por el propio periodista (‘averral’). Si se consideran los resultados del análisis de los elementos de la atribución de manera independiente, se puede observar como la atribución principalmente se construye mediante el equilibrio entre citas directas e indirectas, mediante procesos neutrales, y mediante participantes humanos. Estos resultados concuerdan con las expectativas típicamente asociadas a este tipo de texto y que están relacionadas con la objetividad esperada por parte del periodista, sugiriendo que dicho periodista actúa como mediador de la información desde una posición invisible o casi invisible. Sin embargo, los resultados también revelan que, dentro de las unidades de voz, el complejo entrecruzamiento e interacción de casos de atribución y de ‘averral’ conllevan la aparición de casos que son ambiguos y que sugieren que el periodista también se posiciona con respecto a la información dada aliándose con la fuente externa de atribución, haciendo que su voz y la de la fuente externa sean literalmente indistinguibles. Además, los procesos que utilizan los periodistas para proyectar las voces de los otros son variados, e incluyen procesos no neutrales que los periodistas emplean para construir su rol de mediador de una manera más visible, aunque no muestren de manera real su evaluación sobre la información, sino más bien

contextualizando y explicando esa información para sus lectores, lo cual es también consistente con la función pedagógica que caracteriza a los artículos de divulgación científica.

Los resultados relacionados con los 'grupos de proyección' encontrados muestran que los periodistas tienden a construir las fuentes externas de atribución refiriéndose a ellas por su nombre propio o por su profesión cuando les citan de manera literal, mientras que si los periodistas parafrasean sus palabras, entonces hacen un mayor uso (un tercio del total) de participantes que son materiales (el estudio, la investigación, etc.). También existe mayor preferencia por el uso de procesos neutrales cuando los periodistas citan de manera literal, y estos procesos aparecen junto con participantes humanos denominados 'Named'. Por el contrario, cuando los periodistas parafrasean la información, hacen un mayor uso de procesos no neutrales y de participantes humanos denominados 'Semi-named'. La comparación de estos dos casos muestra una clara diferencia en la manera en la que el periodista construye su papel como mediador de la información, ya que no muestra ningún signo de mediación cuando usa citas literales, mientras que su papel como mediador está mucho más marcado cuando parafrasea las palabras dichas por otros. Finalmente, el papel mediador del periodista también se construye a través del fenómeno de 'embedding', y en concreto a través del uso de nombres de proyección, que presentan la información que ha sido mediada por el periodista como empaquetada y, por lo tanto, no susceptible de ser cuestionada por los lectores. Esto está directamente ligado con un mayor control por parte del periodista cuando está narrando los hechos científicos. Toda la información obtenida de cómo funciona la construcción de significados de atribución desde una perspectiva experiencial muestra que el constante entrecruzamiento de la atribución y de 'averral' se utiliza por parte del periodista para construir una representación de los hechos científicos que radica en la construcción del

papel mediador del periodista con el objetivo de guiar a sus lectores no expertos a lo largo del texto, siendo esta constante interacción de significados narrados y atribuidos mucho más dinámica que lo que se había demostrado en estudios anteriores.

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-Fairy tales and more fairy tales.
Creative imagination is the essential element in the
intellectual equipment of the true scientist-
Albert Einstein

Chapter 1
Introduction

From the 1960s, there has been a growing interest in the study of language in context, by taking into account the context of situation which permeates and shapes certain linguistic configurations. This dissertation is concerned with the study of language in context, specifically with the discourse of science popularization in the British press. Specific attention is given to how journalists construe projected meanings and the main resources used to integrate language reports in this text type as attributed to external sources or, conversely, presented as narrated by the journalist him/herself. To this end, the theoretical framework provided by systemic-functional linguistics (SFL henceforth) on the one hand, and the tools provided by corpus linguistics on the other, are the two approaches relied on with the ultimate aim of exploring how attributed meanings are construed when popularising science and how this meaning construal contributes to the expression of the journalist's epistemological positioning in the text. This twofold approach stems from the interest in obtaining and subsequently exploring data which can be described from both a quantitative and a qualitative perspective.

1.1 Purpose of the study

This dissertation delves into the question of how meanings are construed in the dissemination of science in the British press by exploring how they are integrated in the text, these meanings being either attributed to external sources of expertise or narrated by the journalist. There has been a growing concern over scientific developments and science in general and how scientific discoveries and advancements have a direct influence on people's lives. Because of this, there has also been a growing need for this scientific knowledge to be recontextualized so that it can be accessible to those people who are non-expert in scientific fields. These recontextualizations of scientific knowledge have attracted the attention of linguists as a genre where scientific language not only adapts to a specific context of situation, but also shapes it.

In the last years a number of studies have focused on the discourse of science popularization articles and have specifically addressed the question of how the phenomenon of attribution is displayed in this type of text. These studies have dealt with the type of reporting signals used (Elorza 2010; García Riaza et al. 2012; García Riaza and Pérez-Veneros 2012), the type of participants which more frequently appear as sources of information (García Riaza 2012; Hawes 2014; Thomas and Hawes 1997), or the type of speech used when reporting (Calsamiglia and López Ferrero 2003; Elorza and Pérez-Veneros 2014a; García Riaza 2010, 2012; García Riaza and Elorza 2013). These studies have been the basis to attempt this larger-scale study, which aims at providing a much deeper insight into how the construal of attribution contributes to the construction of science dissemination by describing more accurately the roles of the journalist and of the attribution sources.

Typically, attribution sources are construed in texts to provide reliability, credibility, and faithfulness to the original language report (Hyland 2009, 2010; Thompson 1996), the journalist relying on those voices either to achieve objectivity or to include his/her own opinion (Parkinson and Adendorff 2004: 388). However, the narration of scientific achievements is not as objective as it appears, since the aim of science popularizations is not only to disseminate new scientific knowledge, but also to attract the readership's attention, by appealing to them and involving them in the world of science (Sušinskienė 2012: 141). Most importantly, the journalist is in charge of deciding when and how to include external voices to legitimize knowledge, and also which information is most important, thus positioning him/herself in relation to that information (Dahl and Fløttum 2014: 410). Therefore, popular texts are considered to be neutral accounts of scientific facts but, at the same time, it is precisely this attribution of scientific knowledge to external sources to support or challenge information which helps journalists interact and construct their own voice within the text.

Attribution has been typically analysed from an interpersonal viewpoint (Bednarek 2006a; Gil-Salom 2000-2001; Hyland 2009, 2010; Martin and White 2005; Myers 2003; Thompson 2001), by exploring how writers interact with their readers and position themselves by integrating voices to challenge or support previous knowledge. In this dissertation, it is my purpose to explore how the analysis of attribution from an experiential viewpoint complements and provides insightful information on how journalists interact with readers and evaluate scientific knowledge in popularizations. Hence, I aim at analysing how the three experiential elements construing attribution, that is, verbal and mental processes, participants and speech presentation co-occur in such a way that the journalist builds a narration where he/she is not only attributing information to external sources but also dominating the stage in which the rest of the

voices come into play, the journalist thus aligning or detaching from the information given according to his/her own view on the issue narrated. With this aim in mind, the following questions arise:

-How does the journalist interact with and contextualise knowledge for his/her readers from an experiential viewpoint?

-How does the journalist construct his/her own voice?

-Which are the experiential resources used by the journalist to epistemologically position him/herself towards the information and how do they co-occur and interact in a given set of texts, while at the same time keeping the balance between voices (self and others)?

-How is polyphony constructed in science popularizations in the British press?

In the constant "flow of voices" (Pérez-Veneros and Elorza 2014) created in popularizations, journalists construct their own alignment towards the information, presenting their voice as dominating the 'stage' where the rest of 'characters' (authorised sources) come into play through the co-occurrence of several lexicogrammatical resources. These can be studied through analysis of the specific projection clusters included in the units of voice identified in popularizations to present meaning which is either attributed to external sources of information or presented as the journalist's narration. This study is located within the framework of systemic-functional linguistics, since we are dealing with the linguistic choices the journalist makes when projecting meaning in popularization articles. To this end, he/she needs to take into account the context of situation in which these articles are published, together with the type of reading audience and their background knowledge. Furthermore, I focus on analysing how the system of projection is deployed in this text type, by studying all the

occurrences of projected meaning. In order to do so, I present and describe the annotation scheme proposed for the study of unit voice as the core unit of attribution in science popularizations and in polyphonic texts in general with the aim of providing more delicate and finer-grained categories for the analysis of the phenomenon of attribution. To obtain quantitative data and frequencies of occurrence of projected meaning, I have applied the tools provided by corpus linguistics which help in the gathering of results relevant enough for a better description of how projection works in popularizations and how journalists construe meaning and interact with their audience.

1.2 Theoretical and methodological framework of the study

The analysis of language from a systemic functional perspective was first developed by M.A.K. Halliday, who sees language as a system network of choices from which the speaker/writer can select depending on the meaning he/she wants to convey. This view of language as a network of choices implies that language must be studied in relation to the context in which it is used, such as professional settings, classrooms, and language tests (Chapelle 1998). By context, we mean "the total environment in which a text unfolds" (Halliday and Hasan 1985: 5), considering text the final product of the ongoing selection in that system network of choices (Halliday 1985; Halliday and Matthiessen 2004: 23). Text is the basic unit of the semantic process and it is also defined as actualized meaning potential, this meaning potential described as "the paradigmatic range of semantic choice that is present in the system" (Halliday 1978: 109). Depending on the semantic choices made, the resulting meaning will be different since it will not only reside in the immediate context in which those choices are made, but also in the cultural context in which that language is used. That is why there is a need to

distinguish between the context of situation and the context of culture. Some scholars posit that the context of situation is the environment of the text (Malinowski 1923, as quoted in Halliday and Hasan 1985: 6)[1] and it is made up of the participants, the action, other relevant features of the situation, and the effects of the verbal action (Firth 1950, as quoted in Halliday and Hasan 1985: 8). However, as Halliday and Hasan note, any context of situation is not simply a group of features, but a totality, since these features constantly interact and appear together in a culture. The context of situation is the particular semantic system which is associated with a specific type of social situation or social context (Halliday 1978: 109) and this is why Isaac (2016: 135) states that the context of situation constitutes one situation instance of a community's typical practices. In turn, any context of situation is placed within a specific context of culture. Therefore, people do certain things on specific occasions and attach the meanings and values coming from their context of culture to the various contexts of situation in which they find themselves (Halliday and Hasan 1985: 46). As posited by the principles of SFL, the context of situation will directly influence language choices to communicate specific meanings, since the situation is the environment in which the text comes to life (Halliday 1978). Conversely, language choices also shape the context of situation. In turn, the context of situation is always placed in a specific context of culture which needs to be taken into account when construing meanings. The influence of these two contexts on how we use language is encapsulated in the notions of genre and register (Halliday 1978)[2]. Genre explores "how a discourse community's social purposes in using language are institutionalized in a text's typical schematic structure" (Martin 1984: 25, as quoted in Isaac 2016: 135). In turn, Halliday (1978) defines register as the language we speak or write depending on the type of situation. Register constitutes "the

[1] cf. Halliday and Hasan 1985: 45-46
[2] cf. Isaac 2016: 135

configuration of semantic resources that the member of a culture typically associates with a situation type" (Halliday 1978: 111). It is the meaning potential which is accessible in a specific social context. Register helps us explain how the experiential, interpersonal and textual meanings and wordings in a text are determined by the variables of field (the ongoing social activity), tenor (the role relationships involved), and mode (the symbolic or rhetorical channel) respectively (Halliday 1978). As Matthiessen and Teruya contend, registers are functional varieties of language and hence are dependent on these three contextual parameters (2016: 206).

The three basic strata in SFL are the semantic, the lexicogrammar and the phonological stratum respectively and the main unit of analysis in SFL is the text. All these strata contribute to the general meaning of the text since, as Halliday points out, "to describe language without accounting for text is sterile [and] to describe text without relating it to language is vacuous" (1985: 10). The tools provided by genre and register allow us to analyse any text and to link their organization, semantics and lexicogrammar "to the presence of typical and hybrid varieties in the cultural and situational contexts in which these texts were performed" (Isaac 2016: 135).

Halliday distinguishes among three different functional components of meaning realization in the semantic system or three metafunctions of language:

-Experiential metafunction/meaning: It represents the speaker's meaning potential as an observer (Halliday 1978: 112). This is the component through which the language is used to talk about the world, both the external and our "own individual experience as a member of the culture" (Halliday 1978: 112) by describing events and states and the entities involved in them.

-Interpersonal metafunction/meaning: It represents the speaker's meaning potential as an intruder (Halliday 1978: 112). It is the component through which the speaker 'intrudes' in the context of situation and uses language to interact with people, both expressing his/her own attitudes and seeking to influence the attitudes and behaviours of others (Halliday 1978: 112). The interpersonal component of meaning also explores the mechanisms used to interact with our interlocutors, how we maintain relations with them and how we express our own viewpoint on things in the world. It also analyses the phenomenon of attribution and it studies evaluative language.

-Textual metafunction/meaning: It represents the speaker's text-forming potential, by making language relevant (Halliday 1978: 112). This is the component which provides texture, making language operational and valuable in a specific context of situation (Halliday 1978: 113). It explores how we organize language and our messages and how language relates to its environment, both the verbal environment (what has been said or written before) and the situational environment.

In any stretch of language these three functional components of meaning need to be taken into account since "they are used as the basis for exploring how meanings are created and understood" (Thompson 2004: 30). These components are reflected in the lexicogrammatical system appearing as individual networks of choice (Halliday 1978: 113). Furthermore, depending on the purpose of the analysis, they can be studied in isolation. However, even if they can be explored separately, these three functional types of meaning realization are construed in the clause at the same time. The clause is multifunctional and, hence, to understand those meanings "we [have to] look at the whole thing simultaneously from a number of different angles, each perspective contributing towards the total interpretation" (Halliday and Hasan 1985: 23).

Complementary to the study of meaning construal, we can also study the frequency with which different meanings are construed depending on the context of situation. To that end, we need to gather data and to study it quantitatively by making use of the tools provided by computational and corpus linguistics. Computing advances have fruitfully contributed to the study of language in context, since they present a series of tools which allow for the identification patterns which would be difficult to perceive if manual analysis is applied (Louw 1993). The compilation of corpora allows us to study those patterns and structures from a quantitative point of view (cf. Hunston 2002: 2) since the linguist has at his/her disposal samples of real language which give him/her valuable information on various linguistic fields. Besides, this information can be much more easily processed thanks to the development of computational linguistics (cf. López Sanjuan 2008), and the data gathered are more objective since, as McEnery and Wilson (2001: 103) state, corpus linguistics helps study language without the need to invent examples, thus contributing to the "elision of the subjective" (Hunston 2013: 627).

To study the dynamics of projection in popularizations, a twofold approach has been followed, to obtain both quantitative as well as qualitative results which can better describe and characterize the discourse of science dissemination. As such, I have taken advantage of the theoretical framework provided by systemic functional linguistics together with complementary models used for the description of speech (re)presentation in narrations (i.e. Halliday and Matthiessen 2004; Semino and Short 2004; Semino, Short and Culpeper 1997; Smirnova 2009); for the description of reporting processes (Elorza and Pérez-Veneros 2014a; Thompson 1994b) and for the description of the participants (Halliday and Matthiessen 2004; Hawes 2014; Hawes and Thomas 2012; Thomas and Hawes 1997) associated with those processes. On the other hand, I have

also taken advantage of the tools provided by corpus linguistics for the gathering of quantitative data.

A systemic-functional approach to language helps us to analyse language in context, to see how language works according to its context of situation, instead of simply taking into account the more formal characteristics shaping it. This dissertation explores the construal of attributed meanings from an experiential viewpoint, by taking into account how the experiential elements participating in attribution processes, namely verbal and mental processes, participants and speech presentation, co-occur for the construal of attributed meanings while, at the same time, contributing to the journalist's epistemological positioning in the text. Conversely, corpus techniques help us to study language from a quantitative point of view, by focusing on the number of occurrences of those experiential resources in real language samples, in this case popularizations, and which help us to obtain data which is essential to theorise language (Halliday and Matthiessen 2004: 34). In addition, the development of computational linguistics and computer assisted techniques allow the linguist to analyse those big data coming from corpora which otherwise would be almost impossible to handle. The combination of a systemic-functional approach to the study of language together with the use of corpus linguistics to analyse data allows us to obtain both qualitative and quantitative results to get a deeper, more insightful and more accurate description of how language works in the specific context of situation of disseminating science in the British press and how journalists interact with their audiences, while at the same time constructing their own identity along the text by either attributing information to external sources of expertise or, conversely, making use of their own voice to narrate scientific events.

1.3 Overview of the dissertation

This dissertation is divided into six chapters (plus the Introduction corresponding to Chapter 1) whose contents are described as follows. Chapter 2 aims at describing science popularization articles from the perspective of their hybrid nature as a genre which presents linguistic features of both scientific and journalistic discourse, with a particular emphasis on their polyphonic nature and on the epistemological positioning that the journalist may adopt with respect to the sources of attribution and the information reported. Chapter 3 revises the concept of evaluation, stance, and appraisal as ways of construing meaning from an interpersonal viewpoint. The chapter also explores the notion of epistemological positioning as defined by the concepts of evidentiality and sourcing. Finally, the concept of sourcing is also approached by describing attribution and averral and how they contribute to the construal of attributed meaning interpersonally. Chapter 4 revolves around the phenomenon of attribution as approached from an experiential viewpoint. The notion of projection is addressed, together with an outline of more traditional approaches to reporting language and which contribute to get a deeper insight into how attribution is studied. This chapter also presents and describes the three lexicogrammatical resources which characterise attribution experientially, namely verbal and mental processes, their associated type of participant and the type of structure to project meaning. Finally, this chapter also presents the unit of voice as the core unit of analysis in this study, and an outline of the concept of 'projection cluster' as being the methodological construct I propose in order to study the structure making up each unit of voice. In Chapter 5 I present a description of the corpus compiled (the *TG_Sci* corpus henceforth) followed by an overview of the general procedure for the compilation and subsequent analysis of the texts which make up the *TG_Sci* corpus. This chapter also presents and describes the annotation scheme

proposed for the tagging of units of voice as the core unit of analysis in polyphonic texts and as made up of projection clusters integrating verbal and mental processes, their associated participants and the mode of projection used to attribute meaning. Each of the tags which are included in this scheme proposal is described and an example from the *TG_*Sci corpus is provided for a more accurate and clearer characterisation of the tag. Chapter 6 outlines the quantitative results obtained from the data gathered and subsequently analysed. Results relate to the frequencies of appearance of the three lexicogrammatical resources studied, namely verbal and mental processes, type of associated participant and type of projection. Results also relate to the frequency and analysis of the projection clusters found as specific patterns through which journalists construe attributed meanings while at the same time epistemologically positioning in the text. Finally, Chapter 7 discusses the implications of the results obtained and how these results are helpful and fruitful to more accurately describe the roles of the journalist and of the external sources of information as contributing to the construal of attributed meanings in science dissemination in the British press.

Chapter 2
Popularization discourse

2.1 The science popularization article as news

News in mass media is seen as a way of transmitting values, which are in turn reflected in the language used to spread news to the community (Bell 1991: 2; Garret and Bell 1998: 64-65). However, Van Dijk (1988: 3-5) states that the concept of news is ambiguous. We associate news with events which have happened recently. News implies new information about people, events or things, and can be found in a TV or radio programme, or in written form, in press articles or on the Internet. However, news may refer not only to a news article in the physical sense but also to the content of that article. As Van Dijk asserts:

> There is a notion of media news involving the whole discourse, including its physical shape, and a notion with a more semantic nature: new information as given by the media and as expressed in news reports (Van Dijk: 1988:4).

In this study we are concerned with science news in the press, and more specifically with how scientific knowledge is popularized in written form, where a process of transforming specialized information into everyday knowledge takes place via a process of recontextualization, which accommodates that knowledge to the needs of non-specialized readers who assimilate these 'lay' versions into their background knowledge (Calsamiglia and Van Dijk 2004). Science popularization articles represent one of the ways of making science.

The main interest and importance of the study of science popularization articles relies on the fact that, as Van Dijk (1988) points out, news which appears in newspapers has a determinant role in mass communication in society in general. Besides, popularizations represent one of the ways in which science is reported in the written media, "outside the realm of science itself" (Calsamiglia and Van Dijk 2004: 371).

Bell (1991: 12-17) makes a distinction between the different types of news in the press which runs as follows:

-Hard news: Reports of accidents, conflicts, crimes, etc. which have come to light since the previous issue of their paper or programme.

-Feature articles or soft news: Journalists are allowed more liberty than in the case of hard news and sometimes features are written by non-journalists.

-Special-topic news: They are written by a specialist group of journalists under the control of their own editor, such as business or sports news.

-Miscellaneous or residual news: They consist of headlines, bylines, crossheads and captions to photographs.

Popularizations could be considered hard news since, as Nwogu (1991) contends, science popularizations present a series of schematic structures or "moves" similar to the ones present in hard news. Nwogu refers to the structural pattern typically found in hard news and which comprises a Description of the event, a finer-grained Explanation of it, and a final Evaluation (DEE pattern). He states that this pattern can also be typically found in popularizations. In addition, popularizations also "conform to the demands of a five-W beginning demanded by newspaper journalism" (Nwogu 1991: 120). Popularizations seek to give answer to the Who, What, Why, Where and When.

The Who corresponds to the source of attribution of the findings narrated by the journalist, while the What corresponds to what these findings were. Typically, the When and Where are also included together with the Why, since the journalist provides the reader with explanations related to those findings. However, the main focus is on the Who, since popularizations are characterised by their polyphonic nature, as will be shown later, and hence sources of attribution are one of their defining features. To these five-Ws the journalist can also add the How, since popularizations sometimes also narrate how experiments were carried out or how a discovery was made. On the other hand, popularizations can also be considered special-topic news (cf. Elorza 2010) because they are written by a specialist group of journalists; in this case journalists specialized in different scientific fields.

Van Dijk (1988: 1-3) also points out that news can be considered a type of discourse by itself. As such, it is interesting to study the relationship which is established between this discourse and the larger context in which it is situated, and the role news and its particular structure play in mass communication.

If we think of news as a type of discourse, we also need to take into account that it presents language with such characteristics as to be worth studying because, as Bell puts it, "media language can tell things both about media and about language" (1991: 5). Bell provides a number of reasons why we should study media language:

-Because it is there and it is interesting to us as language users and receivers.

-Because media generate a lot of the language used in different social contexts.

-Because language is a tool and an expression of media messages.

-Because it offers the linguist advantages over face-to-face communication.

-Because it can be easily accessed.

Media language encompasses the study of society since it is a mirror for that society, which is present in news thanks to the meanings construed. Besides, since mass media is present everywhere, researchers in different fields of knowledge who are interested in studying the language used have easy access to it. As Bell argues (1991: 5-7), the study of media language is a fruitful source of information for disciplines such as sociolinguistics, linguistics, discourse analysis, semiotics, communication studies, and so on, since it provides many samples of the use of language in real communication exchanges.

The question now is what it is that makes a piece of information a piece of news or what makes a subject newsworthy. Adams Smith points out that for a subject to be worth appearing as news it has to be "either controversial, relevant to the reader, of long-standing interest, important, a breakthrough, unique or, preferably, a combination of all these" (1987: 634). Not every piece of information can make it to the news. News is driven by news values (Bednarek 2006a; Bednarek 2016; Bell 1991; Potts et al. 2015), by at least one or a series of features which combined make the subject valuable enough to be considered of interest for the public domain:

-Negativity: Negative events make news.

-Recency: Events that have just happened make better news.

-Proximity: Geographical closeness as an enhancer of news value.

-Consonance: Compatibility with audience's preconceptions and background knowledge in relation to how society works.

-Unambiguity: The more clear-cut a story is, the more it is favoured to be treated as news.

-Unexpectedness: The unpredictable and unexpected make better news.

-Superlativeness: The more, the better (more violent event, bigger fire, more destructive earthquake).

-Relevance: Events which are more relevant for people's lives make news.

-Personalization: Something which can be conceptualized in personal terms is more likely to be presented as news than abstract generalizations.

-Eliteness: Eliteness of news actors is an important factor in decisions about what counts as news.

-Attribution: To whom the information is attributed. The news value of Attribution is intimately related to that of Eliteness since the more elite a source is in a specific field of knowledge, the more faithful and reliable that source is considered by the audience.

-Facticity: "The degree to which a story contains the kind of facts and figures on which hard news thrives" (Bell 1991: 158).

In science popularization articles the news values present include those of Recency, Consonance, Relevance and Personalization. All these values are related to what is important and relevant to people's lives and also related to their background and general knowledge about the world. The values of Eliteness and Attribution are also present in science dissemination since events addressed in popularizations are always supported by relevant sources who are experts in the scientific field and whose words are assumed to give credibility and reliability to the information. Additionally, if those external voices are integrated by directly quoting them, the words originally uttered can also construct news values even if, as Bednarek (2016: 33) posits, the news organisation is also involved in the selection of those words by eliciting, selecting and editing in the

several stages of the news process. Conversely, when authorised sources are integrated in the narration of the journalist, both the reporting expressions and the reported utterances can be used by journalists to construct specific news values (Bednarek 2016: 35). To take an example:

> (1) Mosquitoes will appear in much greater numbers in the Arctic as it warms because of climate change, with negative consequences for caribou and the indigenous people who live off them, researchers warn. (TG_Sci_179)

In example (1) we can see how the journalist makes use of *researchers*, a label that construes the source of attribution as specialists who are not 'ordinary' people. The reporting expression *warn* constructs the news value of Negativity, together with the message that the researchers want to communicate as their findings. Adjectives such as *greater, negative* and the noun group *climate change* also add to the construal of negative polarity as news value. Furthermore, Negativity is transmitted to the audience from the very beginning, since this information is included in the first paragraph of the popularization. The news values of Eliteness and Negativity combine to give readers the idea that what they are going to read is bad news communicated by a reliable source, even if it does not affect their lives in a direct way. However, the use of the noun group *climate change* can be said to also construe the news values of Personalization and Proximity, since it is a problem which affects the whole world, and not just a few.

Bell argues that any news items will be more newsworthy the more news values it registers. Not every single piece of news presents all the values at the same time but, as this author asserts, journalists always try to keep a balance, so that if some values are not present, others will be, hence the information will still be considered news worth reading.

Some scholars (Gil Salom 2000-2001; Olmedo Estrada 2011; White 1997) have studied the relationship between news as reporting "some form of disruption in society" (White 1997: 101) and its interest for the general public since the disruption can affect their daily lives. Similarly, new developments in science may affect people's lives, either positively or negatively. Sometimes science news reports about developments or discoveries that will make people's lives easier and more comfortable; while at other times science deals with more negative aspects of life, such as the discovery of a new disease or the consequences of climate change. The direct consequences of science development on people is what has made audiences more interested in scientific fields and in how science can have either a positive or negative impact on their lives. This interest in science is what has made necessary its dissemination for those who are non-experts in it, but still want to know what is going on.

This interest in science is not new. At the turn of the 20th century newspaper publication entailed a massive revolution and some papers such as *The Guardian* tried to give coverage to different aspects of science as well as "some ongoing sense of where the sciences stood on major issues" (Bowler 2009: 197). This was mainly due to the fact that people were interested in reading about science for entertainment and because there was an emphasis on science being able to provide benefits for their daily lives, especially in relation to developments in technology and in the medical sciences. However, what people considered to be the most exciting developments could also be the most dangerous and alarming, and they did not find it so attractive to read about something which could make their lives worse. Another difficulty was that few scientists actually ventured into the challenge of science writing, even though there were some who were brave enough to both accept the financial benefits as well as the professional risks (Bowler 2009: 201). As such, the situation was complex, since few

scientists had the time to devote to writing for the press, even if they had the necessary writing skills. In turn, the audience, interested though they were in advances in science, were afraid of its more negative consequences. Still, science needed to be disseminated in the press, since people were interested in it, even if it was "as likely to focus on threats as on benefits" (Bowler 2009: 265). With this challenging situation in mind, the new profession of the science correspondent emerged. These new professionals knew enough about science to talk about it in an authoritative way to their audience, but without using technical jargon. They were interested in making people aware of how new discoveries and advancements could have an impact on people's lives and in how proper and sensible use of science "could create an ideal state in which all material wants would be satisfied" (Bowler 2009: 208). Their aim was to explain science in such a way that people could know as much as possible about the latest developments and discoveries, while being aware of their potential benefits, however alarming and dangerous some of its advancements may sound.

A progressive change took place, from scientists who wrote for lay audiences in mass media, to journalists who started to write about science for those lay audiences and, consequently, who started to mediate between both groups. As scientific research evolved over years, audience interest in science increased, and mass-market popularization grew. Scientists started to understand that they should stop hiding themselves behind their technical language and "impenetrable screen of arrogance" (Kenward 1988: 31), and they had to learn "to deal with the channels of communication that are open to them and be ever alert to changing circumstances" (Bowler 2009: 277). While interest in science has always been there, it has increased over the last few years thanks to the rapid development of science and technology. In addition, as Hyland argues (2010: 118), elite educated audiences get information about science from

specialized books, but most of the public gets that information from specialized magazines and from most daily newspapers, which have sections devoted to science, with the number of science articles increasing. Scientific knowledge continues to accelerate and scientists need to be aware that mass media can help them communicate their findings to an audience eager to know how science can change their lives, either positively or negatively, but always trying to point out its potential benefits.

In addition, science dissemination plays a decisive role at the crossroads between science and politics, since politics plays a decisive role in the development of science. As Kenward (1988: 31) claims, scientists cannot expect to receive any government investment if they do not explain what they are doing to the community beyond their area of research. Calsamiglia and López Ferrero (2003: 148) also argue that the development of technologies and communication together with scientists' awareness of the importance of their studies for the "distribution of political power" have eventually made the scientific community start sharing their knowledge with the general public. Halliday posits that there are some steps which need to be taken towards more democratic forms of discourse which are able to reconstruct the world not only for a few, but for all who live in it (2004: 225).

As seen, science dissemination has received interest from scientists, journalists and even politicians, but thanks to science's rapid growth in the last years and also thanks to the general public's increasing interest in scientific issues, the appearance and development of the science popularization article has been possible, establishing itself as a stable and prominent genre within the press, and as a fruitful and new field of research in discourse studies (Williams Camus 2013: 26). Science popularization articles are said to be "fill[ing] the traditional gap" (Calsamiglia and López Ferrero 2003: 147) existing between the scientific community and *lay people* (Calsamiglia and López Ferrero 2003)

or *the average citizen* (Adams Smith 1987: 636). Unlike other genres from mass media, they are also considered pedagogical texts (Gallardo 1999; Hernando and Hernando 2006; Parkinson and Adendorff 2004; Williams Camus 2013) since they provide scientific knowledge to a public who is uneducated in scientific fields in such a way that the new scientific knowledge is understood and valued by them (Gallardo 1999: 55). Journalists writing about science are said to act as bridges between that scientific community and those non-expert people, science popularization standing as a meeting point for these two groups and the journalist acting as "text processor" (Bell 1991: 217), as someone whose role is to 'teach' science to a non-expert group. In Myers' words:

> Popularization discourse includes only texts about science that are not addressed to other specialist scientists, with the assumptions that the texts that are addressed to the specialists are something else, something much better; scientific discourse. An article in *Cell* does not belong in this field, but when the same author writes it up in *Scientific American*, or a science journalist reports it in *The Times*, or when a television documentary shows the scientist walking across a leafy campus, the same material becomes popularization (Myers 2003: 265).

Myers makes a clear distinction between popularization discourse and scientific discourse. However, the boundaries between the two are not necessarily straightforward. This situation is further complicated because popularizations not only share some characteristics with scientific discourse, but also with journalism since, as Hyland (2009: 164) remarks, the main purpose of popularizations is to present research as news for non-expert audiences who demand information on science which can affect their daily lives in a direct way, but transmitted in such a way that they understand what the scientific community wants to communicate. Berruecos (2000: 106) talks about a "triangular communication space" since there is a constant interaction among the

scientific community, the journalists as mediators, and lay people. The communication of science can be seen as a cyclic process in the sense that the discourses which come into play are interacting dynamically. Scientists communicate knowledge to the general public and, in turn, the scientific community is critically influenced by audiences' opinions and views on their production (cf. Gotti 2014; Williams Camus 2009). The three different interlocutors interact with each other, mutually influencing one another, so much so that the way of reporting knowledge can be affected by the feedback received.

2.2 Popularizations: Blending journalism and science into a hybrid genre

The constraints of the context of situation in which journalists are writing those popularizations determine to a great extent how the findings are going to be narrated, independently of the content of the information given. Journalists write to be published in mass media, which implies that they find constraints in relation to time (deadlines) and space (maximum and minimum length demanded), together with the competition to get their stories published, for which they need to have 'text appeal'. The question of presenting research as news, of transmitting scientific information but, at the same, adapting to the context of getting published in a newspaper makes popularizations a 'unique' text type in which features of both newspaper and scientific discourse meet. That is why some authors (Elorza 2011; Muñoz 2015) define popularization articles as a hybrid genre, since they are taking into account the hybrid mixture of variables in both the context of situation and the context of culture in which this text type is performed (cf. Isaac 2016). Along the same line, popularizations can be considered good examples of what Matthiessen and Teruya describe as the overlapping of two registers so that

"certain texts display features of each and they are borderline cases" (2016: 201). Elorza (2011) represents the place popularizations occupy in Figure 1 below:

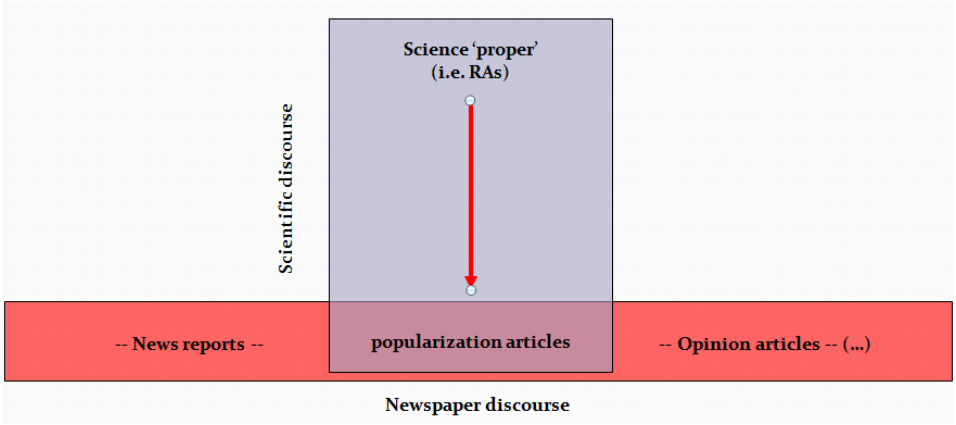

Figure 1: Popularization articles as a hybrid genre (Elorza 2011)

As can be seen, popularizations are located in a continuum along with news reports, opinion articles and other genres. At the same time, they are at the crossroads of the continuum of scientific discourse, in which they hold a vertical relationship with research articles (which are produced chronologically before), and the continuum of newspaper discourse, as they present features of both.

2.2.1 Popularizations as newspaper discourse

The concept of news encompasses the giving of new information about people, things or events. News can be considered a type of discourse by itself (Van Dijk 1988) with its own language. Besides, as Bell (1991) posits, in most cases news is about what people have previously said more than what they have actually done or what has happened. Science popularization articles are considered news, since they present some of the characteristics which define newspaper discourse. In them we find new information about scientific events, with a language which presents some features defining its nature

as the language used for popularizing science and for recontextualizing scientific meanings to adapt both to the new audience and to the mass medium acting as the transmitter of information and which presents its own constraints. Popularizations are also considered polyphonic texts in the sense that there is a multiplicity of voices speaking, which is in agreement with Bell's assertion about news being what people say more than what they do. As such, popularizations are considered a genre within newspaper discourse, since the social purposes aimed at being fulfilled by the use of specialized language to transmit scientific knowledge to a non-expert reader are institutionalized in popularizations' typical schematic structures (cf. Martin 1984: 25 as quoted in Isaac 2016).

Some studies have dealt with analysing popularization articles as a genre within newspaper discourse, for example the previously mentioned study by Nwogu (1991) on the structure of science popularization articles as being similar to the one present in hard news. He posits that popularizations seek to provide readers with information about who is the main source of attribution of the scientific findings, what those findings are, when and where it happened, and a reason for the findings.

On the other hand, popularizations also seek to fulfill the social purpose of dissemination. In turn, this transmission of knowledge has an influence on how people perceive and form opinions on the latest scientific findings, since the representation of scientific knowledge and how it is seen by the audience is partly derived from the mass media used to popularize science (Calsamiglia 2003: 140). Gotti also supports this idea by pointing out that mass media are no longer passive mediators of scientific information, but that they encompass a social function, participating actively in its transmission and, which is more relevant for this study, even "including views that do not derive from scientific sources" (2014: 26) but from other stakeholders such as

politicians, spokespeople or even 'ordinary' people whose lives are somehow affected by the scientific event narrated. Science journalists take into account their readers' expectations and interest in that information, and the context of the news medium for which they are writing, with its own rules and constraints. Gotti adds that when analysing the discourse of popularizations, the analyst should be concerned not only with the ways scientific knowledge is approached for a lay audience, but also focus on what journalists do "to comply with various concomitant constraints such as public interest and concern, market demands, the newspaper's ideological slant, and competition from other types of media" (2014: 27). In this dissertation I specifically focus on how journalists act as mediators of the attributed information or conversely as narrators using his/her own voice to comply with their readers' interest and expectations. Readers expect to find information which is reliable and faithful since it is attributed to authorised external sources and as such journalists in popularizations present the construal of attributed meanings through mediation and/or narration to fulfil those expectations while at the same time interpreting the information given.

According to Bell (1991: 176-183), the typical structure of procedure and results is overturned in scientific reports for media coverage. Results lead the whole story, even appearing as part of the headline and lead for questions of newsworthiness, brevity, clarity and to hook and hold the reader (cf. Nwogu 1991; Reah 2002). Moreover, as Gotti also notices, there are various views coming from different worlds, such as the political, the industrial or the economic, which need to be taken into account when "speaking" science in what Moirand calls a *plurilogal intertext*, because it is made of "recent scientific or technological events which have taken on a political significance" (2003: 197). Furthermore, in this plurilogal intertext the voice of the journalist also takes part as what has been called the Correspondent Voice (Iedema et al. 1994; Martin

and White 2005). This voice is halfway between the Reporter Voice, which is construed as objective, and the Commentator Voice, which is construed as subjective. Journalists in popularizations, as Correspondent Voice, are "entrepreneurs of science" (Nwogu 1991: 12), reporting objectively on new scientific events, popularizing them and signing the articles as science correspondents (cf. Martin and White 2005). Conversely, the journalists' voice is also construed as subjective since their positioning towards the attributed information is also present in the text by acting as mediators of the information and thus interpreting it for their readers.

Popularizations have increasingly acquired a strong presence in newspapers and their visibility is prominent nowadays. This genre is more and more accessible in daily newspapers, both in electronic and in written format. Some newspapers, such as the British *The Guardian*, present a long tradition of popularizing science. In the case of other newspapers or other journalism traditions the situation is different. Mass media communication is affected by the context of culture, and the presence of science in press media can be interpreted as a symptom of the importance that science receives in a certain cultural context. If we take the Spanish newspaper *El País* as an example, until the year 2014 it included some articles on science but as part of the Society section. Nevertheless, on the 30th September 2014 this newspaper became associated with the website Materia to become "the meeting point for readers with an increasing interest in science, health, technology and the environment" (El País 30 September 2014, my translation). From this moment onwards, popularization of science in *El País* has gained ground and has found its own place among news genres. All these changes in newspapers to popularize science are due to the question of making it accessible to all audiences and to give science more visibility in mass media communication, as part of the discourse of newspapers. However, popularizations also present features which

mirror the realm of scientific discourse, even if, as will be seen in the next subsection, science popularization as a genre is distinguishable from the discourse of science itself.

2.2.2 Popularizations as/vs. scientific discourse

Adams Smith describes the research paper as emphasizing the conceptual structure of the discipline under study, with the organization, grammar and vocabulary subordinating "the activity of scientists and subjects to the development of the discipline" (1987: 636). Conversely, the popular article presents science as an accumulation of facts which leads towards a new discovery which can have a technological application or some kind of value for the layman's daily life, the activity of the scientist as deriving from a simple question which finds an answer by the observation of nature (Adams Smith 1987: 636).

Myers (1990, 1994) describes the research article as a narrative of science and the popularization article as a narrative of nature, also focusing on the differences in the language used. According to Myers, research articles create a narrative of science, since "they follow the argument of the scientist, arrange time into a parallel series of simultaneous events", and use the vocabulary and syntax to accentuate the conceptual structure of the scientific field (1990: 142). Conversely, the science popularization article, as narrative of nature, presents a narrative which is sequential in which the product and not the process is the main subject. In addition, the narration is chronological and the vocabulary and syntax found are there "to emphasize the externality of nature to science practices" (Myers 1990: 142).

According to Myers, the focus of research articles lies on the methodologies and procedures followed and, as Calsamiglia posits, the product or object of that research

"has an immanent value in scientific and specialist contexts" (2003: 140). On the contrary, for the popularization article the product or result of the research is the main focus of the discourse, and this product does not have an intrinsic value, but rather an external one, its importance lying "in its application, its utility, and the consequences of its use in people's lives" (Calsamiglia 2003: 140).

There have also been numerous studies (Gil-Salom 2000-2001; Hyland 2010; Muñoz 2015; Myers 1994; Pecman 2014; Salager-Meyer 1994; Varttala 1999) which have focused on the differences found in the structural patterns followed (cf. Adams Smith 1987 on the structure Problem-Solution in popularizations) and in the language used in research articles and in popularizations, so that the former is focused on methodologies and procedures while the latter is focused on results and products.

Both Salager-Meyer (1994) and Varttala (1999) analyse the use of hedges in scientific discourse and in science popularization discourse. Salager-Meyer states that hedges in research articles are used to make scientific knowledge "subtle rather than fudged" (1994: 164). Varttala states that, in principle, hedging in popularizations is not as important as in scientific discourse because the knowledge transmitted comes from expert sources to lay people who are not in a position to question what those authorized sources state (1999: 189-190). However, he comes to the conclusion that, in the case of the popularization of medical research, hedging is one of the fundamental devices popularizers use. This can be due to the fact that writers of popularizations want to "create a scientific atmosphere and to increase the rhetorical effect of the text in the eyes of the lay audience" (Varttala 1999: 193). Authors of popularizations want to create a discourse which, even if adapted to a non-expert audience, still preserves some traces of scientific discourse so that the audience can still feel that what they are reading is science, in this case coming from an article in a newspaper.

Hyland (2010) characterises the research article as being written for a professional audience, with exactness and foregrounding procedures. In addition, scientists use a very specialized vocabulary, technical terminology (cf. Pecman 2014), acronyms, nominalizations (cf. Halliday 2004; Myers 1994), and reference to routine craft practises. As Muñoz states (2015: 27), researchers present their findings through the research article so they can engage in scholarly debate, discuss about the procedures followed and thus construct new knowledge.

Conversely, popularizations are written not to construct, but to reconstruct and recontextualize that knowledge. Journalists present the scientific work in such a way that the target audience can make direct connections with their background knowledge. Myers concludes that scientific knowledge changes as it is presented in one discourse or another, being more tentative and mediated in research articles.

2.3 Popularizations as recontextualization of scientific knowledge

Popularizations do not merely present a simplification of scientific knowledge, but a full recontextualization of it (Calsamiglia and López Ferrero 2003; Calsamiglia and Van Dijk 2004; de Oliveira and Pagano 2006; García Riaza and Elorza 2013; Gotti 2014). We must understand the science popularization article "not as a simplified version of the research article, but as a discursive reconstruction of scientific knowledge to an audience other than the academic one" (de Oliveira and Pagano 2006). Sometimes, as Myers posits, the problem with the study of popularizations is that it is so much focused on the words used that it leads to the assumption that popularizing is equivalent to "simplifying and perhaps distorting the original message provided by science" (2003: 272). Along this line, Calsamiglia (2003) talks about the interpretation of popular

science writing as ‘vulgarization’, ‘debasement’ or ‘translation’ of science content. However, Olmedo Estrada contends that the transmission of scientific knowledge implies much more than presenting the audience with information which can be incomprehensible for the readership (2011: 141, my translation), simply because the journalist has ‘translated’ what was stated by the scientific community. Hyland also adds to this perspective when noting that the original scientific claims need to be ‘boosted’ in popularizations and supplemented with some more information so that they can meet the new readers’ assumptions and background knowledge (2009: 156).

The process of recontextualization of scientific discourse can also be seen as a process of adaptation of this discourse not only to the new type of audience, but also to the new communicative events and to the constraints of the media in which the popularization will be published (Gotti 2014: 22-26). Writers of popularizations need to take into account the fact that they are writing for a non-expert audience who needs to understand scientific assertions. Besides, the communicative situation takes place in mass media, with its constraints of space and time and the competition to get a story published, something journalists need to bear in mind to also try to “minimise the uncertainties that are often present in scientific research” (Williams Camus 2013: 34).

Journalists writing popularizations cannot forget about the guidelines followed by the newspaper or magazine in which they are writing and which limit the way in which they write or how they present information. Furthermore, adapting to a new public not only means using some forms of language which are different to the audiences reading scientific research papers, but also trying to call the reader’s attention to the scientific issue being dealt with. Thus, journalists need to make use of some strategies for those popularizations to be attractive and easily understandable for the reader. One of these strategies is to focus on readers’ everyday experience, to enhance the news values of

consonance and personalization (Bell 1991) so that the audience can more easily conceptualize events which are not related to their background knowledge and personal experience. There is a link to the new concepts being addressed, "the comparison with everyday reality and the recourse to concretization meant to facilitate comprehension of abstract information and distant situations" (Gotti 2014: 23).

This recontextualization of scientific knowledge also involves a process of reformulation to fulfil the demands of the readers. As Gotti puts it, the language which is used in popularizations needs to be "remodelled" so as to address and adapt to a new type of audience (2014: 19-22). Readers of popularizations learn about science through a language which is specifically used for the purpose of popularizing science.

2.3.1 The language of popularizations

In his work, Bowler (2009: 93) addresses the fact that, as early as 1926, Haldane, a "scientist-celebrity in biology" (Bowler 2009: 85), collects in his article "How to Write a Science Popular Article" a number of tips which are presented by Haldane as prescriptive instructions for what scientists *should* do, such as the use of short sentences or the recommendation to use the active rather than the passive voice. Instructions also include recommendations referring to the adaptation of their narration to the readers' own experience in order to make the topics understandable. Although we do not know if or to what extent Haldane's tips have had an influence on the way science has been disseminated, linguistic analyses of science popularization features point to the use of various strategies to report and disseminate scientific knowledge which help journalists to connect their readers' background knowledge with the new knowledge being addressed (Calsamiglia and Van Dijk 2004). Among these strategies we find the

pervasive language used to deal with terminological definitions and the limited use of specialized vocabulary (Gotti 2014: 16-19), "the popularization [substituting] for some scientific term and explanation or a rough equivalent in the general vocabulary" (Myers 1994: 187), together with less complex syntactic structures to link concepts and to develop the discourse. García Riaza and Elorza also point to the lesser formality of popularizations so that they are more appealing to the readers (2013: 53). Other strategies to create 'text-appeal' include the use of analogies, some forms of figurative language (cf. Darian 2000) such as puns and, recurrently, the use of metaphor and inverted commas for terms which connote some type of metaphoric meaning (Gotti 2014). Williams Camus (2009, 2013) has carried out a study on the use of cancer metaphors in popularizations from the Spanish and the British press to conclude that metaphors are one milestone in popularizations "to help conceptualize abstract or unfamiliar knowledge in a more comprehensible manner" (2009: 493). The use of rhetorical strategies makes popular science more appealing to the audience. As Kenward argues, we must never forget that "even the most honourable newspaper or magazine is as interested in entertaining and keeping its readers as it is in communicating greater truths" (1988: 31). One of the aforementioned strategies used to attract the target reader's attention is displayed in the headlines of popularizations. As Nwogu (1991) points out, science journalists use leads in popularizations to hook and hold the reader, by constructing them with short words, proverbs or puns which make the audience turn their attention to them (cf. García Riaza and Pérez-Veneros 2012; Reah 2002: 16), as the following headline from *The Guardian* shows, playing with the homophony of 'great' and 'grape': *Italian archaeologists have* ***grape expectations*** *of their ancient wine* (The Guardian, 22 August 2013).

As seen, popularizing science is both a question of 'educating' the public in scientific topics, as well as of catching the audience's attention, with the purpose of offering the audience some entertainment (Williams Camus 2013: 34) by linking science to their personal experience and by addressing scientific issues with rhetorical strategies that make the journalist's narrations fully understandable for readers as well as appealing and entertaining.

One of the aspects which is still under-investigated is the relation between the language used by the journalist in his/her narration as mediator, and the information attributed to other sources in the text. As some of the scarce studies on this question have revealed, the journalist's mediation may involve the use of evaluative language, or rephrasing which anticipates the content of the attributed information (de Oliveira and Pagano 2006; Elorza and Pérez-Veneros 2014a). In this research a focus on this question is also placed (cf. Chapter 5, section 5.4; Chapter 6, section 6.1).

2.4 Popularizations as polyphonic texts

Although the science popularization article presents the voice of the journalist talking directly to the public, readers also expect to hear the experts' voices. As such, in science popularization articles we find a multiplicity of voices speaking which, together with the journalist's voice, "create a story" (Bell 1991: 26). News is better seen as what people say rather than what people do, so we can consider news as embedded talk (Bednarek 2006a; Bell 1991), since journalists are seldom witnesses to or actors of the events they are narrating (Semino 2009: 447). As Bell points out, the majority of the information given by journalists is either a reproduction or a reformulation of information someone else said to him/her, and in this sense "the basic stuff of news [is]

what people tell a reporter" (1991: 41; cf. Ciapuscio 2003). In the case of science popularization articles such as the ones analysed in this research, those 'people' typically refer to scientists/experts but also include other stakeholders, such as spokespeople or politicians.

From a textual perspective, the multiplicity of voices speaking in the text is what we call *polyphony*. The notion of polyphony was first developed in the music field, and Bakhtin extended it to the study of literary language with an analysis of Dostoevsky's poetics, published in 1971. However, it was Oswald Ducrot (1986 [1984]) who was the first to apply the concept of polyphony to linguistics. He states that the different voices which manifest in any stretch of text are related to each other in a hierarchical positioning: there is a main voice/speaker at the top of the hierarchy and he/she plays with the rest of voices he/she decides to bring into the text. Polyphony is also related to the notion of heteroglossia, also developed by Bakhtin and defined as "another's speech in another's language, serving to express authorial intentions but in a refracted way" (Bakhtin 1981 [1975]: 324). He considers this speech a special type of discourse, because "it serves two speakers at the same time" and it conveys two intentions: the intention of the original speaker and the intention of the author reproducing the speech of that original speaker. These two intentions are interrelated and merge, "the reader having the impression that the speaker and the author are holding a conversation with each other" (324).

Vicente Mateu (2007) states that textual polyphony is one of the main characteristics of newspaper discourse in general. By bringing new voices to the text, the author progressively gives shape to the discourse, those voices being crucial to support, refute or give credence to the ideas transmitted by the author. Therefore, we can consider newspaper discourse as a multi-voiced media discourse (Moirand 2003), where different

attitudes, opinions and reactions from different 'outside' speakers merge with the voice of the author in the creation of a new text.

As stated before, journalists in popularizations also integrate external voices into their discourse, making science popularization discourse a polyphonic and heteroglossic one. The intention of the journalist is to disseminate scientific news and, in order to give credibility and reliability to the information being reported, he/she relies on the voices of experts and other relevant stakeholders. Following Bakhtin's words, the different views of stakeholders and journalists interrelate and merge but in such a way that it is the journalists in popularizations who are having a conversation with the reader, leading them to hold their view on the issues narrated.

In popularizations the question of sourcing is also related to authority in the sense that external voices endow scientific facts "with an authority they did not always have within the specialist discourse from which they emerged" (Myers 1994: 179). This is so because, as Williams Camus (2013: 34) notes, popularization genre presents fewer uncertainties than the discourse of scientific research articles. Moreover, information in popularizations is not only attributed to the researchers or scientists responsible for the findings narrated, but also to sources of expertise which have a position in an institution and which are relevant to the information being reported. These sources are typically scientists and researchers in different scientific fields. However, depending on the nature and social relevance of the findings narrated we can also hear social elite sources, such as politicians, associations' representatives and spokespeople, contextualizing (part of) the information, giving their opinion on what is being treated in the article, or even positioning themselves if the issue is controversial in some way (e.g. climate change or genetically-modified food or crops).

In this study, the relationship between the different voices in these polyphonic texts is treated by only distinguishing between two types of voices: the journalist when "speaking" by him/herself (which will be termed *averral*), and the other voices which are brought into the text by the journalist for various purposes, no matter whether they are the researchers responsible for the findings or others (which will be termed *attribution*).

In this chapter I have explored the main characteristics which define popularizations as a hybrid genre presenting features belonging to newspaper discourse and scientific discourse. In addition, popularizations have also been defined as being recontextualizations of scientific knowledge for a non-expert readership, with a language which is motivated by this specific context of situation. Finally, popularizations have been described as polyphonic in nature, since there is a multiplicity of voices speaking about science and, at the same time, giving shape to the text. It is precisely this polyphony and its importance for the journalist to include a multiplicity of views (including his/her own) on the issue narrated which leads us to explore in the next chapters the phenomenon of attribution and averral and also the phenomenon of projection as the ways through which writers integrate voices in a text. Attribution and averral will be firstly addressed from an interpersonal viewpoint to see how writers evaluate information by establishing relationships and interacting with their readers, to focus the study on how attribution and averral are construed from an experiential viewpoint, by analysing the phenomenon of projection and how the experiential elements construing it (verbal and mental processes, participants, and logical-dependency relations) also shape the text and help the journalist construe and control the narration of scientific findings for ordinary readers.

Chapter 3
The interpersonal construal of attribution and averral

In the previous chapter I discussed and revised the science popularization article and the main features which define it as a hybrid and polyphonic genre. When addressing the question of the journalist's voice, I discussed how popularizations are imbued with the journalist's view on the issues under comment. Even in a subtle mode of presentation, writers of popularizations guide their audience throughout the text in such a way that readers align with or detach from the information integrated according to the journalist's desires. And this is achieved through the constant interplay of voices which are projected into the text. The aim of this chapter is to analyse how journalists' positioning is constructed in relation to the interpersonal meaning projected when they bring other voices to their narrations. As will be shown, by placing different projecting structures at different parts of the text, the journalist is also evaluating the scientific knowledge conveyed. This is the reason why evaluation is also an essential element of this research in order to shed light on how popularization discourse works and how journalists popularize science.

Because of the evaluative nature of science dissemination, this chapter deals with the phenomenon of evaluation, stance and/or appraisal as different though similar ways to study how journalists evaluate the world and their experience of it, the interactions with their interlocutors and the relationships established with them, and the way journalists structure and present their discourse to their readership. Finally, the concept of

epistemological positioning is also studied by addressing the notions of sourcing and evidentiality as yet two other phenomena through which writers position themselves towards the information within a text.

3.1 Imagined dialogues in texts: Interacting with the reader

In any given text, we find information to be transmitted from writers to a specific type of readership with its own characteristics and needs. In media discourse there is always a disjunction of place and often of time between the communicators of news items and their audience (Bell 1991: 85). The addresser needs to have and work with an idea of the readership he/she is addressing, their needs, expectations and assumptions and, therefore, texts are constructed by a writer with a clear idea of the target audience they address.

This situation is clear in cases of face to face conversation, since the speaker is addressing his/her interlocutor in a direct way, being aware of the context of situation in which the communicative act is taking place and partially knowing the needs and expectations of his/her addressee. Conversely, in written communication the writer is producing a piece of information with an ideal reader in mind, but he/she cannot have a real idea of who that reader is or the context of situation in which that piece of language will be received. As such, writers need to make a series of assumptions about those potential readers, constructing what Thompson (2001: 61) calls a "reader-in-the-text", to whom the message is addressed. Therefore, the meaning of the text is construed by way of the interaction between the writer of a text and the readers of it, by building it both on the writer's assumptions about his/her potential addressees and on the expectations of those readers.

Several studies (Coulthard 1994; Hyland 1999, 2009, 2010; Kim and Thompson 2010; Thompson 2001) have focused on the interaction between writers and ideal readers and the mechanisms used by writers to construct the ideal 'reader-in-the-text'. Coulthard (1994: 4-5) makes a distinction between what he calls the 'Imagined Reader' and the 'Real Reader'. The 'Imagined Reader' is the one the writer has in his/her mind, who can be similar to the 'Real Reader' in the real world to a greater or lesser extent. As he states, writers are faced with the problem of the 'Imagined Reader' knowing more than the Real one, in which case the text will be too difficult to understand, or, conversely, the 'Real Reader' knowing more than the Imagined one, in which case the text will be of no interest to him/her. As such, all writers should take a decision on two basic issues: what information to include, depending on the previous knowledge of the assumed reader, and to what extent they should present the information as given or as new (cf. Halliday and Matthiessen 2004). Thompson (2001) states that there are two different ways through which writers can present information to their readership: through *interactive* and through *interactional* resources. *Interactive* resources guide the reader through the text, while *interactional* resources allow him/her to interact with the information, thus involving readers in the argument developed in the text. Through these resources, writers are able simultaneously to introduce their own position on the information. Besides, since they are projecting that idea onto the reader, depending on the resources employed, they may present ideas either as open to question or as taken for granted, in which case readers would be expected to accept the argument without further question (Thompson 2001: 65).

Hyland (2009, 2010) has intensively studied the interaction between writers and readers in both research articles and science popularization articles. He addresses the notions of *interpersonality* and *proximity* as the two main ways at the writer's disposal to initiate a

"conversation" with their audience. *Interpersonality* (2010: 216) relates to how writers negotiate social relationships with the readers, by highlighting what they see as important information and how they feel about it. *Proximity* (2010: 217) deals with the rhetorical features a writer displays in a text to show authority and his/her position on the topic developed in a text. Proximity includes the idea of interpersonality and elaborates on it, since it not only deals with questions of relationships between writers and readers, but also with how the writer talks about the world and the linguistic devices used to do so to integrate the reader into his/her text. Hyland's idea of interpersonality is linked to the interpersonal meaning conveyed by language, since it deals with how writers and readers establish and maintain social relationships and with the way information is evaluated as more or less important. Conversely, proximity is related to the experiential meaning of language, by addressing how the writer represents the world and which linguistic elements he/she uses to do so in such a way that the reader is engaged in the text.

Hyland (2010) distinguishes among five ways through which writers construct proximity with their readers in the research article and the science popularization:

1. Organisation: The way texts are constructed to guide their readers through their content in such a way that the information presented as more important will hook into the readers' mind more deeply.

2. Argument structures: They deal with issues such as *novelty, focus* and *frame.*

- Novelty: "A means by which individuals gain credit for themselves, prestige for their field, and growth for their discipline within a shared understanding of what is worth knowing" (Hyland 2010: 120). In the case of the research article, the new work needs to recognize previous work done in the field and against which

it proposes a new change. In popular science, novelty is transformed into newsworthiness (cf. Bell 1991 on news values). Journalism presents news which reports on scientific breakthroughs which often have an immediate impact on readers' lives.

- Focus: Research articles center on the objects of study and the procedures followed, while popular journalism focuses on the products of previous research and on their effect on the audience's lives.
- Frame: It comprises the language choices used by writers so that readers recognize something as familiar or already accepted knowledge. Research articles rely on technical terms, acronyms and reference to craft practices and specialized forms of equipment. Popularizing science, however, means making connections between the new information and readers' previous knowledge. This means defining new concepts and trying to link the strange and exotic to everyday events in people's lives.

3. Credibility: To make the information reliable in research articles the writer relies on his/her own practice and expert handling of methods, being cautious when presenting the information and supporting it with evidence. Reference to external sources of information appears for the writer to align with those sources. In popularizations, however, reliability is bestowed on external sources of information which are brought into the text, since the writer is often not a scientist him/herself. Thus the audience can rely on the voices of experts, who are the ones legitimizing the information.

4. Stance: Writers also construct proximity by presenting a clear stance or alignment towards the information given. Stance makes reference to the ways specialists "comment on the possible accuracy or credibility of a claim, the extent they want to commit themselves to it, or the attitude they want to convey to an entity, a proposition

or the reader" (Hyland 2005: 178). Hyland (2009) identifies four resources writers employ to construct stance:

- Hedges: Devices which withhold complete commitment to a proposition.
- Boosters: Devices for encoding certainty in what writers say. They also help the writer mark involvement with the topic and solidarity with the audience.
- Attitude markers: Devices for marking writers' affective attitude towards propositions, "conveying surprise, agreement, importance, frustration, and so on rather than commitment".
- Self-mention: Devices such as first person pronouns and possessive adjectives for writers to present the information and their own view on what they are talking about.

5. Reader engagement: The different ways in which writers bring readers into the text, engaging them in the issues being explored and anticipating potential objections and problems. Hyland distinguishes among five different elements of engagement:

- Reader pronouns: Use of inclusive *we*, which identifies the reader as someone who shares knowledge with the writer as a member of the same discipline.
- Personal asides: Writers use them to address readers directly by interrupting the flow of the argument with a brief comment on what was being talked about.
- Appeals to shared knowledge: Explicit signals used by writers asking readers to recognize something as familiar or already accepted knowledge.
- Directives: Imperatives and obligation modals.
- Questions: They are the main device to engage readers into the text. They encourage curiosity and bring interlocutors into the discourse in such a way that they can be led to share the writer's viewpoint.

Other scholars (de Oliveira 2007; de Oliveira and Pagano 2006; Gil-Salom 2000-2001; Myers 2003) have also studied the ways writers and readers interact in both scientific research articles and science popularization articles. Gil-Salom (2000-2001) focuses on the structure followed by both genres and she notes that when interacting with the rest of the scientific community, science writers need to follow specific models of rhetoric organization as a way of corroborating that they all belong to the same community. For this same reason, the discursive distance between writers and their peers is less acute than in popularizations, the authors of which do not follow a specific structure (Gil-Salom 2000-2001) and they give more importance to the external sources of information than to their own, distancing themselves from the claims made (de Oliveira 2007; de Oliveira and Pagano 2006). Myers adds that the audience in popularizations interacts with popularization writers by evaluating those sources of information and also by "actively constructing believable or discreditable identities" (2003: 273).

There are several ways for writers to interact with their readers, engaging them in the conversation which is created along the text, guiding them through it and giving credibility to the information included. In the next section, these different ways of engaging the reader into the 'conversation' developed in the text will be addressed, with a special emphasis on evaluation, evidentiality and, most importantly, attribution, as one of the key devices for writers of popularizations to build relations with their potential readers. As stated before, evaluation needs to be mentioned since it is a way for writers and readers to establish interpersonal relationships; the writer is evaluating the information encoded and thus presenting it to the audience as such. In addition, as we will see in the next section, evidentiality gives the reader an indication of how reliable and credible the information is, thus taking that information as more or less valid, or more or less valuable. Finally, attribution, as the phenomenon through which we study

the inclusion of external voices into the text, also relates to the concepts of evaluation and evidentiality in the sense that depending on the source and on how important he/she is, the information will be more or less credible, reliable and valuable.

3.2 Evaluation, stance and appraisal: Approaching meaning interpersonally

According to Thompson and Hunston (2000), evaluation is considered the umbrella term which covers aspects such as the speaker's or writer's expression of his/her stance or attitude, viewpoint or feelings about the entities or propositions being addressed. The attitude might refer to "certainty or obligation or desirability or any of a number of other sets of values" (Thompson and Hunston 2000: 5). Hence, evaluation is the broad term and stance is one of the ways in which evaluation can be realized. Later on, Alba-Juez and Thompson (2014) revise the notions of evaluation and stance to assert that evaluation is the actual realization of the expression of the speaker's stance or attitude. From this perspective, stance is considered the abstract and umbrella term and evaluation would be the actual verbal realization or manifestation of stance. As seen, the concepts of evaluation and stance are different since, depending on the approach taken, one or the other is considered the umbrella term. Yet, they can also be addressed as interchangeable, interconnected and overlapping concepts, since both of them are used to express the speaker's or writer's attitude towards the entities being evaluated. Evaluation of entities can also be realized through appraisal, which is how evaluation is approached from a systemic functional view, and which is defined in very general terms as "the indication of whether the speaker thinks that something is good or bad" (Thompson 2004: 75). Martin and White (2005) very accurately summarize the different approaches followed to study evaluation by different scholars in the field:

APPROACHES TO EVALUATION	'entity focused'	'proposition focused'
Chafe and Nichols 1986		evidentiality
Ochs and Schiefflen 1989	affect specifiers	affect identifiers
Biber and Finnegan 1989	affect	evidentiality
Wierzbicka 1990	emotion	
Bybee and Fleischman 1995	evaluation	modality
Niemeier and Dirven 1997	emotion	
Conrad and Biber 2000	attitudinal stance	epistemic stance
Hunston and Thompson 2000	opinions about entities	opinions about propositions
Hunston 2000	'status' and 'value' on the autonomous plane	'status' and 'value' on the interactive plane

Table 1. Approaches to evaluation (Martin and White 2005: 39)

In the following subsections I will address the concepts of evaluation, stance and appraisal as separate concepts to better characterize them, but without forgetting that they are interrelated concepts which are used to evaluate entities in the world and propositions by speakers/writers.

3.2.1 The analysis of evaluation

In their book on evaluation Thompson and Hunston (2000) give a number of reasons why it is important to study evaluation, which are summarized as follows:

-To express opinion and points of view, "to tell the reader what the writer thinks or feels about something" (6).

-To maintain relations between writers and readers, to interact with the audience of a text by means of "exploiting the resources of evaluation to build a particular kind of relationship with the reader" (7).

-To organize the discourse, the writer telling the reader "this is the beginning of our text, that is how the argument fits together and this is the end of our interaction" (10).

A closer look into these three perspectives on the study of evaluation leads us to conclude that evaluation pervades the three metafunctions of language in systemic-functional terms. Through language we can express three different types of meaning (experiential, interpersonal and textual) and these three meanings can be evaluated by expressing opinions (evaluating the world; the experiential meaning), by maintaining relations (e.g. to manipulate the reader, to adjust the certainty of propositions or to show politeness; the interpersonal meaning) and by organizing the discourse (e.g. by presenting one idea as the reason for another idea; the textual meaning).

When analysing evaluation, we need to identify "signals of comparison, subjectivity, and social value" (Thompson and Hunston 2000: 13). Moreover, we need to analyse lexis (some lexical items may carry evaluative charge), grammar, and text, which has to be taken into account because evaluation "tends to be found throughout a text rather than being confined to one particular part of it" (Thompson and Hunston 2000: 19). These authors propose four general parameters to evaluate any entity, namely good-bad, certainty, expectedness, and importance. Through them, speakers/writers are able to express their views on the world.

Hunston (1994: 191-192, 2000) considers that to evaluate something is to have an opinion about it, particularly in terms of how good or bad it is. She contends that in any study of evaluation, it is necessary to distinguish between status and value, and between

the autonomous and interactive planes, so that we can explore "the different types of evaluation that are expressed and their relationship to the different things that are evaluated" (2000: 176). According to Hunston, in any given text "statements are of a particular type and they have a particular source" (2000: 177), providing them with a certain status. At the same time, these statements are given positive or negative value. Based on Sinclair's (1981) model of evaluation, Hunston further distinguishes between the autonomous and interactive planes. On the interactive plane, "the writer signals to the reader what the role of any particular proposition is in the larger meanings being expressed in the text as a whole" (2000: 176). Conversely, on the autonomous plane the writer evaluates the world, "looking at the text in terms of its content rather than of its construction" (176). Hunston (1994, 2000) explores the role of evaluation in persuasive texts and in written academic discourse by paying attention to how this phenomenon is conveyed in both the autonomous and the interactive planes, and how in both planes statements will be assigned different values depending on their status. She notes that on the interactive plane status is concerned with the evaluative parameter of certainty, assigning different degrees of certainty to any given proposition; that is, "the statements differ from each other largely in terms of how certain or uncertain they are" (2000: 202). Conversely, status on the autonomous plane, where the writer is evaluating the world, is evaluated "on the good-bad parameter as well as or instead of on the certain-uncertain parameter" (2000: 202). Hunston concludes that status and value should be defined not in terms of parameters of evaluation, but rather "in terms of presenting an entity and ascribing a quality to that entity" (202).

Several scholars (Biber and Finegan 1988; Channell 2000; Conrad and Biber 2000; Diani 2010; Thetela 1997) have focused their attention on the study of evaluation as it is conveyed in the lexical elements which appear in texts. Thetela (1997) states that

different entities can be assigned different values in any given text. She distinguishes between discourse entities and world entities in her analysis of evaluation in academic research articles, which corresponds to both Sinclair's and Hunston's distinction between the interactive plane and the autonomous plane, respectively. Thetela notices that in these articles two different types of evaluation can be carried out: Research-Oriented Evaluation (ROE) and Topic-Oriented Evaluation (TOE) (104-106). In the case of ROE, the writer is said to be observing the research, paying attention to how the discourse develops and how evaluation is constructed along that discourse; this corresponds to evaluation in the interactive plane. TOE refers to cases of evaluation on the autonomous plane, when the writer is observing the world and evaluating it.

Focusing now on the linguistic identification of evaluation, Channell has carried out a study of collocations and highlights that the use of collocational information is essential "to provide evidence for connotations that the reader may not have been aware of previously" (2000: 38). She emphasizes the fact that both semantics and pragmatics are essential to work out the meaning of a word, since she is discussing lexical items "which encode evaluation as part of their meaning, alongside other features, rather than those whose overt and only purpose is to evaluate" (2000: 40). It is necessary to pay attention to the words a specific item collocates with to see what particular effects those words can have on the evaluative load of a specific item and in the patterns of behaviour of that item.

Other research, such as Biber (2006), Biber and Finegan (1988), Conrad and Biber (2000) and Diani (2010), has focused on the study of adverbials, modal verbs and/or complement clauses for "speakers and writers to mark their personal 'stance'" (Conrad and Biber 2000: 57). Conrad and Biber have carried out a study on the use of these adverbials in conversation, academic prose and news reportage, reaching the conclusion

that these stance adverbials "have important social functions beyond simply marking the speaker's stance" (2000: 73). For instance, Biber (2006) asserts that the study of stance is also essential in university contexts to understand how language is used in these specific contexts, whereas Diani's study (2010) on the use of the adverbial *really* concludes that it is used as a writer's strategy to affirm the credibility or truth of a source.

Other studies have turned their attention to the study of grammar to analyse evaluation, and specifically "on the importance of patterns in the grammar and lexis of English" (Hunston and Sinclair 2000: 83). The importance of these patterns stems from the fact that from a systemic-functional viewpoint, grammar and lexis cannot be studied as separate phenomena, but together, by studying lexicogrammatical elements which construe evaluation in texts. Moon (1994) analyses some fixed expressions in English and how "they contribute to the content, structure and development of a text" (117). She points to the question of informing, modalizing, evaluating and organizing the text as the four main functions realized by fixed expressions in text, so that they are taken to be strategies adopted by the speaker/writer to communicate his/her message and to interact with his/her potential readers. Hunston and Sinclair propose the use of a local grammar, rather than a general one to study adjective patterns because local grammars "will assign category labels that are far more transparent and trustworthy than the highly general ones" (2000: 79) and because they also incorporate some valuable pragmatic parameters. They state that every single meaning of every word "can be described in terms of the patterns it commonly occurs in, with words which share a particular pattern typically also sharing a meaning" (2000: 83). This is very much related to the analysis carried out in this dissertation, since I analyse projection by paying attention to the projection clusters which are typically recurrent in popularizations and, as such,

assigning labels which are more useful and trustworthy for the purposes of the study. We could talk about 'a local lexicogrammar of science popularizations', with its own specific lexicogrammatical features which do not necessarily characterize other text genres.

Finally, as was previously outlined, evaluation can also serve the purpose of organizing the text, being best seen as working at the level of discourse rather than at the grammatical level (Thompson and Ye 1991). Thompson and Ye state that evaluation accumulates along the text rather than being explicitly signalled at specific points, "and it may depend crucially on context (including position within the text)" (1991: 367). This accumulation derives from a variety of textual features, which may (and often do) include discrete local features. One example is the use of adverbials with evaluative charge. Thompson and Zhou (2000) investigate how disjuncts are also related to text-structuring and not simply to establishing relationships between writers and their potential readers. They state that disjuncts are seen as "conjuncts with attitude" (2000: 124), since they are approached as not only including the writer's attitude or comments towards a certain proposition, but also as contributing to the structure of the text. Thompson and Zhou conclude that for the whole understanding of a text the concept of propositional coherence has to be complement to the concept of evaluative coherence, this entailing the recognition of disjuncts as playing an important role in the structure of a text. Thus, the conjunctive functions of disjuncts cannot be ignored, since they "invoke both the writer's presence and the writer's awareness of the reader, exploiting them to make what is in fact a monologue sound like a dialogue and thus achieving a more reader-friendly tone" (Thompson and Zhou 2000: 140). Some lexical items such as adverbs do not simply integrate evaluative charge, but they also give shape to the

general structure of the text by contributing to the interaction between writers and readers.

In the model of text organization developed by Labov and Waletzky (1967) and Labov (1972), evaluation plays an essential role. This model proposes that any clause in personal narratives presents two different functions: a referential and an evaluative function. The referential function alludes to what the story is about, whereas the evaluative function "communicates the meaning of the narrative by establishing some point of personal involvement" (Lavob and Waletzky 1967: 33 as quoted in Cortazzi and Jin 105)[3].

Cortazzi and Jin further elaborate and revise this model by proposing three layers of evaluation, where this phenomenon is not only occurring *in* narrative, but also *of* and *through* narrative. This three-layered view of evaluation implies that in any given text the audience is not only evaluating the story as such (evaluation *in* narrative). The evaluation of any narrative will also depend on the type of audience and its cultural background (evaluation *of* narrative) and, besides, these narratives are used by the teller/writer to project a specific persona in the text so that the audience will be evaluating that teller/writer at the same time (evaluation *through* narrative). They conclude that evaluation is a multi-layered phenomenon best approached from more than one angle. Apart from evaluating any story for its intrinsic value, linguistic and socio-cultural elements are also brought into the text, "speakers and hearers evaluating their individual and collective sense of self through the telling and hearing of stories", which implies that evaluating a narrative also means to take into account the several points of view through which that narrative is seen (Cortazzi and Jin 2000: 120).

[3] cf. Johnstone 2001

Along the same line, how narratives are evaluated can also be studied through Hoey's (1994) Problem-Solution structure in discourse (cf. Winter 1982, 1994). One common discourse structure in English is that of Situation-Problem-Solution (or Response)-Result-Evaluation. After analysing this pattern, Hoey argues that evaluative clauses appear along stories precisely where they do in order to provide an incentive for the reader to read on. Besides, by providing a Solution to the presented Problem and also by evaluating it, the writer encourages the reader to find out more about that Solution and why it was evaluated as such (1994: 40-42). Hoey states that this structure is common in popular scientific texts, and specifically those ones in which the journalist is reporting someone else's work, by "offering either an evaluation and then a reason for that evaluation and [its] basis, or the situation is presented first, and then evaluated" (Hoey 2000: 32), as is the case of the example (2) below, taken from the corpus used in this investigation:

> (2) As the plague swept through London, the parishes recorded the disaster in elegantly neat handwriting. **Though one page reveals a very human tragedy**: "In the middle of one week the handwriting changes completely," the librarian Isabelle Chevallot pointed out. "The clerk was dead." (TG_Sci_166)

In this example, the journalist narrates about all the handwriting recorded about the Great Plague in London, and introduces his/her own evaluation in the narration. After evaluating the situation, the journalist, by reporting an expert's words, justifies and gives a basis for that evaluation. In the example, the evaluation of that piece of handwriting as a 'very human tragedy' is explicitly present but also open to question by the readers. Because of this, the journalist provides a reason for that evaluation. However, Hoey (2000) also contends that evaluation can be presented as "defused of its powers" by placing it in a rank lower than the sentence (2000: 33), by what he calls "the

Emperor's new clothes gambit". This evaluation is taken for granted and, therefore, not open to question. In the previous example, the adverb and adjective "elegantly neat" to describe the noun "handwriting" are presented as taken for granted, as given information or common ground, by placing them in premodified position (Hoey 2000: 33), and the same can be said about the use of the evaluative noun 'disaster' to describe the plague. Similar examples can be found in the analysis made by Elorza and Pérez-Veneros (2014a). Finally, we can also observe an example of evaluation structuring the text through the conjunction 'though'. Even if typically this conjunction presents an intrasentential function, in this case the evaluation is made intersententially, so that it affects the structure of the text more than working at sentence level.

We can conclude that evaluation is a powerful device which can be displayed in more than one way, not just at the lexical level, through words which are evaluative *per se* (Biber 2006; Biber and Finegan 1988; Channell 2000; Conrad and Biber 2000; Diani 2010) but also through grammatical structures (Hunston and Sinclair 2000) and throughout the structure of a text/narrative (Cortazzi and Jin 2000). As Hunston very clearly puts it, "the ideological space of a discourse is constructed both by the way the world is labeled and by the way the argument is constructed" (2000: 205). Evaluation is important because it plays an essential role in constructing the ideology of any text and because it also contributes to the organization of a text, presenting information in such a way that evaluation appears where the reader needs it to have a clearer idea of the value of that information. Through evaluation, the writer not only talks about and evaluates the entities in the world, but also interacts with his/her readers, by indicating how entities are evaluated in texts. In addition, evaluation also serves the purpose of organizing the text, the writer guiding the reader through it by signalling the beginning

of the narrative, how the different arguments fit in, and what the conclusion and evaluation of those narratives are.

3.2.2 Stance

Several scholars (Bednarek 2006a; Biber 2006; Biber and Finegan 1988; Conrad and Biber 2000; Silver 2003) have focused on the analysis of stance. As Bednarek very accurately defines it, stance is considered:

> The overt expression of the speaker's attitudes, feelings, judgments, or commitment concerning his/her message, including the indication of the speaker's degree of commitment towards the truthfulness of the message (Bednarek 2006a: 25).

As seen from this definition, stance not only deals with the expression of the teller's/writer's attitude, feelings and so on towards a specific piece of information, but it also includes the degree of certainty which can be assigned to that information, whether the speaker/writer is more or less sure about what he/she is talking about and to what extent the information is true or not. Three different categories of stance are established (Bednarek 2006a; Conrad and Biber 2000):

-*Epistemic stance*: It includes speakers/writers' comments on the certainty, doubt, reliability, or limitations of a proposition and is thus related to both modality and evidentiality. Epistemic stance also includes the commitment towards the reliability and certainty of the message (Bednarek 2006a).

-*Attitudinal stance*: It conveys speakers/writers' attitudes, feelings, or value judgments, including both evaluation and emotions of all kinds. Attitudinal stance is similar to what

Martin and White (2005) consider appraisal, so it will be dealt with in the following section.

-*Style stance*: It is concerned with how the information is presented and on the manner of speaking. The lexical items comprised in this category of stance state the way in which information is being presented or is meant to be understood; e.g. *honestly, literally, more simply, put briefly* (Conrad and Biber 2000).

The three categories of stance are intimately related through the three functions of evaluation previously presented, again proving that evaluation and stance are two different yet closely interconnected concepts. Through the expression of the degrees of certainty, credibility and truthfulness of the information (epistemic stance) we are establishing relations with our reader/listener and interacting with him/her. When talking about our feelings, attitude and view on the world (attitudinal stance), we are evaluating that world and presenting it to our interlocutor(s). Finally, there are also some linguistic devices which help us organize the text (style stance), evaluating its structure and presenting it in such a way that it can have the expected effect on our reader/listener.

Focusing our attention on how stance is linguistically realized, Biber and Finegan (1988: 7-8) make a distinction among six semantic categories of stance adverbials:

-*Honestly* adverbials: They express the manner of speaking.

-*Generally* adverbials: They express approximation, generalization, typical or usual case.

-*Surely* adverbials: They express conviction or certainty.

-*Actually* adverbials: They express actuality, emphasis, greater certainty/truth than expected.

-*Maybe* adverbials: They express possibility, likelihood, questionable assertions, hedging.

-*Amazingly* adverbials: They express attitudes towards the content independent of the epistemological status.

These six categories of stance adverbials are related to the three stance categories previously described. *Honestly* adverbials are used to express style stance, while *generally, surely, actually,* and *maybe* adverbials convey epistemic stance. Finally, *amazingly* adverbials serve the purpose of expressing attitudinal stance, linked to the concept of appraisal, which is dealt with in the next subsection.

3.2.3 Appraisal

Appraisal is defined by Thompson as "the indication of whether the speaker thinks that something is good or bad, the good or bad scale seen as the simplest and most basic one" (2004: 75). This approach to the study of evaluation deals with the semantic resources used to negotiate emotions, judgments and valuations, alongside resources for amplifying and engaging with these evaluations (Martin 2000). As Thompson asserts, appraisal is mainly expressed by lexical choices, leaving aside grammatical structures for the evaluation of meaning (2004: 75). However, he notes that appraisal contributes mainly to construe the interpersonal meaning, since it is one more way for the writer/speaker to establish relationships with their potential interlocutors.

Appraisal Theory has been fully developed by Martin and White (2005) and it revolves around the analysis of a number of resources at the writer's/speaker's disposal to interact with their potential readers/listeners, to create a persona in the text and to express his/her positioning towards the information included. Martin and White distinguish three different functions of Appraisal which help us convey a personal alignment: an attitudinal positioning, a dialogic positioning (positioning towards real or potential interlocutors), and an intertextual positioning. Appraisal Theory is related to interpersonal meaning, "by attending to three axes along which the speaker's/writer's intersubjective stance may vary" (Martin and White 2005: 1). These three axes or domains along which the speaker/writer expresses his/her stance towards the information are called 'attitude', 'engagement', and 'graduation'.

Attitude deals with our attitudinal positioning, "our feelings, including emotional reactions, judgments of behaviour, and evaluation of things" (Martin and White 2005: 35). Attitude is itself divided into three subcategories:

-*Affect:* Resources for construing emotional reactions.

-*Judgment:* Resources for assessing behaviour according to various normative principles.

-*Appreciation:* Resources for construing the value of things, including natural phenomena and semiosis.

Engagement deals with the linguistic resources which are used for the speaker/writer to position himself/herself dialogically towards the information included in a text (Kaplan 2004: 67, my translation). Martin and White define Engagement as:

> The ways in which resources such as projection, modality, polarity, concession, and various comment adverbials position the speaker/writer with respect to the value position being advanced and with respect to potential responses to that value position – by quoting or reporting, acknowledging a possibility, denying, countering, affirming and so on (Martin and White 2005: 36).

Contrary to Attitude, Engagement does not entail the showing of emotions, but rather the speaker/writer showing where he/she stands in relation to the information provided, thus Engagement addresses the notions of evidentiality, attribution and epistemological positioning.

Last but not least, *Graduation* deals with the way in which speakers/writers intensify or lessen the strength of their propositions intertextually (Kaplan 2004: 72, my translation). Graduation "has to do with adjusting the degree of an evaluation" (Martin and White 2005: 37) in the Attitude axis. This type of graduation is called *force*, and it includes intensification, comparative and superlative morphology, repetition, and some graphological and phonological features:

raise *so touchy, infinitely more naked, quite clinical, most dangerous*

lower *a little upset, somewhat upset, the least bit more information*

When the resources of graduation are non-gradable, then "graduation has the effect of adjusting the strength of boundaries between categories, constructing core and peripheral types of things" (Martin and White 2005: 37). This type is called *focus* and it is exemplified as:

sharpen *a fully-fledged, award-winning, gold-plated monster; all alone*

soften *a word…spelled somewhat like terrorists; about 60 years old*

(Martin and White 2005: 37)

In a nutshell, evaluation, stance and appraisal serve the purpose of evaluating the way in which we express our view on the world, engage and interact with people and organize our discourse. While appraisal and stance focus more specifically on the lexical items which are used to evaluate entities, the concept of evaluation also covers grammatical structures and how the text is structured in such a way that it is by means of the combination of all that evaluation is achieved. Evaluation is necessary in this study in order to analyse how the journalist conveys his/her alignment on the information and how that information is evaluated through the inclusion of external sources into the text. Stance and appraisal were not considered for my analysis because I aim at studying how journalists evaluate the information they integrate by the inclusion of authorized sources of knowledge. One of the main characteristics of science popularizations is their polyphonic nature and, as such, the main objective is to analyse how evaluation is construed by means of sourcing, by how, when, and where external voices are incorporated into the text.

Due to this inclusion of external sources to justify science journalists' alignment towards scientific information, the next sections are devoted to the notions of epistemological positioning, expressed through sourcing and evidentiality, since they are concerned with how the speaker/writer positions him/herself towards the truthfulness and credibility of the information by attributing it to specific sources and by giving a basis for that information, respectively. The last section of this chapter deals with the notion of attribution, which is very much related to epistemological positioning and evidentiality, and which also deals with the source of knowledge or information given, whether that source is the writer/speaker him/herself or an external one.

3.3 Epistemological positioning: Evidentiality and sourcing

Epistemological positioning mainly deals with the question of sourcing although, as Bednarek (2006b: 636-637) states, it also overlaps with the notion of evidentiality and, as such, she distinguishes between the subcategories of certainty of knowledge (epistemic modality and sourcing) and basis of knowledge (evidentiality). Therefore, epistemological positioning is more productively envisaged by describing the phenomena of sourcing (source of knowledge) and evidentiality (basis of knowledge) as constantly overlapping and interplaying with each other.

The term evidentiality was first coined by Chafe (1986) as one of the "epistemological considerations that can be coded linguistically in English" (262). In very broad terms, Chafe defines evidentiality as "attitudes towards knowledge" (262). This knowledge can be regarded by the speaker or hearer as more or less reliable, depending both on the source and on the basis of it. Chafe proposes a classification of types of evidentiality in relation to where that knowledge comes from (sourcing), and which is very much related to the classification Bednarek (2006b: 640-643) proposes later on for the different bases of knowledge people have. Chafe distinguishes between:

-Belief: People believe in things because other people believe in them, too, or simply because they want to. Normally, there is no source for that belief and, if any, it is the self, and not an external source of knowledge. Bednarek talks about obviousness, since the basis of knowledge is obvious or self-sourced, and also about general knowledge, being background knowledge shared by both the audience and the writer.

-Induction: People infer information by relying on some evidence whose source is not the self, but an external one and which is normally perceived through sensory perception, mental perception or showing (cf. Bednarek 2006b). As such, the expression

of induction is linguistically realized through verbs linked to the five senses, such as *see, hear,* or *feel*. Bednarek also considers induction or proof, as she calls it, those propositions which are based on some sort of hard proof, such as *tests found*.

-Deduction: It is defined as the invention of models "which predict what will count as evidence" (Chafe 1986: 269). It involves the formulation of a hypothesis from which some conclusions about evidence can be deduced. Modal verbs such as *should* or *can/could* and adverbials such as *presumably* are ways for deduction to be encoded linguistically. Bednarek (2006b) notes that expressions such as *it emerged that* or *it turned out that* are deductions because, even if the source is unspecified, the audience can still deduce that there was some source of knowledge present.

-Hearsay: The knowledge comes from external sources of information and people get that knowledge through language, when someone tells us about it, or mentally (cf. Bednarek 2006b on *mindsay* as a source of knowledge). The knowledge thus derived is attributable to some source of information other than the self.

How evidentiality is conveyed influences the way the interaction between the writer and the audience is constructed and how the information is interpreted, the value ascribed to that information and the degree of knowledge and certainty of the proposition (Díaz Rojo 2007; López Ferrero 2001). Depending on the basis of knowledge, the proposition expressed will present a higher or lower degree of credibility and reliability. It is not the same to know something because you simply believe it and there is no basis for that belief than to know something because you have been a witness of it or you have heard it. As Cornillie very clearly puts it, evidentiality refers to the reasoning processes that lead to a proposition while epistemic modality evaluates the likelihood that this proposition is true (2009: 46-47).

Another crucial aspect is that evidentiality construes social meaning. Kim states that "the choice of the speaker's evidential marking is relative and interactively organized" (2005: 87). As such, depending on the context, the speaker/writer will make use of different markers of evidentiality depending on who the recipient is, "claiming different degrees of authority, responsibility and entitlement" (88). Kim (2005: 104) argues that the choice of these evidential markers do not only rely on the original source of information, on where the knowledge comes from, but also on the context and the participants who shape the communicative situation the speaker/writer is immersed in.

Journalistic discourse and, in this case, popularizations are characterized by their polyphonic nature because, apart from the fact that news is what people say more than what people do (Bell 1991; Semino 2009), journalists are hardly ever witnesses to the events they are narrating. Thus, their knowledge comes not from direct contact with the events under comment, but from other people whose words they are reproducing. In the case of popularizations, scientific knowledge is thus based on what journalists have read or have been told by experts in the field. In Bednarek's (2006b) terms, journalists' basis of knowledge is hearsay basis, also known as attribution.

As such, in the next section, the phenomenon of attribution will be addressed as the main way through which journalists construct their epistemological positioning in newspaper discourse. Attribution is considered the milestone strategy writers of popularizations have at their disposal to align or detach from the information included, whilst at the same time establishing social relations with their audience.

3.4 Sourcing: Attribution and averral

When reading a text, whether it is for leisure or with more academic or professional purposes in mind, the audience typically expects to hear the voice of the author or writer of that text as the main voice guiding them through it. This would be the 'normal' situation and what everybody should expect of any text-type, the unmarked option chosen or the "by default" voice (Williams 2010: 627). Following the "good reason principle", this unmarked option of interpretation is the one readers opt to choose "unless there is good reason to choose otherwise" (de Beaugrande 1991: 237). As Monika Fludernik states, the reader in fact "constructs a narrator's voice as a default value [and then] experiences an evocation of figural voices on that background" (1993: 350). Under normal conditions and not being told otherwise, the reader assumes that it is the writer's voice the one which is heard alongside the text and, alternatively, the writer assumes the reader's ability to recognize the default settings which are established (Tadros 1994: 74-76; Williams 2010: 628).

Nevertheless, as Fludernik suggests, apart from the narrator's default voice construed by the reader, some other voices are evoked on the background of that narratorial voice. This is so because among the decisions the writer takes when building a new text, he/she has to choose from among the range of available options for how that voice is going to be introduced and construed. This phenomenon of the inclusion of external voices to the text has been labeled attribution (Bednarek 2006a, 2006b; Charles 2006; Hunston 2000; Martin and White 2005; Sinclair 1986). Hunston (2000: 178) posits that when a piece of language is attributed, it is presented as deriving from someone other than the author of the text in which that piece of language is included.

Martin and White define attribution as "those formulations which disassociate the propositions from the text's internal authorial voice by attributing it to some external source" (2005: 111). The proposition known to be attributed to someone external to the text is thus framed through the use of communicative process verbs, as can be seen in example (3) from the *TG_Sci* corpus:

> (3) Dr Aaron MacNeil, a co-author on the study from the Australian Institute of Marine Science, said: "This gives reef management a major boost in the face of the threats posed by climate change and, encouragingly, suggests people can take tangible steps to improve the outlook for reefs […] (TG_Sci_97)

As can be seen in this example, the information included between quotation marks derives not from the author of the text, but from someone else, in this case one of the co-authors of the study from the Australian Institute for Marine Science, Aaron MacNeil. The author of the text clearly signals that he (the writer is Adam Vaughan) is not the one uttering those words, but an outer source who is presented as an expert on the issue under comment.

In order to describe the writer's own voice in text, some authors (Bednarek 2006b; Charles 2006; Hunston 2000; Tadros 1994) have relied on the concept of *averral*, as the phenomenon by which the self, the author of the text, is giving shape to his/her own voice instead of including other voices. Furthermore, Hunston, based on previous studies by Sinclair (1986), assumes that there is still a complicating factor when trying to distinguish between averral and attribution, since all attributions are ultimately averred in the sense that the writer is the one in charge of deciding when to include the voices of the external sources of information. Even if those voices do not belong to the writer, it is his/her voice which serves the purpose of framing the new propositions coming from those outside sources and which help shape the discourse of the author.

Susan Hunston (2000), in her study on the use of evaluation in persuasive texts, delves into the question of how all sentences in a text have a source (status) and, depending on that status, they are ascribed some specific value. She makes a distinction between attribution and averral, the first being addressed as the writer's delegation of responsibility for what is attributed to the attributee, and the last defined as the writer assuming responsibility for what is averred. She also states that if an averral is in some way modified, then it is comparable to attribution. Alternatively, if an attribution is in some way modified, then there is more responsibility on the part of the writer, thus being similar to an averral. In relation to the different sources a statement originates from, she distinguishes between self as source and other as source (2000: 189-192). In self as source, the source is the writer, and Hunston points out that we can find three different types of reports:

-Averred (sourced and non-sourced).

-Emphasized: Attribution made to the self, and we find both reporting and reported clauses.

-Hidden: The writer attributes the proposition elsewhere:

- General attribution: Statements attributed to people in general *(one can argue).*
- Internal attribution: Statements attributed to writers' own work, or to a feature of it. In her words, the main function of this type of averral is "to set-up an 'in-group' of like-minded people, to which the reader is positioned as belonging, and thus to construct consensus (191).

-Averral without attribution: Averral of a proposition without attributing it to a source *(it can be seen).*

Other-sourced reports are characterised by their source being attributed outside the thesis writer, and she distinguishes between:

-Attribution: responsibility relegated.

-Attribution: responsibility reclaimed, by choosing some specific reporting verbs that signals agreement, such as *prove, point out* or *show*.

Maggie Charles, in her work on the use of reporting clauses in the study of theses (2006), also deals with Sinclair's (1986) and Hunston's (2000) notion of attribution and averral. She states that writers are assumed to aver and thus take responsibility for all the propositions included in a text as long as there is no indication that those propositions come from a different source. If that is so, then the propositions and the responsibility for uttering them are attributed to someone external to the text. As Charles further argues (2006: 494), the writer can also decide whether to attribute certain information to an external source or not, when and to which sources that information is attributed. Thus, and also in accordance to Sinclair's view, all attributions are also averred, since the author of the text is in charge of deciding if a piece of information is attributable to someone else or not. As Hunston posits, "every attribution is embedded within an averral" (2000: 179), as the writer is the ultimate source of information.

Charles follows the classification previously established by Hunston (see above) in order to classify the different voices which appear in a text, making a distinction between self-sourced reports and other-sourced reports as sources for the information. She sub-classifies self-sourced reports into:

-Emphasized averral: The writer stresses he/she is the source of the proposition by overtly attributing it to him/herself and thus taking responsibility for its reliability. In

this case, the two more frequent human subjects are *I* and *we*, the last one being divided into two categories:

- Exclusive *we*: The writer is responsible for the proposition, but he/she is not as visible as when using the pronoun *I*. It helps the writer to show academic modesty, making "potentially threatening statements more acceptable to the disciplinary community" (2006: 507).
- Inclusive *we*: The writer creates consensus with the reader, since the audience is included in what the writer states (2006: 508).

-Hidden averral: The writer obscures his/her responsibility for a proposition by attributing it elsewhere:

- General attribution: The statement is attributed to people in general.
- Internal attribution: Writers attribute the statement to their own work *(*e.g. *chapter 3 reported...)*.

-Averral without attribution: The writer avers a proposition without attributing it to a source and thus the reader is in charge of inferring that the writer is the source of the proposition.

Other-sourced reports are defined as those where the source is attributed outside the thesis writer and can be divided into:

-Research reports: Reference to the works of others in the same field of knowledge.

-Non-research reports: The source is not part of the work of the discipline.

Bednarek (2006b) also deals with the notions of attribution and averral as defined by Sinclair (1986) and Hunston (2000) although, regarding averrals, she distinguishes

between based and non-based averrals. She also links the phenomenon of attribution to that of evidentiality. Thus, if some of the propositions included in a text are presented as deriving from someone other than the writer of that text, then the writer needs to give some information about the basis of self's knowledge (Bednarek 2006b: 643). The writer needs to indicate if that information has been expressed by a third party either linguistically, by a hearsay marker of evidentiality (Bednarek 2006b; Chafe 1986; Clift 2006; Cornillie 2009) or rather mentally, by a mindsay marker. If we follow a systemic-functional perspective, as proposed by Halliday and Matthiessen (2004), the participants associated to different verbal processes are labeled either as 'Sayer' (2004: 252), when language has been uttered, or 'Senser', when the piece of language has been thought, felt or experienced (2004: 201).

Bednarek further distinguishes between based and non-based averrals, the distinction relying on the fact that in the case of based averrals there is some indication about the evidential basis of the writer, although that basis is not the Other, but rather "the writer's interpretation of data" (2006b: 647). She argues that attributions and based averrals are envisaged as situated "on a cline of subjectivity depending on whether the sources and bases of propositions are construed as external or internal" (2006b: 649).

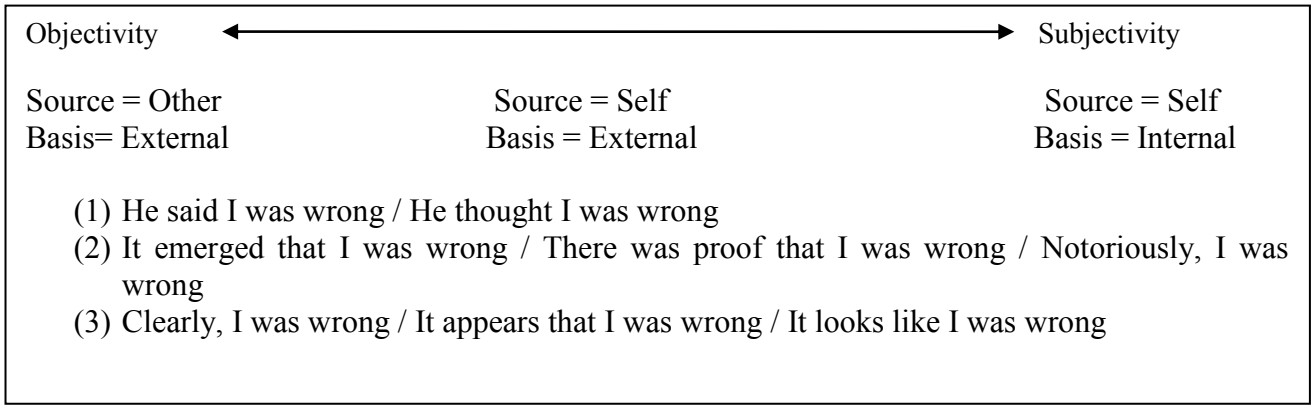

Figure 2. Cline of subjectivity (Bednarek 2006b: 649)

Apart from needing a basis for that knowledge, Bednarek also states that to have a more complete and thorough view of this interplay between attribution and averral, we also need to take into account the degree of certainty of the information presented as deriving from a voice external to the text. The person including some words which come from an outer source needs to include information about the basis of that knowledge and also about the degree of certainty of the information he/she is talking about.

Caldas-Coulthard (1994) relies on Sinclair's (1986) definition of fact. According to Sinclair's view, a *fact* is a state of affairs in the world which does not require to be verbalized. However, when we want to refer to facts, when we want to make them verbalized, this is what he terms as *averral*. Caldas-Coulthard deals with this notion of averral in her study. When a speaker wants to refer to a state of affairs in the world, he/she avers that information. In contrast, when that speaker wants to make reference to the words uttered by others, he/she is only able to aver that the other speaker said something but not the factuality of the words uttered by that speaker (1994: 299). She does not make reference to the phenomenon of attribution, but only to that of averral, stating that there are two different averrals when the speaker/writer refers to the words of others. The two averrals are presented as one depending on the other (1994: 302). Coulthard (1994: 5-6) also aligns with this position when he points out that the truth always lies within the averrer, but that this averrer may or may not be the writer. At some points, the role of averrer can be transferred to an external participant who is the source of the information. Nevertheless, even in these cases, the author is still responsible for giving the role of averrer to those external sources and, as Coulthard indicates, the writer is ultimately stating that readers are reading his/her own text to

know what he/she thinks even if sometimes "I use other voices to help me to express my views" (1994: 6).

With this idea of one averrer in mind, Caldas-Coulthard further elaborates on the issue by delving into the distinction between *fact* and *fiction* (1994: 302). She argues that newspapers are supposed to report facts, the basis of knowledge being either hearsay or some sort of proof, normally sensory perception. They talk about the autonomous plane (Hunston 2000), entities which exist in the world (Thetela 1997) and which can be evaluated. In this case, most people believe what they read. However, factual reports may not be true. The main difference between factual and fictional reports of speech is that in a factual report the writer's words or the writer's averral depend on the words uttered elsewhere. We could be talking about two averrals, one depending on the other. In the case of fictional reports, the writer avers in his/her own voice, and the things averred may refer to the real world or not. However, fictional reporters may refer to the real world or could base their narrations on real-world happenings. Conversely, factual reporters, who are always supposed to report things happening in the real world, may actually distort that reality because the reproduction of the words previously uttered may not be as accurate and faithful to the original event as readers might expect. That is why the two worlds of fact and fiction can merge in what Caldas-Coulthard calls the world of "factionals".

According to Caldas-Coulthard (1994: 303-304) when writers of news use both direct and indirect speech to report the words of others, they do it to provide traces of reliability and legitimization of the information. However, this constant referring back to what others said (what she calls "recursiveness") may blur or distort the real facts happening in the real world and what is transmitted in news may be as fictionalized as any work of fiction. She points out that in direct reports, as we have mentioned before,

the author is providing the text with features of reliability and faithfulness to the original speech event. In the case of indirect reports, however, the narrator is integrating the words of others into his/her own discourse, so he/she is in complete control of the words of others and there is "not even the pretense that the voice of the character is heard" (1994: 304). Nevertheless, it could be argued that in both cases (direct and indirect speech) the narrator is always controlling the information he/she is including and faithfulness to the original words uttered can always be questioned. This "factional" world which is created in news reports is therefore understood by Caldas-Coulthard as a meeting point for fact and fiction. Reporters are supposed to be reporting facts happening in the real world, but the fact of reporting may distort the information presented and make it to appear as if it were fiction. And this is the case for both the use of direct and indirect speech as devices for reproducing other people's words.

Some other authors have focused on attribution in spoken discourse, although studies on this territory have not been developed as much as the ones written on discourse. Ädel has carried out a study on the role of attribution in spoken academic discourse. She defines attribution as the act of referring to a source by ascribing some propositional material to it (2008: 84). In her work, only expert, third-person attribution is considered, because, according to her study, this is the prototypical category used in academic discourse. She distinguishes among three types of formal realization of attribution (93):

-A reporting verb: This is the unmarked type, and the most common.

-Nominal type of attribution: It involves nouns such as *statement, claim*, etc. According to her results, this type of nominalization is largely avoided in lectures.

-Prepositional type of attribution: It involves the use of *according to, for*, etc. According to her analysis, this type is also quite rare in academic spoken discourse.

Her findings show that attribution in university classroom discourse is mainly self-reflexive. Lecturers try to avoid citation in order not to "weaken their authoritative voice" (88). They mainly use attribution to place the topic in a historical context; to show that a topic is debated/debatable; to illustrate agency behind research; to transfer responsibility for what is said; to support a point of view; and to demonstrate familiarity (100).

As was stated at the beginning of this section, when readers are dealing with a text, unless otherwise indicated, the voice they are listening to is the voice of the writer of that text. When this is not the case, the phenomenon of attribution comes into play and readers listen to other voices as giving the information included. As Williams (2010: 619) posits, at any stage of the written production readers should not hold any reasonable doubt about the information deriving either from the writer of that text or from other source. Nevertheless, in his work, he deals with a special type of attribution, which he calls *implicit attribution*, and which makes reference to "an attribution correctly inferred where no source authorship is actually asserted in the sentence" (617). He works with this concept to try to give answer to the question of why attribution is so much present in some genres, while merely implicit or non-existent in others. He states that implicit attribution appears in cases where the information transmitted can be assumed to be known by the public, belonging to their general knowledge of the world. He concludes that whenever we find cases of implicit attribution, there is always some mention of a source. However, and according to Posner (2007; cf. Williams 2010), there are some cases where, even if they involve a fidelity violation, there has been no objection to these practises. These are the cases of legal briefs in the US, basic-level textbooks, and other textbooks, where the information included is part of the shared

knowledge of the community and thus it is not necessary to make reference to the original source.

There have been numerous studies (Beke 2008; Gallardo 1999; Hyland 1999; Massi 2005) which have focussed on attribution as contributing to the features of credibility and objectivity to the information included, as supporting or refuting that information and, as was previously seen, as engaging readers with the text. As Hyland puts it, whenever attribution is used in a text, the writer is able "to display an allegiance to a particular community or orientation, to create a rhetorical gap for his or her research, and to establish a credible writer ethos" (1999: 342). This notion of the creation of a writer ethos is related to the integration of a new discourse into the discourse of the writer (Massi 2005: 6). Massi calls this phenomenon "overlapping of discourse" by means of which the writer integrates new meaning into the text, making it possible for the author to appropriate the voice of the others and to establish his/her own ideological positioning towards that knowledge.

Both Beke (2008) and Massi (2005) agree on the fact that attribution contributes to the soundness of the arguments and the knowledge transmitted. The writer, by the inclusion of external sources of information, wants his/her reader to see that he/she is well-documented and has studied and analysed the topic in such a way that he/she is able to talk about it, including authorised sources of information which corroborate his/her expertise and updating the issue narrated. Beke (2008: 16) also notes that attribution is used to present a topic by making reference to previous or background knowledge which is already established. At the same time, the writer can show that there are some research gaps which still need to be fulfilled, thus justifying the investigation carried out. Finally, by attributing material to external and authorized sources, the writer can support his/her own view on the issue investigated, demonstrating that what he/she is

telling is the truth, that it is credible because experts have previously agreed on it. Conversely, writers can introduce these sources of attribution to refute what they state, to detach themselves from the information presented (Gallardo 1999: 60) and thus to present his/her epistemological positioning as the alternative and 'good' view on things.

The functions of attribution depend on the context of situation and the text genre which is the focus of the study. In science popularization articles, being considered transmitters of scientific knowledge in a factual way, the attribution of information to external sources plays the role of justifying and supporting that information in an objective way. Furthermore, science journalists want to provide the text with features of credibility, reliability and faithfulness to the original language event (Hyland 2009, 2010; Thompson 1996). As Parkinson and Adendorff posit, the appearance of objectivity in popularizations is achieved by relying on the utterances of experts more than on the writer's opinion (2004: 388). These authors point out that interpersonal relationships in popular science are constructed by focusing on the integration of external sources of information more than on the information by itself. Readers in popularizations expect authorized and expert sources to give credibility to the knowledge integrated and journalists interact with their audiences by including them in their discourse. Nevertheless, as Dahl and Fløttum posit, it is actually the journalist who is in charge of deciding when and how to include those voices and whose words are most important, thus "taking a position in mediating a specific stand" (2014: 410). As such, integrating voices into their texts is the way journalists have at their disposal to align or detach from the information included, since popularizations are expected to be factual and objective, without presenting explicit evaluation of the information. Hence, my claim here is that attribution is a double-edged sword, both providing the text with traces of objectivity but, at the same time, contributing to the writer's epistemological

positioning and the building of relations with his/her potential reader. In this chapter, an approach to attribution and averral from an interpersonal viewpoint has been outlined, by considering attribution an interpersonal element through which journalists establish relationships with their audience while positioning themselves towards the information encoded. However, studying attribution interpersonally is not the only way of analysing how writers construe evaluative meanings in text.

Hence, the next chapter will be devoted to analysing how attribution and averral are realized as meanings construed from an experiential viewpoint. As such, I will explore the phenomenon of projection as the main realization of attribution and averral from a systemic functional perspective. Furthermore, I will also present other approaches to the study of attribution, mainly focusing on what from a traditional grammar perspective has been termed reported speech. Through the analysis of this more traditional approach, we will get a more complete picture of the phenomenon of attribution and how the reference to other people's voices can be approached and analysed from different perspectives. Together with the analysis of the different approaches to classifying the (re)presentations of speech, I will also discuss the participants and the verbal and mental processes which, together with the various speech presentations, comprise the projection clusters analysed from an experiential viewpoint to get a better picture of how journalists construe attributed meanings in text.

Chapter 4
The experiential construal of attribution and averral

In the previous chapter, the phenomenon of attribution was discussed and how it can be considered an umbrella term for those situations where the speaker/writer gives voice to someone who is not him/herself, bringing a new voice into the text and either reproducing or rephrasing his/her words. In this chapter, I will discuss the phenomenon of verbal projection as the main realization of attribution from a systemic-functional perspective. I will further explore other more traditional approaches to the phenomenon of attribution, such as the notion of reported speech and how it has been addressed and studied from a traditional grammar perspective. The modes of projection presented here, in combination with other models for the presentation of reported language, are one of the lexicogrammatical resources analysed in this dissertation. I will also focus on the verbal and mental processes related to attribution, and the types of participant associated with them, as the other two strategies used by journalists to integrate external sources of attribution and which, together with verbal projection, make up the projection clusters which are the object of my analysis.

Thompson (1994b: 151-152) points out that, in broad terms, in newspaper discourse the journalist's opinion and attitude is not explicitly present in the text. However, he/she can choose who to report and where in the text to include those words; and this very often suggests a certain position towards the information, even if it is not explicitly conveyed. The study of attribution and how it is realized in science popularization

articles will help us better characterize how this phenomenon materializes in science dissemination in the press and to what extent it contributes to the writer's epistemological positioning and his/her visibility in the text. The inclusion of those external voices, apart from supporting and giving credibility to the scientific issue under analysis, also serves the purpose of enhancing or diminishing the writer's visibility throughout the text.

4.1 The construal of projected meanings

From a systemic functional viewpoint, there are three basic meanings that can be construed through language. One is experiential, conveyed when we use language to talk about the external world, to narrate our experiences in the outer world, and also to talk about the world in our minds, representing the speaker's meaning potential as an observer (Halliday 1978: 112). In turn, we can also use language not to represent the world in a direct way but, as Halliday and Matthiessen (2004: 441) put it, to give "our representation of a previous (linguistic) representation". Thompson (2004: 210) points out that the phenomenon of projection manifests itself in this double layer, since we are representing and therefore projecting a previous representation of the world, and signaling that that stretch of language is not our own even if, at the same time, "it clearly differs from the original utterance in that it is now incorporated into our present message rather than coming straight from the original source" (Thompson 2004: 210). Halliday and Matthiessen (2004: 442) point to some of the functions of projection, such as to attribute information to sources in news reporting, to include different views and opinions in scientific discourse, to construct dialogue, or to frame some questions in

conversation (cf. Chapter 3 on the functions of attribution). They also point out that there are three different systems for the distinction of three types of projection, namely:

-The level of projection: Since projection implies that one clause is set up as the representation of the content of a previous clause, this projection can represent the content of a 'mental' process and these projections are named **ideas**. Conversely, projection can also represent the content of a 'verbal' process and these projections are called **locutions** (cf. Thompson 2004).

-The mode of projection: Projection combines with the two interdependency relations of **hypotaxis** and **parataxis**, and with the constituency relation of **embedding**. Words which are paratactically projected are **quotes**, while words which are hypotactically projected are **reports**. We can also find embedded projection, as in example (4): *the witness' claim that she saw one young man open fire seems plausible* (Halliday and Matthiessen 2004: 443). As these authors state, while hypotaxis and parataxis are relations between clauses, embedding is "a semogenic mechanism whereby a clause or phrase comes to function as a constituent of a clause" (2004: 426). Hence, the relationship between the main clause and the embedded clause is an indirect one; typically it functions as Postmodifier in a nominal group, as Head of a nominal group, or as a Postmodifier in an Adverbial group. Nouns of projection with embedded fact and nouns of fact with embedded fact, as we will see later on, represent cases of embedding in the *TG_Sci* corpus.

-The speech function: We can project different types of speech functions. As such, the projection of a statement is a projected **proposition**, while the projection of an offer, a command or a request is a projected **proposal** (Halliday and Matthiessen 2004: 444).

Thompson's (2004) concept of projection is based on Halliday and Matthiessen's (2004) one. He also distinguishes between quotes and reports as the mode of projection to represent a previous (re)presentation of the world. Quotes imply a more or less accurate reproduction of the words which were used in the previous language event:

> (5) **"If you're interested in discovering new planets, there is a gap in the types we can detect,"** he said. **"We are not very good at finding planets far out from their stars, but one way to do that might be to look for their auroras. This brown dwarf observation is an important first step towards that."** (TG_Sci_162)

The uses of quotes are numerous and may include "eyewitness material in the news, dialogic passages in narrative, scenes in biography, quotes in scientific writing", and so on (Halliday and Matthiessen 2004: 446). Popularizations, being the genre under analysis, also make use of quotes for the journalist to integrate the voices of experts without his/her mediation. Furthermore, quotes are also used to support and justify a previous evaluation of information by the journalist, so that he/she is not liable for the meaning conveyed.

With reports, however, there is no projection or reproduction of the original words as they were uttered. The focus is not on form, but on content or meaning (Thompson 2004: 210). We report language events as meaning, as the "gist" or sense of the words, more than the words themselves (Halliday and Matthiessen 2004: 453-454). In this case, the projected clause fits structurally with the projecting clause, since reports are more fully incorporated into the writer's own message:

> (6) Professor Iain Suthers, a marine biologist at the University of NSW, said **the volcano discovery was made when the team was searching for nursery grounds for larval lobsters.** (TG_Sci_157)

Projection also happens in verbal and mental processes (Halliday and Matthiessen 2004), which corresponds to what Bednarek (2006b) identifies as *hearsay* and *mindsay*, respectively. As such, Thompson distinguishes between *locutions* (projected verbal events) and *ideas* (projected mental events) (2004: 211). Normally, locutions are constructed by means of quotes, while ideas are constructed by means of reports, since we cannot know for sure what the person was thinking, and that is why the projected clause typically represents a thought more than a wording (Halliday and Matthiessen 2004: 449). Alternatively, especially in the context of literary texts, the omniscient narrator can reproduce his/her characters' thoughts through quotes as well. As Halliday and Matthiessen also note, this distinction between ideas and locutions is given expression in cartoons, where ideas are represented in 'clouds', whereas locutions are represented in 'balloons' (2004: 443). Locutions can also be constructed by means of reports, since it is also possible to report a 'saying'. This is what is traditionally known as 'reported speech' (see next section). Conversely, we can also quote thought or we can construct ideas by means of locutions, although this is more restricted (Halliday and Matthiessen 2004: 456). This not only happens in literary contexts, but also when one can think in words, as in example (7) *So I figured, 'Well, then obviously it's going to be a nineteenth-century American novel.'* (Halliday and Matthiessen 2004: 457). As these authors signal, the implication of quoting thoughts is 'I said to myself…' and it is labeled self-projection, conveying the fact that one can think, believe or figure in words. Thompson (2004) also acknowledges the idea of *self-projection*, when the speaker/writer clearly signals that it is his/her own voice the audience is listening to:

(8) ***I promise*** *I won't keep you a moment longer*. (Thompson 2004: 211)

Self-projection is also related to what other scholars have termed *averral* (Bednarek 2006b; Charles 2006; Hunston 2000; Tadros 1994). However, it needs to be pointed out

that averral and self-projection are not fully equivalent terms. While all self-projections are averrals, not all averrals can be considered self-projection, as shown in example (9):

> (9) Martin Smith, who led the work at the University of Cambridge, said: "Finding the head is the main scientific result. There's been lingering controversy about this."
>
> **The hallucigenia, which was around 35mm long, lived in the oceans around 505m years ago during the Cambrian explosion when most major animal groups first appear in the fossil record.** (TG_Sci_152)

Example 9 is an example of two of the units of voice identified in the *TG_Sci* corpus, and in which two voices (Martin Smith's and the journalist's) can be heard. The text in bold is an example of pure narration by the writer. It is also a case of averral, since the writer is using his/her own voice to talk about a plant in this case. However, one cannot say that this is a case of self-projection since there is no projecting clause. Nevertheless, we can still say that there is a voice to which we can attribute these words and, therefore, we can take narrations as cases of implicit self-projection. To identify cases of self-projection, there is a need for a projecting and a projected clause, while to identify averral or implied self-projection, the analyst needs to identify that there is a change in voice and that the speaking voice is attributable to the writer of the text only, as is the case in example 9.

Thompson (2004) also discusses other non-canonical types of projection, namely those in which the projecting clause is in mid-position or follows the projected clause, so that it seems to be linked paratactically to that projected clause, as in:

(10) *She wanted desperately to finish the novel,* ***she told Alexis****.* (Thompson 2004: 212)

This corresponds to *Separate equal* signals in Thompson's (1996) classification of language reports, which will be explored later in this chapter.

Thompson (2004) also talks about blended types of reports, namely *partial quotations* and *free indirect speech*. Thompson defines *partial quotations* as a quote which appears as part of a report, as in:

> (11) A study has found that Martian meteorites contain pockets of methane gas, hinting that methane-eating microbes might be able to thrive in the planet's soil in a **"deep biosphere similar to that on Earth".** (TG_Sci_147)

The other type of blended report, *free indirect speech*, consists of "a report retaining some of the interactive features of the original speech event" (Thompson 2004: 212). Halliday and Matthiessen define it as a blend, where "the projected clause has the form of an independent clause […] but it is a report and not a quote, so time and person reference are shifted" (2004: 465):

Quoted ('direct') → "Am I dreaming?" Jill wondered.

'Free indirect' → Was she dreaming, Jill wondered.

Reported ('indirect') → Jill wondered if she was dreaming.

(Halliday and Matthiessen 2004: 465)

Projection can also be realized by means of nominalization, whereby a congruent verbal or mental process is realized as an entity (Sušinskienė 2012). Some studies have explored the phenomenon of nominalization as a way to project meaning (Halliday and Matthiessen 2004; Hood 2010; Moyano 2013, 2015; Thompson 1994a), these nominalizations also being able to act as participants of new projections. Halliday and Matthiessen (2004) outline different possibilities of nominalizations as packaged projected meaning. They distinguish between nouns of projection and nouns of projection with embedded fact. *Nouns of projection* are considered nominalizations of

verbal and mental processes (Hood 2010), whereby a process, which would be congruently construed as a verb, is construed as a noun. Furthermore, they are construed as grammatical metaphors (Halliday 2004: 172-176; Klein and Unsworth 2014: 2), through which "a semantic element that would be construed congruently through one grammatical choice is reconstrued through a different grammatical choice" (Klein and Unsworth 2014: 2)[4]. Nominalizations are considered grammatical metaphors of the ideational type since they derive from a congruent clause nexus. In turn, these nominalizations can integrate more information by encoding it in the form of embedded clauses. These are cases of *nouns of projection with embedded fact,* as shown in example (12):

> (12) […] but there are **fears that the expedition could endanger the health of isolated tribes that have never been exposed to common human diseases.** (TG_Sci_28)

These nominalization processes have the potential to leave the Sayer unspecified and they also contribute to discourse cohesion "by the fact that [such nouns of projection] can be used anaphorically to refer back to propositions and proposals already established in the discourse" (Halliday and Matthiessen 2004: 468):

> (13) In a demonstration of the power of science to ruin a perfectly respectable work of art, researchers have discovered the colour of the dark side of the moon […] The **revelation** comes from two years of measurements by an international team of astronomers who installed a telescope and a sensitive camera […] (TG_Sci_03)

In example 13, the noun *revelation* encapsulates the previously given information as packaged meaning which is in turn acting as participant in a new process and, at the same time, used anaphorically to refer to what was previously stated and to summarise

[4] cf. Halliday 2004; Liardét 2016

it according to the writer's view, so that the writer is also able to integrate his/her own stance towards the meaning construed.

Secondly, *nouns of fact* (e.g. *fact, issue, problem, idea* (see classification by Halliday and Matthiessen 2004: 469)) and *nouns of fact with embedded fact* are considered impersonal projections (Halliday and Matthiessen 2004), since they do not derive from a congruent process. They are presented as already established knowledge, also being considered semiotic abstractions (Hood 2010), as example (14) shows:

> (14) Unlike the auditory system, which can be measured in frequency, the olfactory system if tricky to assess. The **fact that most odours are composed of many different chemicals** causes more difficulties. (TG_Sci_26)

Thompson (1994a) suggests an alternative way to study projection, since his point of departure is to analyse how we convey experiential meaning and its representation through Propositions, Facts and Things. He posits that the congruent encoding of a process together with its participants and circumstances is through a Proposition. However, we have the possibility of 'packaging' meaning through the resource of grammatical metaphor (Halliday 2004: 172-176) by treating a process and its participants as something belonging to the world (a nominalization) so that it can be talked about and become a participant in a new process. Thompson suggests the same cline for conveying meaning experientially be applied for the subsequent projection of that world. Hence, the cline of projection suggested by Thompson runs as follows:

-The projection of a Proposition is a quote:

(15) 'That's right,' the guard said.

-The projection of a Fact is indirect speech:

(16) Mrs Carstairs explained that Sybil had a nasty sore throat.

-The projection of a Thing is NRSA(T) (Leech and Short 2007 [1981]; Semino and Short (2004)), nouns of projection and nouns of fact (Halliday and Matthiessen 2004):

(17) They have declared an end to violence.

Thompson suggests that we can track meanings in a text to see how they are projected, so that we can explore how the dynamics of projection works and how writers encode meanings which have been previously represented. Thompson focuses on how meaning develops logogenetically since he is interested in studying how meanings are integrated in texts and how they are shaped as the text unfolds. He states that in order to do so, we can track a single meaning along a text to see if it is projected as a Proposition, Fact or Thing or, conversely, to study the relative frequency, distribution, and function of Propositions, Facts and Things in a single text or group of texts. Ideally, meanings entering a text would run along the cline of packaging of propositions, by entering the text as a free-standing meaning to be partially packaged and, finally, to appear as a nominalization (Thompson 1994a: 14). In his study, Thompson focuses on scientific discourse (research articles) to state that, typically, new meanings enter as Facts, as partially packaged meaning, " 'framed' with a commentary by the writer" (Thompson 1994a: 17). Semi-packaged meaning entering scientific discourse stems from the fact that, as Thompson points out, the writer detaches from the integrated information to "perform the academically valued functions of commenting, labelling [and] ascribing" (1994a: 18) as the writer proceeds on the integration of new meaning. Conversely, Propositions would be seen as parallel to raw data, where the writer's positioning is not visible, while Things would be seen as an already-established phenomenon and not open to question from the readership. Nevertheless, if new meaning is brought into the

text as partially packaged, the writer is indicating that his/her interpretation is still open to question. Therefore, as meaning has not been encapsulated (yet), it is more dynamic in interpersonal terms. Later, the writer can decide to pick up that Fact as already established knowledge and "thus available for complete package as a nominalization" (Thompson 1994a: 19), although attested data suggest that this order might vary depending on the genre (Pérez-Veneros in press).

Taking into account the variety of types of projection found in language, we can say that projection is both a complex and an extremely frequent phenomenon through which it that the speaker/writer makes reference to a previously worded representation of the world. The ways through which those representations can be projected in a new context of situation are varied and depend not only on the structure of the projected meaning but also on what the speaker/writer wants to communicate through them. Nevertheless, more traditional approaches to reporting typically focus on the grammatical structures used to project meaning, leaving aside the functional and meaning making potential of projection. However, it is important to discuss these other approaches because, together with projection, they help us gain a deeper insight into the ways meanings can be projected in text. In the next section, I will discuss the phenomenon of reported speech, as it is still a mainstream perspective when describing sourcing and attribution.

4.2 Types and functions of reported speech

Different scholars have proposed different labels and classifications for the phenomenon of reported speech to be addressed in this section. Tannen (1986) equates reported speech in general to direct speech, as its main manifestation. She focuses on the analysis of reported speech in English and Greek spoken conversation and in English and Greek

novels. She only addresses the question of direct speech but, interestingly enough, she equates it to reported speech in general, since she argues that "what is commonly referred to as reported speech or direct quotation in conversation is constructed dialogue, just as surely as is the dialogue created by fiction writers and playwrights" (Tannen 1986: 311). However, other scholars have focused on both direct and indirect speech, such as Coulmas, who addresses direct speech as that of the reported speaker, "the reporter stepping behind the characters whose words he purports to report" (1986: 2). Conversely, in indirect speech the reporter comes to the surface, and he/she reproduces the previous speech with his/her own words. Haberland (1986) revises these notions by addressing the question of the illocutionary force of the utterance. He states that in the case of direct speech, the illocutionary force is expressed within the quotation since it comes from the reported speaker's words. Conversely, in the case of indirect speech the force is conveyed in the reporting clause (especially in the reporting verb) or has to be deduced from the context. As such, the illocutionary force is to some extent shared by both the original utterer and the speaker/writer whose voice he/she is reproducing (Haberland 1986: 220-221).

Coulmas (1986: 21) introduces the notion of a continuum of speech presentation, or a cline, similar to the cline of projection previously mentioned (Thompson 1994a). Coulmas posits that on one extreme of the cline we find direct speech and, on the other, "the reduction of a proposition to a noun phrase". In between, we find the different instances of indirect speech, what he calls the *transition zone*.

Thompson (1996) further elaborates on the question of reported speech and he talks about language events' reports from a more functional approach. In this case, he distinguishes among four dimensions of choice which characterize any language event report:

-The voice: Who or what is presented as the source of the language being reported.

-The message: The way in which the function or content of the 'original' language is presented.

-The signal: The way in which the present reporter indicates that this is a language report.

-The attitude: The evaluation by the present reporter of the message or the original speaker.

(Thompson 1996: 507)

He goes beyond the question of the structure to address other parameters which also intervene in any language report and which characterize them in a better and more accurate way. These dimensions of choice to characterize language event reports are the basis for the analysis of units of voice and their corresponding projection clusters in the *TG_Sci* corpus. Let us analyze these four dimensions in turn.

VOICE: Thompson distinguishes among *self, specified others, unspecified others, community* and *unspecifiable others*. In the case of *self*, the speaker considers him/herself the source of the language event. This has also been termed *averral* (cf. Hunston 2000) or *self-projection* (Thompson 2004). With *specified others*, what we can hear is the voice of another speaker who was speaking in a different place and at a different time. This has also been termed *attribution* (cf. Hunston 2000). Thompson names *unspecified others* those speakers who decide "to present something as a report without specifying the source although the source is, in principle, identifiable" (1996: 508):

(18) **It was claimed that** the platypus laid eggs.

(19) One of the women in the house **allegedly** flung boiling water on the crowd in the street.

(Thompson 1996: 508)

With *community* as the voice, Thompson refers to those meanings conveyed by a group of people whose voice is collective because they share some background knowledge. This is why he further distinguishes between *folk quotes* and *proverbs* as two manifestations of the dimension 'voice: community'.

The last source of language events' reports which can be used is referred to by Thompson as *unspecifiable other(s)*. In this case, "the voice must remain unspecified, since each reader is in fact being implicitly encouraged to accept it as his own voice" (1996: 510):

> (20) All across the country, people spent the rush hour in bed. Some took their wives out to lunch for the first time in years, and for many, those little jobs that needed doing around the house were finally completed. **Pick up the kids from school? Certainly**. (Thompson 1996: 510)

From example 20, the reader gets the impression that the words in bold are those which would be in his/her mind in that situation. The writer has selected those words on purpose, so that readers can accept it as their own voice. The writer plays with voices by blurring them so that attributing them to a specific source is challenging and hence the meaning construed can be attributed to more than one source.

Thompson also presents *partial quotations* (1996: 513), which might appear within paraphrases and summaries (see the dimension of Message) and which are used "for the reporter to distance from the language highlighted by the inverted commas" for a

number of reasons, including disassociation, humility, or superiority. Thompson further classifies some partial quotations as *scare quotes* (1996: 509), used when the writer does not accept the term in inverted commas, independently of the audience's acceptance or non-acceptance. Finally, he also classifies partial quotations as *technical terms*, which are terms probably not familiar to the reader but which still need to be mentioned as part of the technical jargon of the issue narrated.

MESSAGE: This dimension deals with the kind of wording in the report. Thompson distinguishes among *quote, echo, paraphrase, summary* and *omission*. *Quotes* imply the reproduction of the original words uttered and they present two main functions: to indicate a higher degree of faithfulness to the original language event; and to present the language event more vividly to the hearer by simulating the original language event (Thompson 1996: 512)[5]. With *echoes*, the speaker is averring in another voice, as a kind of ventriloquism. Echoes are construed as free indirect speech in the sense that both the original voice and the voice of the speaker/writer are blurred and are the potential source of attribution:

> (21) Little Chandler had come home late for tea and, moreover, he had forgotten to bring Annie home the parcel of coffee from Bewley's. **Of course** she was in a bad humour and gave him short answers. (Thompson 1996: 513)

Another structure in which the words of others can be encoded is through *paraphrase*. Thompson points out that with paraphrases "the message is expressed entirely in terms which are appropriate to the reporter in the reporting context" (1996: 515) and thus it is 'indirect speech'.

[5] cf. de Oliveira and Pagano 2006: 644; Tannen 1986

The two last categories are those of summary and omission. *Summaries* consist of two main types of message: a noun group or a prepositional phrase following a reporting word:

(22) Tom's boss demanded **a pledge of loyalty** from him.

(23) Lendl spoke **about his growing love affair with Wimbledon and how he has gradually come to terms with the eccentricities of British life**.

(Thompson 1996: 517)

In these two examples, the underlined reporting verbs are followed in the first case by a noun group and in the second case by a prepositional phrase. In these cases, the amount of information included in the message ranges from minimal, as in the first case, to a fairly long summary, as in the second.

In *omissions*, the audience is aware of the fact that some words were uttered, but the speaker/writer gives no information about what was said:

(24) He walked down the stairs, still **muttering**. (Thompson 1996: 518)

As can be seen from the illustrative example provided by Thompson, the verb *mutter* implies that there has been some speech event going on, but we as readers have no clue about the actual words that the character was muttering.

Thompson compares these two last categories to the categories of Narrator's Representation of Speech Act with Topic and Narrator's Representation of Speech Act (cf. Leech and Short (2007) [1981]; Semino and Short (2004); Semino, Short and Culpeper (1997)), respectively. This classification will be dealt with in greater detail later on in the chapter.

The next dimension distinguished by Thompson is that of SIGNAL. As he states, this is the way in which the reporter signals to the audience that a stretch of language is to be interpreted as a report. Thompson distinguishes between two main aspects in the choice of a specific signal. The first is related to the structural dependencies of the reporting and the reported clause, whether there is a paratactic or a hypotactic relation in systemic functional terms. The second has to do with the position of the signal itself and how it fits with the rest of the text and the context of situation. Depending on the position the signal occupies, the whole report is to be interpreted from a different perspective. For instance, a nominalization is to be taken as something which is true and not open to question because it is a fully-packaged meaning. In another situation the reporting clause comes at the end of the structure, and the message is thematised. Thompson argues that "the reported clause is not clearly subordinate to the reporting clause" (1996: 519), since it is placed at the beginning and not the other way round (cf. Vandelanotte 2004).

Thompson distinguishes among four types of signal, namely *separate dominant, separate equal, separate subordinate* and *fused*, respectively. The first, *separate dominant*, appears when the reporting clause comes at the beginning of the structure, and it is considered the unmarked option:

(25) **British Coal said** it could only damage the industry. (Thompson 1996: 519)

Thompson notes that among the main kinds of separate dominant signals there are also cases with a reporting noun, with the message in the post-modifier, as in example (26) *She sat calmly through the film despite* ***the usherette's protestations*** *that she was under age* (Thompson 1996: 519); a reporting verb with the message as object, as in (27) *Experts* ***predicted*** *years of stagnation for the world's banking industry* (Thompson

1996: 519); and a reporting adjective with the message in the post-modifier, as in (28) *Bank of England officials were **dismissive of suggestions** that measures were needed against speculators* (Thompson 1996: 519)[6].

The second, *separate equal*, appears most clearly in the case of quotations, where equal status is given to the message and to the signal. It can also be the case for those reporting clauses which appear at the end of the language event. According to Thompson (2004), in cases where the projecting clause appears at the end, both projecting and projected clauses can be said to be in a paratactic relation to each other, as in:

> (29) The impact was caused by an enormous meteorite that split into two 10km-wide chunks before it slammed into Earth around what is now the Warburton basin, **lead researcher Andrew Glikson, from the Australian National University, said.** (TG_Sci_121)

To the third type, *separate subordinate*, belong signals construed as adjuncts, which function as "tags or labels for the dominant message" (Thompson 1996: 520):

> (30) **As Alan Kraut at the Association for Psychological Science puts it**: "The only finding that will replicate 100% of the time is likely to be trite, boring and probably already known: yes, dead people can never be taught to read." (TG_Sci_172)

The last type of signal, *fused*, is intimately related to the category of free indirect speech, since there is no wording signaling the report but rather the signal is the message itself:

> (31) But she could not really see herself with whatever it was, vase, or rug or necklace, trying to sell it. **No, that was out.** (Thompson 1996: 520)

[6] cf. Halliday and Matthiessen 2004 on nouns of projection and attributive clauses with embedded fact

The last dimension is that of ATTITUDE. Here Thompson distinguishes among *neutral, positive* and *negative* attitude, specifically in relation to the degree of certainty of the information integrated. Further still, as Thompson points out, even where there is no overt attitude conveyed, the mediator role of the reporter automatically creates a space or a distance between the reporter and the attributed message, a kind of 'evaluative space' (de Oliveira and Pagano 2006; Thompson and Ye 1991) which can be used by the reporter to introduce his/her own stance (Elorza and Pérez-Veneros 2014a) or, as it happens especially in journalism, to leave it open to give the impression that he/she is being objective (Thompson 1996: 522). In this sense, the assumption made here is that, even though no attitude has been explicitly signaled, the journalist always adopts a certain perspective on the reported information.

Parameter	**Types**
Voice	Self
	Specified other(s)
	Unspecified other(s)
	Community
	Specifiable others
Message	Quote
	Echo
	Paraphrase
	Summary
	Omission
Signal	Separate dominant
	Separate subordinate
	Separate equal
	Fused
Attitude	Neutral
	Negative
	Positive

Table 2. Thompson's (1996) parameters for the description of language reports

The four different parameters in the description of any language event go beyond the structure of the report to also deal with questions of source, whether there is some attitude conveyed in the report or to what extent the position of the signal plays a role in signaling the presence of a language event report which has a specific function in the context of situation where the report is inserted.

Further elaborating on both the structure and the functionality of reported speech, Calsamiglia and López Ferrero (2003) have carried out a study on how both scientific and other stakeholders' voices are called into the text in a sample of newspaper articles dealing with the topic of 'mad cow' disease. Interestingly, they point out that when reporting the writer is also able to manage the words of others to serve his/her purposes, organizing the text as he/she wants, introducing the words of others when it suits him/her best and giving a slant to what is said (Calsamiglia and López Ferrero 2003: 149). As they posit, this is contrary to the views posed by journalistic practices and journalism training, where citation "not only makes the writer's discourse more objective and credible, but frees him/her from any responsibility" (149). In journalistic practice, the words of others are brought into the text to provide it with traces of credibility, reliability, authority and legitimacy for the words under comment. In fact, as Calsamiglia and López Ferrero signal, "literal quotation is intended to be objective knowledge, far removed from the subjectivity of the journalist" (2003: 152-153). However, as they clearly note, citation is there to serve the purposes of the speaker/writer thanks to "the building of a world of reference through a combination of a variety of voices" (2003: 156) which, depending on how many times they appear, when and where, those voices create a "profile of protagonism taken on by the social actors whose voices are called upon in relation to the topic" (156). In this way, the journalist is at the same time able to create his/her own argument and position towards

the information presented by the selection and placing of voices along the text in such a way that it is the journalist's epistemological positioning and, consequently, the positioning of the audience, which is built in the text.

Calsamiglia and López Ferrero (2003: 155) distinguish among four different citation styles:

-*Direct citation:* The reporting and the reported clauses present two deictic centres so that there is a fracture between their syntax. The relation established between them is that of parataxis and they are signalled by graphic markers such as (:).

-*Indirect citation:* The report presents one single structure and one discourse, D1, with a single deictic centre, a clause in hypotactic relation introduced by a conjunction, and the correspondent agreement of tenses.

-*Integrated citation*: The report presents one single structure and, in this sense, they are similar to an indirect citation but with inserted segments cited "with clear graphic or typographic marking, mainly with quotation marks or marked fonts" (2003: 155). Integrated citations correspond to Thompson's (1996: 513) partial quotations, as described above.

-*Inserted citation*: The report presents words coming from an external source which "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,* [and] which have the function of assigning explicit words to a particular agent [...] without any communicative verb" (Calsamiglia and López Ferrero 2003: 155). Inserted citations correspond to stance adverbials which mark the source of information (Conrad and Biber 2000: 67). From an experiential viewpoint, they also correspond to those Sayers or Sensers construed as Circumstantial Adjunct with the role of representing the source of information (Halliday and Matthiessen 2004: 276).

As seen, Calsamiglia and López Ferrero (2003) distinguish among four different types of message (cf. Thompson 1996) for speakers/writers to encode the words of external sources of information. As these authors posit, these four realizations of the phenomenon of citation serve the journalist to orientate his/her positioning on the topic of information as much as they serve as a way "of abdicating their responsibility to inform objectively" (Calsamiglia and López Ferrero 2003: 170).

Citation styles	Main features
Direct citation	There is a fracture between the syntax of reporting and reported clauses because it entails the maintenance of two deictic centres. The two segments are connected through juxtaposition and they are signalled by graphic markers such as (:)
Indirect citation	There is only one discourse with a single deictic centre, a subordinate clause introduced by a conjunction, and the correspondent agreement of tenses.
Integrated citation	Similar to an indirect citation but with inserted segments signalled as being cited directly/literally with clear graphic or typographic marking, mainly with quotation marks or marked fonts.
Inserted citation	Words from the external source are brought into the main discourse by means of markers such as *según X* or *para X, in the words of X* or *according to X* which have the function of assigning explicit words to a particular agent without any communicative verb.

Table 3. Citation styles (Calsamiglia and López Ferrero 2003: 155)

Many studies on reported language focus on newspaper discourse (Caldas-Coulthard 1994; Casado Velarde and de Lucas 2013; Obiedat 2006; Ochi 2008; Semino and Short 2004; Semino, Short and Culpeper 1997; Smirnova 2009, 2012; Urbanová 2009, 2012; Vandelanotte 2004); on how writers report in academic discourse (Keizer 2009; Massi

2005; Sabaj Meruane and Páez Muñoz 2010); or on the study of ways of reporting in literary contexts (Alsina 2011; Semino and Short 2004; Semino, Short and Culpeper 1997). Among this rich literature, the most fruitful ones in taxonomical terms for the purposes of this dissertation are Urbanová (2009, 2012), Keizer (2009), Semino, Short and Culpeper (1997) and Semino and Short (2004). The main reasons for specifically choosing these studies stem from the fact that the first three studies (Urbanová 2009, 2012; Keizer 2009) present a more elaborate and detailed analysis of free forms of speech as yet another way in which the words of others can be called upon into the text. The other two studies (Semino and Short 2004; Semino et al. 1997) propose a cline of speech presentation that has proven useful and fruitful to further classify the paratactic and hypotactic projections found in the corpus of science popularizations studied. Finally, with the exception of Keizer's work, the other studies focus on newspaper discourse and the language of newspapers, and hence they are most appropriate for the description of projection in science dissemination.

Urbanová (2009) distinguishes between canonical and non-canonical forms of reported language. The canonical forms are *direct* and *indirect speech*. Urbanová points out that in the case of direct forms, the writer is reproducing the exact wording of the original and he/she presents the reader with its verbatim reproduction. Obiedat (2006) also states that through this verbatim reproduction of the speech event, the original speaker/writer is represented metonymically in the new text, thanks to the selection of some of the words he/she uttered. According to de Oliveira (2007) and de Oliveira and Pagano (2006), quotations are rhetorical resources which are used to reproduce in an exact way the words uttered by others. De Oliveira (2007) and de Oliveira and Pagano (2006) state that journalists make use of direct quotations for three main reasons. The first reason is that quotations present the quoted authors as superior to the writers who are

popularizing them (2006: 644). The second is that, contrary to what happens with indirect speech, quotations limit the journalist's possibilities of appropriating the voices of the sources they are quoting. In the third place, which is also the main purpose of our study, journalists make use of quotation, in the process creating a discursive distance or gap between the voice of the journalist and the voices of the experts. Journalists can make good use of this gap to include their own evaluations of the information. Thompson and Ye also refer to this space, used by journalists to report the propositions without any responsibility for their content while, at the same time, making their view clear either as opposed or similar to the view included in the original utterance (1991: 369). However, de Oliveira and Pagano argue that even if this space for evaluation is created, "it does not contribute to the subversion of social and cultural differences" (2006: 644), because there are some rhetorical conventions associated with some genres which make it difficult for the journalist to appropriate that space for his/her own purposes. As they point out, there is some status ascribed to the encoded knowledge so that journalists need to make it clear whose voice belongs to whom. Despite the constraints journalists have to face when using direct speech constructions, they still show their stance towards the information presented, even if it is in a subtle way. Thompson (1996) argues that direct quotes are the best option to reproduce a language event which presents a high degree of faithfulness to the words originally expressed. He also argues that they provide the text with features of reality and drama. In line with this view, Caldas-Coulthard (1994) also posits that they make the text more lively. It is as if we were attending a theatre play because the words presented are supposed to reproduce in the best possible way the original words which were uttered in the original context. This view is also very much related to Davidse and Vandelanotte's (2010) definition of direct speech and its main characteristics as opposed to those of indirect speech. They

state that direct speech is fictive because the reported clause which appears could be considered a re-enactment of an original speech event in contrast with the reporting clause, which is constructed by the writer or speaker at the "ongoing moment of encoding" (2010: 6-7). In relation to direct speech as a canonical form, Urbanová (2009) tackles the question of the extent to which direct speech reproduces and is accurate to the original words uttered, and here she relies on the principles of markedness and selectivity, as suggested by Clark and Gerrig (1990), who state that any direct form of presentation which is marked and presented as direct is accepted by the audience as such. Furthermore, as Urbanová notices, when introducing direct discourse the journalist is in charge of deciding whose voice he/she is going to reproduce, so that, even if it is ideally a verbatim reproduction, it is only of that part of the original discourse the journalist is most interested in. This phenomenon takes place whenever the reader finds a case of direct form presentation.

Conversely, for Urbanová (2009), indirect speech forms appear when the writer is reformulating the content of the previous message by using his/her own words, thus being accurate to the content of the original message but not to the words and as such preventing the original speaker from having autonomy to speak (82-83). Regarding the non-canonical forms of reported language, Urbanová (2009, 2012) makes a distinction between *mixed forms*, *fragmented forms* and *free forms*. *Mixed forms* have the structure of an indirect form of presentation, with reporting and reported clause, with the particularity that in the reported clause some of the words appear in quotation marks, reproducing the words as they were originally uttered. This corresponds to partial quotations (Thompson 1996) or integrated citations (Calsamiglia and López Ferrero 2003):

(32) The head of the main Palestinian security service, General Jamal Kayed, said he had put his forces **"on maximum alert"**. (Urbanová 2009: 83)

With *fragmented forms*, Urbanová makes reference to the condensation that both the reporting and the reported clauses can suffer, "resulting in gradual loss of information regarding the original content and speech act" (2009: 83):

(33) He condemned the police for a "bandit attack on citizens of Russia, who did nothing illegal but were just walking on the streets of their capital". (Urbanová 2009: 83)

Finally, in the case of *free forms of speech*, Urbanová (2009) distinguishes between *free indirect speech, free direct speech* and *free direct thought*. According to her, *free indirect speech* refers to those cases where the reporting clause comes at the end of the stretch of reported language, or where there is partial retention of the original deictic centre.

Conversely, Urbanová considers that *(free) direct forms* are forms with a "deictically dual structure with a clear separation of the deictic centre of the reported and reporting element" (2012: 41). Urbanová points out that (free)direct forms make the whole discourse " 'come alive' on page", be more authentic and provide the reader with an opportunity "to witness or experience it more directly" (2012: 42):

(34) She said: "I asked what would happen if you hit the water from that height and he said, 'You wouldn't survive it, anyway.' I said 'Thanks for reassuring me, Dad!' I never imagined it would happen". (Urbanová 2012: 41)

As Urbanová posits, in example (34) there are cases of Direct Speech occurring within a case of Direct Speech. She also points to the fact that in the main body of newspaper reports, when the reader finds cases of free direct speech, it is still clear enough who the

source of attribution is, because it typically follows a case of report which include information about the originator of the words or at least a narrator's passage where there is clear reference to the reported speaker. As will be seen later, this finding also corroborates what other scholars (Semino and Short 2004) have concluded on the distinction of free direct speech, since the reader always has some signs to rely on when it comes to attributing the utterance in direct form to a specific participant. Nevertheless, this claim challenges what has been found in the *TG_Sci* corpus, since in this genre it is sometimes difficult to assign voices to participants because the journalist is playing with them in such a way that the audience lacks reliable signs in order to attribute the voices to a specific participant. The main function of free direct speech, according to Urbanová, has to do with questions of avoiding repetition and saving space.

Urbanová also studies cases of *direct thought*. She notes that since it is impossible to know what people think and then to reproduce it, at least in a non-fictional genre as newspaper discourse, all the instances are cases of direct thought embedded in direct forms of speech presentation, so that the person uttering the words is also the one thinking and then putting his/her own thoughts into words, as in the example below:

> (35) Dannatt, commanding Nato troops in Germany at the time, told the Chilcot inquiry: "I was totally unaware. **'Where did it come from?'** was my feeling at the time." (Urbanová 2012: 50)

Urbanová concludes that the use of both free direct and direct forms of reported language "contributes to a multiplicity of voices and perspectives" (2012: 51), this situation being reinforced by the inclusion of embedded chunks of language within direct forms of speech presentation.

Urbanová concludes that journalists use reported language for a variety of reasons apart from giving credibility and objectivity to the information given. She states that whether it is for clarifying, summarising, evaluating or offering contrasting views, journalists resort to reported language to convey a particular communicative intention (88). As Waugh (1995) also points out, reported language is used in newspapers for reasons of newsworthiness (cf. Bednarek 2016), evidentiality and personalization of the report, apart from supplying the discourse with objectivity and authenticity to the words originally uttered.

Linked to the previously presented non-canonical forms of reported language Keizer (2009) also describes them by clarifying that the three non-prototypical structures she suggests are all characterized by the presence of a reporting clause. The first construction is what she calls Free Indirect Speech Constructions with a Reporting Frame (FFIS). This is so because, even if at first sight it seems weird to find a free indirect form framed by a reporting clause, there are some structures in which this situation seems to be the case:

(36) Could he help in any way? **he asked.**

(37) How her heart was beating now! **she thought.**

(38) He was, **he thought**, looking as cool as possible.

(Keizer 2009: 854)

FFIS constructions are characterised by the reported clause keeping the features of a normal FIS construction, while the reporting clause almost always follows the reported clause, as in the first two examples given above. These constructions correspond to Urbanová's (2009) *free indirect speech* and Thompson's (1996) *separate equal signal*.

The second non-prototypical category Keizer distinguishes is that of Distancing Indirect Speech (DIS). As in Indirect Speech, this structure presents only one deictic centre, that of the reporter, but with the peculiarity that he/she is making two claims at the same time: the first of these pertains to the information given in the reported clause, while the second alludes to the source of this information. In the same line, Vandelanotte posits that we can talk about an 'echoic' type of speech, since "some speech act originally made by someone else is appropriated and echoed by the current speaker" (2004: 552):

(39) John will be late, he said. (Vandelanotte 2004: 551)

In example (39) Vandelanotte argues that "it is the speaker who claims that John will be late, and that he or she knows this because of something John said" (2004: 551). The appearance of the reporting clause at the end of the structure creates this "voice confusion" (Vandelanotte 2004: 554), which is used "to represent from a speaker's perspective a voice distinct from the speaker's" (577). Vandelanotte even distinguishes between two types of Distancing Indirect Speech, these being Representational DIST and Scopal DIST:

-Representational DIST → "The reporting clause is not hypotactically dependent on the reported clause. The two component clauses are thus structurally 'juxtaposed' in a compositional dependence relation" (2004: 555):

(40) John will be late, **he said** / or **so he said** / or **that's what he said**. (Vandelanotte 2004: 555)

-Scopal DIST → "The reporting clauses do not operate on the level of mere representation, but rather on the interpersonal level, that is, the level at which the representational meaning is negotiated 'socially'" (2004: 555-556):

(41) Looks a bit black out there **I think.** (Vandelanotte 2004: 555)

In spite of the above distinction, when analysing news reports, Vandelanotte points out that an intermediate stage between representation and scopal DIST is to be found in cases as the examples below:

> (42) The arrest of Mukhlas, alias Ali Gufron, was a major blow to Jemaah Islamiyah, which has been implicated in a string of terror plots against Western targets in Southeast Asia, **officials said.** (Vandelanotte 2004: 560)
>
> (43) Benchenane believes the findings could be the basis for a non-invasive tool for memory manipulation in humans. Rather than electrodes, functional MRI scans could be used to identify when a person is replaying a specific memory during sleep, **he suggested.** (TG_Sci_114)

Leech and Short (2007 [1981]) and Thompson (1996) simply treat these structures as indirect speech forms where there is an inversion of the order of appearance of reporting and reported clauses. However, Vandelanotte argues that we can hear the voice of the journalist, since he/she is reformulating what was said but, at the same time, he/she is including the source of information in the reporting clause at the end, which "serves merely to indicate that, ultimately, the information is not 'mysteriously' part of the general knowledge of the journalist, but rather originates in someone else's discourse" (2004: 563). Nevertheless, thanks to the placing of the reporting clause at the end of the structure, the journalist can introduce some claims which, in the end, turn out to be not his/her own claims made in a straightforward way.

The last non-prototypical structure Keizer (2009) deals with is what she calls Interrogative Blends (IB), where we find the combination of an introductory reporting frame and an embedded reported question with main clause interrogative word order:

(44) All they wanted to know was **could I cook beans on toast**. (Keizer 2009: 858)

Keizer states that these non-canonical forms, together with the prototypical ones of indirect speech, direct speech and the free forms of speech develop along a continuum rather than being strictly separate categories. When speakers/writers include other voices in their texts, they do so by using several structures which are not always clearly distinguishable, because there is a constant blending and mixing of voices to the point that sometimes the audience can be listening to two different voices speaking at the same time.

Leech and Short (2007 [1981]), Semino, Short and Culpeper (1997) and Semino and Short (2004) also suggest a cline of speech presentation since "discourse presentation scales are not an assemblage of hard-edged, discrete categories, but continua, rather seen in the colour spectrum" (Semino and Short 2004: 9). They take into account all the possible participants that can be given voice, including the speaker/writer who acts as the narrator of the text, averring information using his/her own voice (cf. Hunston 2000).

Leech and Short first propose a cline of speech presentation ranging from the voice of the narrator, situated on one extreme of the cline, to free direct speech form, on the opposite extreme. As they state:

> As we move along the cline of speech presentation from the more bound to the more free end, his interference [that of the narrator] seems to become less and less noticeable until, in the most extreme version of FDS, he apparently leaves the characters to talk entirely on their own (Leech and Short 2007 [1981]: 259-260).

In the cline of speech presentation suggested, they distinguish between the narrator's voice and the voice of others, between averral and attribution, or between self-projection and projection. It is a cline where the voice of the speaker/writer him/herself

is included as an essential element of the complex web of voices that readers find when facing polyphonic texts. Leech and Short distinguish between:

N → Narration: It is the narrator's voice in the text.

NRSA → Narrative Report of Speech Acts: A speech act has occurred, but the narrator does not have to commit him/herself to giving the full content of what was said, let alone the original words which were uttered.

IS → Indirect Speech: It is the narrator's expression of what was said, of the content of the utterance, but the narrator uses his/her own words.

FIS → Free Indirect Speech: It is a freer version of indirect speech, where the reporting clause is omitted. This type of speech has the ability to give the flavour of the original speaker's words, but maintains the deictic elements corresponding to an indirect speech rendering, so that the narrator is kept in "an intervening position between character and reader". This makes Free Indirect Speech "an extremely useful vehicle for casting an ironic light on what the character says" (Leech and Short 2007 [1981]: 262)[7].

DS → Direct Speech: The narrator quotes the words used verbatim.

FDS → Free Direct Speech: It is direct speech, but either without quotation marks or without the reporting clause, to make it freer. Sometimes, the two characteristics can be present at the same time. Free Direct Speech is characteristic in literature, where the absence of the reporting clause makes it difficult to distinguish who is speaking, whereas the absence of quotation marks merges narrative with speech.

Semino et al. (1997) include finer-grained categories which are then used again in the work carried out by Semino and Short (2004), and intended to cover both fiction and

[7] cf. Fludernik 1993: 310

non-fiction narratives. They include the new categories of Narrator's Representation of Voice (NV) and Narrator's Representation of Thought (NI) and two sub-types of categories: Narrator's Representation of Speech Act with Topic (NRSAT) and embedded quotes.

With NV they make reference to a minimal form of speech presentation, since the reader simply knows that the character was engaged in some form of verbal activity, or we are faced with a general reference to a speech event that involved a large number of participants. The latter is typical in newspaper discourse, including references to speeches by elite characters, debates, negotiations, and so on:

> (45) An unholy **row** broke out yesterday over a new politically-correct Bible. (Semino and Short 2004: 69)

As can be seen from the example given by the authors, we know that there was a speech event going on (an unholy row), and that it was a collective one. However, we are presented neither with the content of what was said nor with the original words uttered.

NI makes reference to the same type of event, but instead of representing speech, now we represent thought. This type of speech presentation is not typical in newspaper discourse, where the reporter does not know what the reported speaker was thinking at the time. However, Semino et al. state that there are some examples in their corpus and, as such, they assume that the reporter must have inferred what the speaker was thinking by drawing on such external events such as the speaker's behaviour or his/her speech:

> (46) Mr Major was **pleased** to see his French counterpart backed his determination to slow down the push towards closer European ties. (Semino et al. 1997: 27)

Regarding the new sub-types in some of the existing categories, Semino et al. include the category of Narrator's Representation of Speech Act with Topic (NRSAT) and

Narrator's Representation of Thought Act with Topic (NRTAT) to expand on NRSA and NRTA, respectively. This new sub-type captures all cases where there is no reported clause as in Indirect Speech, but the reporting verb is accompanied by some explicit reference to the topic dealt with in the reported event construed as a prepositional phrase with the function of message conveying circumstantial information:

> (47) Mr Major **warned** yesterday **of the dangers of Britain being left behind if a group of European Union members pushed ahead with a single currency**. (Semino et al. 1997: 30)

As seen in example (47) taken from Semino et al., there is no reproduction or reformulation of the words originally uttered, but we have a verb with illocutionary force (*warn*) and the message.

The other sub-type these authors introduce is what they call *quotation phenomena*, which corresponds to *partial quotations* (Thompson 1996) or *integrated citations* (Calsamiglia and López Ferrero 2003). They may occur inside any of the categories along the cline and they allow the author to select that part of the original utterance or text he/she wants to reproduce without the need to reproduce all of it, thus "achieving vividness and precision without sacrificing the need for brevity" (Semino et al. 1997: 31). As these authors also point out, thanks to the use of 'embedded' quotations, the information provided lends itself to a partial representation of other people's voices, "since the original speaker's words are embedded, both grammatically and semantically, within the reporter's own discourse" (Semino et al. 1997: 31).

Semino and Short (2004) also work with both fiction and non-fiction narratives, specifically literary works, autobiographies, and newspaper discourse. They distinguish

among speech, writing, and thought presentation because, even if there is some common ground among the three types of discourse presentation, "there are also important differences which are unhelpfully hidden if the general term 'discourse presentation' is used as an alternative for these more specific, mode-related terms and concepts" (2004: 2).

The speech presentation cline they follow is similar to those followed in previous works and it is ordered in relation to the amount of involvement of:

-the original speaker in the anterior discourse.

-the person in the posterior discourse presenting what was said in the anterior discourse.

N → Narration: No speech presentation involved; the audience listens to the voice of the narrator:

> (48) Ceres holds enough frozen water to fill all the lakes on Earth. The ice it contains is hidden beneath the surface, but collisions with other objects in the asteroid belt between Mars and Jupiter may have exposed patches here and there, creating the shiny spots. (TG_Sci_113)

NV → Narrator's Representation of Voice: Minimal reference to the fact that there was some speech event, "consisting either of simple references to the fact that someone spoke or of general references to speech events involving utterances from large numbers of people" (Semino and Short 2004: 69):

> (49) Their staterooms were filled with flowers and she ran around excitedly, wondering how this could possibly be a boat when it looked just like a proper room, while Gerard **talked** quietly with Lais, looking very serious. (Semino and Short 2004: 71)

NRSA → Narrator's Representation of Speech Acts: It is also closely linked to Narration, being the presentation of speech as a material or a behavioural process. NRSA prototypically has only one clause, with the 'speech report' verb:

> (50) She had **pleaded**, **cajoled**, and **quarrelled** violently as she tried to win the Prince's assistance. (Semino and Short 2004: 77)

The category of NRSA is typical in newspaper headlines, since it requires less space than the sub-type NRSAT.

NRSAT → Narrator's Representation of Speech Act with Topic: Explicit indication of the subject-matter / topic of the utterance or utterances in question, but there is not a separate reported clause. They are particularly frequent in Semino and Short's (2004) subcorpus because of journalists' space restrictions which clash with their need to give substance and warranty to what is being reported:

> (51) But senior Tory figures openly **questioned the Prime Minister's judgement in effectively throwing away the Government's majority to limit the rebellion of the European Finance Bill.** (Semino and Short 2004: 76)

IS → Indirect Speech: It presents the contents of utterances without reproducing the original words uttered:

> (52) The happiest man in Miami last night was Terry Huckabee, who had complained to staff at the airport **that he was having a bad day**: he had missed the flight. (Semino and Short 2004: 79)

FIS → Free Indirect Speech: It is a form between IS and DS because it shares linguistic features prototypically associated with both the IS and DS forms. It may contain some deictic features which are typically found in DS and, at the same time, others which are typical for IS:

(53) I heard Les's voice in the background saying **yes he fucking well did mean it**. (Semino and Short 2004: 86)

DS → Direct Speech: It is the 'norm' for speech presentation and it serves the purposes of dramatization and characterization, since the writer is literally reproducing previous utterances with changes neither in the content nor in the form.

FDS → Free Direct Speech: It presents a direct string, yet including either the reporting clause or the punctuation surrounding the direct string, but not both. In its most extreme form, it presents the words of the character/original speaker with no apparent 'interference' from the narrator/reporter.

(54) **'What a blotch!'** said the young Mary, as they topped the crest of the hill and looked down into the valley. Stanton-in-Teesdale lay below them, black with its slate roofs and its sooty chimneys and its smoke. The Moors rose up and rolled away beyond it, bare as far as the eye could reach. The sun shone, the clouds trailed enormous shadows. **'Our poor view! It oughtn't be allowed. It really oughtn't.'** (Semino and Short 2004: 90)

In example (54), the stretch in bold is tagged by Semino and Short as a case of Direct Speech, while the one in bold and underlined is Free Direct Speech, since there is no reporting clause framing it. In cases where Free Direct Speech is used readers have to rely on inference and contextual clues to be able to attribute the words to the participant uttering them (Semino and Short 2004: 96).

The speech and thought presentation scales are usually represented as being ordered along a horizontal axis, with NV in the left-most speech presentation position, adjacent to N and the free direct category in the right-most position:

N NV NRSA(T) IS FIS DS FDS

At the extreme ends of the speech presentation scale we get (a) Narration; that is, the voice of the reporter using his/her own voice and without reproducing any other voices, where no speech presentation is involved at all; and (b) (free) direct speech, where it is assumed canonically by readers that the direct string reports exactly the words and structures used by the character to say whatever they said in the 'anterior' discourse.

Authors	Cline of speech presentation
Leech and Short (1981)	Speech presentation: N NRSA IS FIS DS FDS
Semino, Short and Culpeper (1997)	Speech presentation: N NV NRSA(T) IS FIS DS FDS Thought presentation: N NI NRTA(T) IT FIT DT FDT
Semino and Short (2004)	Speech presentation: N NV NRSA(T) IS FIS DS FDS Thought presentation: N NI NRTA(T) IT FIT DT FDT Writing presentation: N NW NRWA(T) IW FIW DW FDW

Table 4. Clines of speech presentation (Leech and Short 2007 [1981]; Semino and Short 2004; Semino et al. 1997)

Semino and Short (2004: 33-35) also distinguish the category of embedded speech, to make reference to those cases of discourse presentation which can contain itself another case of discourse presentation. As Urbanová (2012: 43) also indicates, embedding

results in a recursive pattern which presents the form *A said that B said that C said that…*, as in:

> (55) 'They're speaking in Cornish,' Zelah said. **'He's asking her if she has brought the need-fire and she tells him that she has. He says: "Was this flame kindled at the altar of the Lord?" and she answers: "This flame was kindled at the holy fire."** (Semino and Short 2004: 171)

Semino and Short indicate that the stretch of direct speech attributed to Zelah itself includes two stretches of embedded indirect speech and two stretches of embedded direct speech which are embedded inside the main direct speech.

The question of embedding from an SFL view and the question of embedding from other approaches to the analysis of reported language is not the same. I will also take this difference into account when dealing with the cases of embedding in the corpus analysed in this dissertation.

In this section I have analysed the mainstream studies on reported speech to gain a better picture of how the reporting of language events has been approached from a traditional viewpoint. As pointed out before the different ways through which journalists project meaning in text is one of the elements studied in the projection clusters identified and analysed in the *TG_Sci* corpus. Thus, an analysis of these approaches together with how projection is explored from a systemic functional point of view is needed to better understand the projection clusters identified and analysed in the *TG_Sci* corpus. These studies help us develop a better conception of what reported language is, its different manifestations, and its function, in this case in newspaper discourse. Since the research carried out in this dissertation also deals with how the phenomenon of attribution works in newspaper discourse, specifically in popularization

articles, these works help us support the hypothesis that journalists not only use reported language to give credibility and reliability to the information included, but also to serve other purposes, such as guiding the reader through the text, giving evidence for the information and playing with the voices brought into the text to include a variety of perspectives towards the issue narrated, including the journalist's own.

4.3 Verbal and mental processes

In this section I will analyse how verbal and mental processes are used by writers as yet another way to construe a certain representation of the source and the language event reported. The interaction and co-occurrence of the various modes of projection, verbal and mental processes and participants, provides us with a detailed and fine-grained picture of how the journalist construes the discourse of science popularizations as a polyphonic discourse whose objectivity, as attested data suggest, is only apparent. Numerous studies have focused on the analysis of verbal processes, or reporting verbs, as "core elements in reporting processes" (García Riaza 2012: 120) and specifically on how they are used in academic discourse (Jalilifar 2012; Thomas and Hawes 1994; Thompson and Ye 1991; Thuy Loan and Pramoolsook 2015) and in the teaching of English as a second language (Elorza and Pérez-Veneros 2011; Pérez-Veneros 2016); in fictional narratives (Caballero 2015) or in newspaper discourse (Caldas-Coulthard 1994; Calsamiglia and López Ferrero 2003; García Riaza 2012; Thompson 1994b), not only to introduce the words of others, but also to convey both the positioning of the external sources of information and the positioning of the writer making use of these verbs. Thompson and Ye (1991) classify the verbs which non-native speakers of English use when introducing citations to refer to the works of others. They are especially interested

in analysing whether there is some degree of evaluation present in the verbs found in their corpus since, as they contend, "one of the clearest signals of the presence of evaluation is a reporting verb, [so] the relationship between these verbs and evaluation seems worth exploring" (1991: 369). They distinguish between verbs with both denotative and evaluative potential, this second group including verbs which show the author's stance, verbs which show the writer's stance and verbs which present the writer's interpretation:

Classification of reporting verbs	Subclassification	Verbal expression as an obligatory component
DENOTATION	Textual	Mental processes
	Mental	Mental or physical processes as part of research work
	Research	Writer's placing of the author's work by comparison or contrast
	Comparing	Writer's use of the author's work in his/her own developing argument
	Theorizing	Attitude which the author is reported to have towards the validity of the reported information or opinion
EVALUATION	Author's stance: positive, negative, neutral	Writer's portrayal of the author as presenting true information (factive), false information (counter-factive) or no clear signal (non-factive) towards the information given
	Writer's stance: factive, counter-factive, non-factive	Aspects of the status of the proposition
	Writer's interpretation: author's discourse interpretation, author's behaviour interpretation, status interpretation, non-interpretation	Verbal expression as an obligatory component

Table 5. Classification of reporting verbs (Thompson and Ye 1991: 369-373)

Thompson and Ye conclude that when analysing the potential evaluative force of a reporting verb, it is necessary to pay attention not only to the reporting verb *per se* but also to the context in which that verb is used. Furthermore, they also point out that the extent to which a reporting verb is construed as a verbal or mental process needs to be represented on a cline, since "there are some cases where the status is more clearly indicated than in others" (1991: 379). It is essential to take the context into account when interpreting whether a so-called reporting verb has been construed experientially as a verbal process, or as a different type of process, for example as a behavioural or as a material process.

Regarding the category of evaluation, Calsamiglia and López Ferrero (2003) discuss the attitudinal potential of the reporting verbs reporting the original source of information as either positive (verbs such as *advocate, argue, hold, see*), neutral (*address, comment, cite, look at*), tentative (*allude to, believe, hypothesize, suggest*), or critical (*attack, condemn, object, refute*).

From a different perspective based on the relation between the verbal process and the speech representation, Caldas-Coulthard (1994) distinguishes between *speech-reporting verbs*, *descriptive verbs*, and *transcript verbs*. With this classification, she is interested in studying the differences in how men and women are given voice in the press, how their voices are represented and which reporting verbs frame their words, as Table 6 below shows:

Classification of reporting verbs	Subclassification	Description and examples
SPEECH-REPORTING VERBS	Neutral structuring	**No evaluation of the saying**: say, tell, ask, enquire, reply, answer
	Metapropositional: contribution of a speaker	**Assertives**: remark, explain, agree, assent, accept, correct, counter
		Directives: urge, instruct, order
		Expressives: accuse, grumble, lament, confess, complain, swear
	Metalinguistic	Narrate, quote, recount
DESCRIPTIVE VERBS	Prosodic	Cry, intone, shout, yell, scream
	Paralinguistic	**Voice qualifier (manner):** whisper, murmur, mutter
		Voice qualification (attitude): laugh, giggle, sigh, gasp, groan
TRANSCRIPT VERBS	Discourse signalling	**Relation to other parts of discourse:** repeat, echo, add
		Discourse progress: pause, go on, hesitate, continue

Table 6. Classification of reporting verbs (Caldas-Coulthard 1994: 305-306)

As seen in Table 6 above, the majority of reporting verbs are related to their particular wording and the type of speech represented, including the physical or behavioural features of the process. Caballero (2015) carries out a similar classification of reporting verbs, since she distinguishes between speech and non-speech verbs and is more interested in what the speaker expresses through them, rather than the writer's conveyance of stance. She also studies whether the type of information expressed in speech events is core or peripheral. Core information includes the speaker's intention(s) and the distribution of speech turns, while peripheral information is concerned with gestures, manners, and the speaker's attitude and emotions (Caballero 2015: 1398). Caballero thus notes that verbs which convey core information are related to the

speaker's intention and how speech turns are distributed, while peripheral information would be conveyed in verbs which relate to the speaker's attitude, gestures, etc. when uttering the words.

Thompson (1994b) presents a more finely-grained taxonomy which very accurately encompasses all the different functions that verbal processes express. He distinguishes among eleven ways that speech representations can be reported in discourse, mainly by means of verbal processes:

-*Neutral reporting verbs:* They are used to report what someone said without adding any extra information about the speaker's purpose or manner (34-36). These verbs contribute to construe experiential meaning, but not interpersonal since these processes do not play a role in construing interpersonal nuances.

-*Showing the speaker's purpose*: Thompson states that even if the writer is conveying the original speaker's purpose in those verbs, it is actually the writer's interpretation of that purpose which is conveyed through the reporting verb. In the majority of cases the writer tries to be honest and faithful to the speaker's original purpose, but sometimes this purpose could be different from the one the reporter is actually conveying (36-38). Hence, these processes contribute to interpersonal meaning, since the writer is integrating his/her own stance through the verb used.

-*Showing the manner of speaking*: These verbs are used to show the way in which something was said (cf. Caballero 2015; Caldas-Coulthard 1994). They typically indicate or suggest the speaker's emotions, how quietly or loudly the speaker spoke, the speed of talking, or the speaker's general behaviour as they spoke. These verbs also contribute to construing meanings interpersonally, especially in terms of appraisal, since they show the original speaker's emotions and attitude when uttering the original words.

-*Showing what was said through the reporting verb*: These verbs give some idea of what was actually said or written. The message in this case is not given in a separate clause but is partly or mainly contained in the reporting verb itself (Thompson 1994b: 43-45). The original speaker's attitude is conveyed in these verbs and hence they contribute to the construal of both experiential and interpersonal meanings.

-*Indicating how the message fits in:* These verbs indicate that what was said is a response of some kind to something that was already said or to indicate that what is said has already been said. Some others refer to the progress of the language event, and through still others the writer can show how what is being reported fits in with the rest of what was said. These verbs also contribute to construing meaning textually, providing the text with cohesion and also adding to the logogenesis or unfolding of meaning in a coherent way.

-*Drawing attention to the speaker's or writer's words*: Through these verbs the reporter can draw attention to the words used by the speaker or writer to describe or name something.

-*Showing the writer's attitude towards what he/she reports*: With the use of these verbs, the reporter can signal that he/she thinks that what the original speaker said is the truth (positive attitude) or, conversely, that it is not true or at least open to doubt (negative attitude). Verbs included in this group also construe meanings from an interpersonal viewpoint, since the writer is evaluating the degree of certainty of the information reported.

-*Showing that the writer does not accept responsibility*: The reporter uses verbs which make clear that what he/she is reporting is someone else's opinion and that he/she does not accept responsibility for the ideas expressed (Thompson 1994b: 52-53). This

detachment from the integrated information means that the writer is also interacting with his/her readers in interpersonal terms, by indicating that he/she is not liable for the words reported.

-*Showing attitude through reporting adjuncts*: Many reporting adjuncts are neutral in the sense that they do not show whether the reporter agrees or does not agree with the information he/she is giving (*according to*). *According to* adds experiential meaning since it gives information on the original source of knowledge and is considered a Sayer acting as Circumstance of Angle (Halliday and Matthiessen 2004). Conversely, other adjuncts express a clearly positive stance, in the sense that the reporter agrees with the information he/she is providing (*as*). Through others the reporter can show that he/she does not accept the truth of the reported message or that that truth is open to doubt (*allegedly, purportedly, supposedly*). These two previously mentioned adjuncts also contribute to the construal of interpersonal meanings since the writer's stance is also present.

-*Showing the effect of what is said*: These reporting verbs are used when the reporter is interested in reporting the effect of what the speaker says on someone else, rather than the actual words that the speaker uses, through verbs such as *convince, dissuade, persuade, prevail*. The reporter focuses on the function and the effect those words had on the interlocutor more than on the actual words uttered. Interpersonal features are also added in meaning construal through these verbs.

-*Showing whether a report is of speech or of writing*: This last group includes verbs which show that the reporter is reporting speech or writing rather than, for instance, thoughts. Some reporting verbs in this group also refer to the manner of writing (*jot, print, scrawl, scribble*). Some others refer to the mechanical means by which the written

message is conveyed (*cable, fax, telegraph, telex, wire*). Finally, a few others make reference to the type of written text produced (*annotate, document, draft, entitle, subtitle*). These processes only contribute to construing experiential meanings and they do not convey any interpersonal nuances.

Functions of the reporting signal	Examples
Neutral reporting verbs	Say, tell, ask, write, speak, talk, express
Showing the speaker's purpose	Hint, imply, insinuate, intimate, enquire, query, question, admit, recommend, suggest, propose, report
Showing the manner of speaking	Storm, quaver, simper, chatter, bluster, giggle, groan, gurgle, sob, titter, whimper, bark, bleat, hiss, howl, purr, snarl, twitter
Showing what was said through the reporting verb	Accuse of, bemoan, deprecate, insult, malign, satirize, slander, acclaim as/for, bless for, endorse, eulogize, apologize, argue, confess, flannel, jeer, joke, swear, waffle
Indicating how the message fits in	Echo, reiterate, repeat, begin, continue, end, finish, interject, interpolate, interrupt, persist, add, digress, elaborate, mention, qualify, withdraw
Drawing attention to the speaker's or writer's words	Brand, call, define, describe, entitle, label, refer, term
Showing the writer's attitude towards what he/she reports	Acknowledge, admit, concede, confess, divulge, foretell, indicate, mention, note, allege, claim, lie, misinform
Showing no acceptance of responsibility	Use of clauses beginning with WHAT: I got myself a table at what was said to be the best restaurant in town
Showing the writer's attitude through reporting adjuncts	Apparently, according to, as, allegedly, purportedly, supposedly, so (e.g. or so the story goes!)
Showing the effect of what is said	Convince, dissuade, persuade, prevail, cajole, coax, nag, talk, wheedle, demonstrate, establish, prove, show
Showing whether a report is of speech or of writing	Spoken events: chat, converse, dictate, heckle, lecture, natter, phone, pronounce, radio, recite, telephone, utter

Table 7. Thompson's (1994b) types of reporting speech representations

The types of reporting means included in Thompson's (1994b) taxonomy cover a wider range of situations than the previous classifications presented. He is including both neutral as well as evaluative reporting verbs, together with verbs which show the intention of the speaker, the main speech event which was taking place, or the way the speaker uttered the words. This is not just a formalistic but also a more functional classification of reporting verbs, since the taxonomy was produced from a systemic functional analysis of attested data.

A similar approach is followed by Bednarek (2016) when she addresses the question of which reporting expressions are used when introducing the voices of others in newspaper discourse. She notes that there are several reporting verbs which contribute to the construal of different meanings, ranging from the mere process of saying (*say, tell*), to the illocutionary force (*promise, threaten*), the relation to surrounding discourse (*reply, add*), the institutional context (*rule*), or paralinguistic features (*whisper, scream*), or according to the degrees of reliability or (dis)endorsement of the writer (journalist in this case) towards the information presented.

From a systemic functional experiential perspective, Halliday and Matthiessen (2004) describe verbal processes as "symbolic relationships constructed in human consciousness and enacted in the form of language, like saying and meaning" (2004: 171), and thus they classify verbs which serve as Process in 'verbal' clauses used to quote, 'mental' clauses used to report; or in 'verbal' clauses reporting propositions and proposals.

In verbs which are construed as Process in 'verbal' clauses for projecting quotes, the reporting verbs presented are all of speech since, as was stated previously, typically reporting verbs which frame quotations do not make reference to thoughts or mental

processes, but to verbal ones. The reproduction of other people's words has to be carried out through the speech verb appearing in the projecting clause, since "the main function of the projecting clause is simply to show that the other one is projected: someone said it" (Halliday and Matthiessen 2004: 446). In popularizations in the British press previous studies (Elorza 2011; Elorza and Pérez-Veneros 2013) have shown that the main verb used to introduce quotes is the neutral verb *say*, which only contributes to the construal of experiential meanings. Conversely, studies on popularizations in the Spanish press (Elorza 2011; Pérez-Veneros and Elorza 2014) have demonstrated that the unmarked options of verbs for introducing quotes are more varied and most of these verbs belong to what Thompson (1994b) classifies as *Showing the speaker purpose*, through which not only experiential meanings are construed, but also interpersonal ones since the writer is interpreting the information previously uttered and, as such, his/her stance is present in the encoding of the verb.

	Proposition	Proposal
(1) General member	*say*	*say*
(2) Verbs specific to speech function: (a) giving	(a) statements*: tell* (+Receiver), *remark, observe, point out, report, announce*	(a) offers*: suggest, offer; threaten* ('offer: undesirable'), *vow* ('offer: sacred'), *promise* ('offer: desirable'), *agree* ('offer: in response')
(b) demanding	(b) questions*: ask, demand, inquire, query*	(b) commands*: call, order, request, tell, propose, decide; urge* ('command: persuasive'), *plead* ('command: desperate'), *warn* ('command: undesirable consequences')
(3) Verbs with additional circumstantial feature: (a)	*reply* ('say in response'), *explain* ('say in explanation'), *protest* ('say with reservation'), *continue* ('go on saying'), *add* ('say in addition'), *interrupt* ('say out of turn'), *warn* ('say: undesirable consequences)	[see (2) above]
(b) manner specifying connotation	*insist* ('say emphatically'), *complain* ('say irritably'), *cry, shout* ('say loudly'), *boast* ('say proudly'), *murmur* ('say sotto voce'), *stammer* ('say with embarrassment')	[largely the same as for propositions] *blare*, *thunder* ('order imperiously'), *moan* ('plead whiningly'), *yell* ('order vociferously'), *fuss* ('order officiously')

Table 8. Verbs serving as Process in 'verbal' clauses used to quote (Halliday and Matthiessen 2004: 448)

Halliday and Matthiessen distinguish between verbs which are used to literally reproduce the words of others according to whether they are propositions or proposals. However, what is important here is to see how all verbs make reference, in one way or another, to the fact that what was originally said was uttered and not thought. All of them are 'hearsay' verbs in Bednarek's (2006b) terms. In this classification, they also include verbs such as *cry, boast, blare, thunder* or *moan* which are seen as *Showing the*

manner of speaking (Thompson 1994b)[8] but which, again, indicate that the original speech event is one of saying and not of thinking.

Conversely, Halliday and Matthiessen classify the verbs which serve as Process in 'mental' clauses used to report. These verbs correspond to the category of 'mindsay' in Bednarek's (2006b) classification. The verbs included here all make reference to the fact that the original speech event was thought or believed, but not uttered. Therefore, the reporter projects by means of a report, and not of a quotation, since a literal repetition of the original utterance is not possible because it was an idea and not a locution. As Halliday and Matthiessen put it, the original language event is projected as a meaning; "it has already been 'processed' by the linguistic system – it is a phenomenon of experience that has been construed as a meaning" (2004: 451).

[8] cf. Caballero 2015

		Proposition		**Proposal**
		statement [indirect declarative clause: (*that*) …]	**question** [indirect interrogative clause: *whether/if; who, which, when…*]	[perfective non-finite clause, or modulated indirect declarative clause]
perceptive				---
cognitive	'like' type	*believe, guess, think, know, imagine, doubt, remember, forget, dream, predict* e.g. *she knew || that he'd left*	*wonder, doubt; consider; find out, ascertain, check; determine, judge; predict* [interrogative / negative clause:] *know, remember,* [= the answer to the question] *know* e.g. *she wondered (didn't know) || whether he'd left*	---
	'please' type	*strike, occur to*		
		e.g. *it struck her that he'd left*		
desiderative	'like' type	---	---	*want, would like, wish, intend, plan for, hope for* e.g. *she wanted || him to leave (that he should leave)*
emotive		---	---	---

Table 9.Verbs serving as Process in 'mental' clauses reporting ideas (Halliday and Matthiessen 2004:450)

All reporting verbs included in Table 9 make reference to the fact that the projected event was a mental process, and the reporter makes use of this projecting nexus in

various ways, which include the representation of the speaker's thinking in dialogue, the representation of the addressee's thinking in dialogue, the representation of a character's consciousness in narrative, the representation of institutional or expert opinions and beliefs in news reporting and scientific discourse, and, finally, the representation of the speaker's angle in scientific discourse, often as the result of a chain of reasoning (Halliday and Matthiessen 2004: 449).

Last but not least, Halliday and Matthiessen also classify those verbs which are used to project offers and commands, whether in quoting or reporting format. According to them, quotes are projected by means of 'speech' verbs which "are used in 'verbal' clauses for quoting proposals, especially in narrative fiction" (2004: 457). Conversely, reported offers and commands are projected hypotactically either by 'verbal' clauses as 'indirect speech' or by 'mental' clauses as 'indirect thought'. Halliday and Matthiessen note that projected proposals through reports all share the same feature: the information is not real, "it is 'irrealis', or non-actualized, and the projecting clause represents the verbal or mental force of actualization" (2004: 458).

In addition, Moyano (2013, 2015) addresses the classification of 'projecting' processes in scientific discourse in Spanish research articles from a functional approach. She studies how projection is realized in scientific discourse in the construction of new knowledge and in the construction of the author's identity along the text. To do so, she focuses on the analysis of the Processes or the verbs which are used to introduce the voices of others, concluding that verbal (hearsay) and mental (mindsay) processes are not the only ones used for this purpose, as other types of processes are also found:

-Behavioural and material processes: These two types are found in contexts where reference to other authors is made explicit, even if neither of them has the capacity to grammatically project:

Example (56): Behavioural Process (attribution source as Behaver)

> (56) **Di Bartolomeo et al. documentaron** también en Argentina prevalencias mayores (3,5%) por exámenes en fresco con SF y por coloración de May-Grunwald Giemsa, aunque se trataba de embarazadas sintomáticas (**Di Bartolomeo et al. also documented** in Argentina major prevalence […] (Moyano 2013: 124; my translation)

Example (57): Material Process (attribution source as Actor)

> (57) **Blanco et al. utilizaron** SIM y **aislaron** E.coli O157:H7 en 5% de 58 muestras de carne picada y hamburguesas (**Blanco et al. used** SIM and **isolated** E.coli O157:H7 to 5% in 58 samples from minced meat and hamburgers. (Moyano 2013: 125; my translation)

-Hybrid (verbal-relational) processes: These verbs can be interpreted as either Verbal or Relational processes. As Moyano (2013, 2015) posits, these two different interpretations represent the two extremes along a cline (cf. Halliday and Matthiessen 2004: 172) where the verbal processes stand for communication, while the relational stand for identity. The typical verbs which display this hybridity are *show* and *suggest* and this is clearly seen in scientific discourse. They can be interpreted as relational processes because they represent an internal causal relation but, at the same time, they are also considered verbs to report since they make reference to the previous words uttered by scientists.

In the light of the classifications presented, it can be said that reporting expressions and, specifically, reporting verbs, are not merely used to frame and introduce the voices of

external sources of information. As seen, there are some verbs which not only make reference to the fact that a language event was taking place at some earlier point in time, but they also present some other features related to the original speaker's purpose or intentions, or with the writer aligning with or detaching from the information given, presenting his/her own views and opinion on it. Further still, from a systemic-functional perspective, it has been shown that not only verbal processes, but also mental, and sometimes even behavioural, relational and material processes, are used to project. This brings us to the conclusion that some verbs whose lexical meaning would not point to their being treated as reporting verbs can be acting as projecting information in some contexts. As such, when analysing projection and the verbs which are used to project, it is necessary to go beyond the lexical meaning of the verb, and focus on what that verb is doing in relation to the rest of the information, whether it is used to narrate some event or if that event is actually being projected and the verb, regardless of its lexical meaning, is acting as one projecting events instead of just narrating them.

In the next section, I will deal with participants as yet the third resource in the equation, together with modes of projection and verbal and mental processes, for the analysis of the voices present in popularization texts.

4.4 Participants

In this section, I will present the external sources of information which are given voice in newspaper discourse, and the ways writers decide to refer to them, as participants of the processes involved in projection. Furthermore, I will explore to what extent the use of different reference practices affects the manner in which writers construe experiential meanings when disseminating science.

Previous studies on participants (Caldas-Coulthard 1994; Thomas and Hawes 1997; Thompson 1994b) have especially focused on their presence in the press and include the distinction and analysis of male vs. female voices of, as well as the classification and study of Participant and Non-participant Themes (Hawes 2014; Hawes and Thomas 2012; Thomas and Hawes 1997).

Thomas and Hawes (1997), Hawes and Thomas (2012) and Hawes (2014) explore the notion of Theme and the range of available options for Theme in English. In their work on newspaper discourse (Hawes 2014; Thomas and Hawes 1997), they describe various participant Themes used to introduce reports in *The Times* and *The Sun*. These authors also explore the notion of Theme and the range of options of thematic elements for the teaching of English for Academic Purposes (Hawes and Thomas 2012). They distinguish between Participant and non-Participant themes. Participant themes refer to those cases where the Subject of the sentence is thematised. Conversely, non-Participant themes are defined as marked (non-Subject) themes which are chosen for good reason, especially for evaluative purposes. The sub-classifications of Participant and non-Participant themes run as follows:

-Participant Themes

- Discourse Participant: The writer adopts a visible position by presenting himself/herself as Subject in thematic position and avers in his/her own voice, mainly through the forms *we, our* and *us.*
- Disguised Discourse Participant: It is as if a section of the text were speaking by itself, so that the writer remains hidden behind that reference. The journalist takes up an invisible position by making use of references to the publication he/she is writing for: *The Times, this newspaper.*

- Pronoun Participant: They present cohesive potential within an anaphoric reference framework.
- Named Participant: The reference is clear enough to be able to identify the entity being referred to without doubt or wrong assumptions.
- Semi-named Participant: This category comprises official titles or positions. It is used to imply a certain distance in human terms.
- Group or Institution Participant: This category comprises cases of specific groups of people and institutions and it is also used to imply a certain distance in human terms (e.g. *the Unions, the Church of England*).
- Non-human Participant: This category includes entities which speak for their human counterparts, such as *the study, the research* or *the findings*.
- Abstract Participant: This last category of participant themes includes cases of participants whose main characteristic is their abstractness and it includes phenomena and abstract notions such as *workplace stress.*

-Non-Participant Themes:

- WH-interrogative: This category comprises cases where the theme chosen is a WH-word, for example ***why***.
- Polar interrogative: This category includes cases where the theme chosen is the Mood in an interrogative clause (e.g. ***Will he*** *come with me?*)
- Verb group: This category presents cases where the theme is a verbal group, such as ***Running*** *is good for your health*, where the verbal group *running* is acting as Theme.

- IT predicate: The role of Theme is played by the pronoun *It*, as in ***It*** *was surprising that you came*.
- THERE predicate: The role of Theme is played by *There* in clauses with an existential process, as in ***There*** *is evidence of a new fossil*.
- Bound clause: A whole subsidiary clause plays the role of Theme of the main clause, as in ***If they succeed****, I will be very happy.*
- Elided (or annex) Theme: The Theme-Rheme structure is incomplete; either Theme or Rheme stands alone but would make no sense without the Theme or Rheme which has been previously presented.

Jančařiková (2009) also analyses participants from two broadsheets and two tabloids from the British press and she notices that depending on the encoding of participants, they can have positive or negative effects on the way the audience perceives those participants. Furthermore, she posits that in the newspapers studied the use of full names to refer to participants makes it possible for the journalist to integrate complete information on that participant, while first names "often strengthen the person's positive status or positive view generated thus on the side of the reader" (Jančařiková 2009: 44). She also states that the age of a person and even making reference to his/her skin colour may be triggered by the need to identify "the good and evil" in that specific participant. As such, naming is an important means not only to identify people but also to shape the audience's views of the world and society.

Popularizations, being articles about science for non-expert people, also present numerous voices which intermingle to construe scientific meaning. Typically, the participants found in popularizations correspond to the ones classified by Thomas and Hawes (1997), Hawes and Thomas (2012) and Hawes (2014) as Participant themes, and specifically those labelled Named, Semi-named, Pronoun, Group or Institution and

Non-human participants. Furthermore, as Jančařiková posits, the choice of participant, in this case in popularizations, is also important to shape the audience's views on them, so that readers can identify sources of attribution who are authorised and reliable enough for the scientific information transmitted to be true to reality. Conversely, the use of different labels to identify participants is used by science journalists to also convey their own stance on the events narrated.

From a systemic-functional point of view, Halliday and Matthiessen (2004) state that experiences in the world are structured as semantic configurations consisting of three elements: processes, participants, and circumstances. Circumstantial elements are typically optional, whereas participants are inherent in the process, "every experiential type of clause [having] at least one participant, and certain types even [having] up to three participants" (175). The processes which can project the words of others are typically mental and verbal. Participants in mental processes are the Senser, the one who experiences, and the Phenomenon, or what is experienced. In verbal processes, the participant speaking is the Sayer, although we can also find in the same process the addressee of the verbal utterance encoded, that is, the Receiver. Furthermore, the verbal process can be directed at a participant different from the Sayer or the Receiver, which is labelled the Target. In addition, the message conveyed by the Sayer can be construed as a nominal group which functions as participant in the process (Thompson 2004: 101) and which is called the Verbiage. When the message is construed as a prepositional phrase, it is called Matter, which is a type of Circumstance. From a systemic functional viewpoint, some scholars (Matthiessen 2004; Matthiessen and Mwinlaaru forthcoming; Matthiessen, Teruya and Lam 2010) focus on the analysis of Sayer-hood, or the study of participants in projection. Halliday and Matthiessen point out that, contrary to what happens with mental processes, in verbal processes any type of entity can be a Sayer,

whether it is a conscious participant or not, as long as that Sayer "puts out a signal" (2004: 254). As Matthiessen et al. (2010) posit, in some languages such as German or Japanese, the Sayer is prototypically represented by human speakers. However, in other languages, such as English, the notion of Sayer-hood extends to include as participants other signals or symbolic sources such as documents (***the research*** *found*) and instruments of measurement (***my watch*** *says*) (Matthiessen et al. 2010: 186). These participants correspond to *non-human* and *abstract* themes in Thomas and Hawes' (1997), Hawes and Thomas' (2012) and Hawes' (2014) terms. Consequently, in verbal processes the participants that project can be either human ones, or symbolic sources such as *the study*, *the letter,* or *the finding*. Even if these participants are not equivalent to a human one, they still can project previously uttered or written information, as in:

> (58) **The study says** that such a diversified village structure produces a dualistic pattern of migration [...] (Halliday and Matthiessen 2004: 254)

These symbolic sources are frequently used in science popularization articles, since the journalist attributes the information coming from scientists and experts to their works. As Matthiessen and Mwinlaaru (forthcoming) highlight, scientific discourse might also involve some other symbolic sources that are not speakers:

> (59) **The finding suggests** that scores of dinosaur fossils in museums around the world could retain soft tissues, and with it the answers to major questions about dinosaur physiology and evolution [...] (TG_Sci_145)

> (60) **The study highlights** how traditional thinking around diets is flawed in the assumption that people put on weight purely because their meals contain more calories than they burn off [...] (TG_Sci_146)

In popularizations we also find documents as symbolic sources acting as Sayer in a projection. Nevertheless, entities such as instruments of measurement are not typical from this text type. We find symbolic sources such as *results* which, to some extent, give us numeric information, but they cannot be considered instruments of measurement in the same sense as Matthiessen et al. (2010) suggest.

Moyano (2015) distinguishes among various types of processes which can be used to project the words of others and she classifies their associated participants. Typically, verbal processes are carried out by human or non-human participants. Human participants are encoded through a reference to the author's surname, whereas non-human ones are represented by semiotic abstractions. In mental processes introducing external voices, the participant is the Senser, the one who experiments the feeling, emotion, or wish which is encoded in the projected words, while those projected words are referred to as Phenomenon, what is felt, sensed or experienced.

In the case of both behavioural and material processes, the participant is typically a human being, referred to as Behaver in behavioural processes, and as Actor in material ones.

Fløttum and Dahl, analyzing news items on the climate change issue, make a distinction between explicitly identified external sources, a mixture of internal and external voices (pronoun *we*) and implicit voices. In implicit voices, they point out that the author of the text is not explicitly present in it, but he/she is represented through other devices, such as specific polyphonic markers and value markers, such as *but, however* and *not* (2012: 18-19). The audience finds a complex web of voices built with the voice of the journalist and the voices of the external sources of information thanks to the inclusion of many voices in the text (cf. Dahl and Fløttum 2014).

Hunston (2000) and Charles (2006) also point to the presence of different voices in text depending on whether they are averred (the writer uses his/her own voice to refer to things in the world or to report some event) or attributed, as voices coming from external sources other than the writer. Hyland and Tse make a distinction on the source of evaluation. They signal that the writer can decide to attribute the source of evaluation either to a human source, including the author or other researchers, to an abstract entity, or to an unnamed originator (2005: 46-47). They note that abstract entities are used because they help remove the implications of human intervention with all its influences which might point to some kind of non-empirical distortion. Similarly, unnamed originators make reference to the use of the pronoun *it* (*dummy it* subjects), which writers take advantage of to depersonalize their opinion and make it appear as an objective and general fact, representing the implied evaluation as a state of affairs in the world, being distanced from the writer and, as such, being less open to negotiation (Hyland and Tse 2005: 54-56). Parkinson (2013: 205) adapts both Charles' and Hyland and Tse's classification of voices and he distinguishes between Human-Author, Human-Other, Concealed, and Abstract participants.

Participants have also been analysed in relation to the evaluation of the information. In addition to the well-known and previously mentioned work by Martin and White on appraisal (2005), White studies the ways in which different descriptions of sources in news reports can lead to both 'invoked' and 'provoked' evaluation of those sources and of the material quoted, the last type of evaluation being found when there is an explicit evaluation of the source as *prominent* or *relevant* (2012: 60). As White points out, since provoked evaluations are visible to the reader, he/she can easily know about the writer's subjectivity and opinion on the information given, since it is this writer who is evaluating the source of information in an explicit and marked way. Conversely, these

evaluations and the way in which external participants are named "can have a significant impact on the way in which they are viewed" (Richardson 2007: 49).

Narrowing the literature on the classification of participants in the press, there have also been previous studies specifically devoted to the study of participants and their relationship to the reporting verb used for the inclusion of their voices in popularizations (García Riaza 2014; García Riaza and Pérez-Veneros 2012). García Riaza and Pérez-Veneros (2012) have carried out a study on the use of attribution in science popularization headlines from the Spanish and the British press. They analyse the processes and participants which appear in those headlines as conforming the reporting clauses framing the language event they are referring to. These authors demonstrate that the British press tends to make more use of personal participants, whereas material participants appear less frequently as the sources of reported events (2012: 440-441). Conversely, material participants are much more present in the Spanish press, in detriment to personal participants. Nevertheless, these analyses take into account just the type of entity (whether it is human or material) in relation to the reporting verb used to introduce the external voice, disregarding the mode of projection used and, therefore, they provide a limited perspective of the phenomena under scrutiny here.

In popularizations, participants are taken as the entities who/which are included in the text as having uttered the words which are either reproduced or reformulated by the writer/journalist. It is journalists who are in charge of deciding how to name those participants; that is, through mentioning their names, surnames, affiliation, etc. or rather by making reference to their work. Fontaine (in press) states that nominalizing an entity deals not only with the fact of objectifying it, but also with how it is done; that is, decisions on how to refer to that entity and the word(s) which is(are) used to encode its

meaning. The selection of this label is a choice made by the speaker/writer and "it is through this choosing that we find one way of connecting the inner (cognitive) processes of nominality (and referring) with the outer (social) processes of convention and social context" (Fontaine in press). As Jančařiková also posits, every participant can be named in different ways, thus "[drawing] the listener's/reader's attention to a particular feature or characteristic of the person which is considered most relevant in the given context" (2009: 49).

4.5 The analysis of units of voice and projection clusters

Polyphony is one of the main characteristics which define the nature of popularizations. This is so because the text is built around the complex web of voices made up of the journalist's voice and the external sources of information which are mentioned by the journalists and which talk about scientific developments. These are the voices which can be identified and analysed in science popularization articles through the phenomena of attribution (the journalist attributing information to external sources) and averral (the journalist using or averring in his/her own voice to disseminate scientific knowledge).

Therefore, in order to analyse voices in science popularization articles units of voice have been used to distinguish among the voices which speak throughout the text. The unit of voice is defined as a discursive unit which is made up of a series of elements. These elements correspond to the verbal or mental processes used by the journalist to integrate the words of external sources of information; the participants associated with those processes and which correspond to the external sources of attribution; and the logico-dependency relations established among the ideas which are attributed, or the different structures of projection which are used to integrate meaning. From the

definition of these three elements, it can be said that the unit of voice is an experiential and lexicogrammatical unit which identifies who is speaking at any point in the popularization article. In addition, the unit of voice presents a logogenetic span, since it is through these units of voice present in popularizations that meaning unfolds in the text. This is so because, as stated before, popularizations are made up of the different voices which are brought by the journalist to give shape and structure to the text and so the main structure of this text type is made up of the voices which bring the text to life (Halliday 1978)[9]. As already pointed out, the unit of voice works at discourse level, since it is not a structural, formal or functional unit. This is so because in order to identify units of voice we cannot rely on their structure, but on trying to delimit where a voice starts to speak and where it ends. This is not easily done since to be able to delimit the unit of voice there is a need to take into account what happens in the co-text of that unit of voice and to what extent a change in voice can be identified.

Because of the problems which arise when trying to delimit the unit of voice, I need a methodological tool which helps in the identification and delimitation of the units of voice. This is why in this dissertation I coin the concept of *projection cluster*, as the methodological construct which proves useful to identify and tag the elements of the units of voice. In line with Hyland's (2012: 150) definition of a cluster, chunk, or lexical bundle, a projection cluster is statistically the most frequently recurrent sequence of elements in a unit of voice. The use of this methodological construct allows for the identification and tagging of the basic elements which make up any unit of voice; that is, verbal or mental processes, their associated participants and the type of projecting structure, which in turn allow me to identify and delimit the several units of voice which shape the text. As Hyland (2012) also notices, the presence of these clusters helps to

[9] cf. Chapter 1

shape meaning in different contexts of situation, in this case in popularizations, while they also contribute to the readership's sense of coherence in the text.

Projection clusters work at discourse level and, as previously stated, they are made up of the three basic experiential lexicogrammatical elements at the journalist's disposal to construe attributed meanings. To the more delicate side of the continuum of lexicogrammatical choices, the side of lexis, belong experiential elements such as verbal and mental processes, participants, and the nominalizations used by journalists to act as mediators of the information. To the grammatical side of the continuum belong the different projecting structures (taxis) used by the journalist to construct projection as the basic logico-semantic relation expressed in this text type.

This chapter has explored the phenomenon of attribution as approached from an experiential viewpoint. We have dealt with the notion of projection together with a presentation of more traditional approaches to reporting language but which also contribute to the study of how attribution is constructed. This chapter has also presented the three lexicogrammatical resources which define attribution from an experiential viewpoint. Finally, this chapter has also outlined the concept of unit of voice as the core unit of analysis and the concept of projection cluster as the methodological construct proposed in this dissertation to analyse the structure of the units of voice present in the popularizations in the *TG_Sci* corpus and which contribute to the construal of attributed meaning in science dissemination. The following chapter presents the corpus and the methodology followed, together with a proposal for an annotation scheme able to tag and analyse from a qualitative viewpoint the constituent elements of the unit of voice as the core unit in popularizations.

Chapter 5
Annotation scheme for the analysis of units of voice: A proposal

This chapter outlines the methodological steps followed in carrying out science popularization articles study. The purpose was to explore how the voices construing scientific meaning in the text are projected and how they are either attributed to external sources of information or conversely, averred by the journalist using his/her own voice. The chapter presents the twofold approach followed for this study and a description of the corpus compiled for this research, but it especially focuses on the presentation of the annotation scheme proposed for the study of units of voice as the basis of analysis and a description of the labels used to tag them as consisting of projection clusters. This description also encompasses cases of averral, where the journalist acts as narrator. Additionally, the annotation scheme is also suggested for the analysis of units of voice in any type of polyphonic text.

5.1 A twofold approach to the study of attribution in science popularizations

As previously outlined, the study presented in this dissertation is based on two different yet complementary approaches which are a systemic functional approach to the study of language together with corpus methodology to quantitatively analyse how attributed meaning is construed in popularizations. Several studies rely on the usefulness of corpus linguistics methodology for the study of language in academic settings by focusing on how attribution sources are integrated in the text, e.g. Thomas and Hawes 1994, Thomas

and Hawes 1997, Thompson and Tribble 2001 and Thompson and Ye 1991, while others focus on newspaper discourse to identify how scientific topics, especially those related to the environment and global warming, are addressed through the study of the voices to whom the information is attributed (Calsamiglia and López Ferrero 2003; Grundmann and Krisnamurthy 2010; Holmgreen and Vestergaard 2009; Malhberg and Brook O'Donnell 2008; Potts et al. 2015; Pounds 2010; Semino and Short 2004; Thomas and Hawes 1997; Williams-Camus 2009, 2013). Other scholars make use of both corpus linguistics and systemic functional linguistics to study the use of reporting verbs as evaluative elements in the Spanish press (Casado Velarde and de Lucas 2013); to analyse the use of direct speech presentation in research articles and in science popularization articles (de Oliveira and Pagano 2006); to explore ideology in the dissemination of science (Hunston 2013); or to analyse the context in which institutional and newspaper discourse merge (Fusari 2016). The study carried out in this dissertation stems from that developed by Hunston (2013), where, as previously posited, she also uses both a systemic-functional approach to language and corpus linguistics techniques to analyse the language used in scientific texts, by focusing on a book about Darwin's life and his concept of evolution. Systemic-functional linguistics helps us to analyse lexicogrammatical choices in texts, which lie half way between grammar and lexis as seen in a continuum. In the analysis of attribution in popularizations, the relevant lexicogrammatical choices involve the type of structures used to project meaning (taxis), the type of processes used and the type of participants associated with those processes (how the attributes are labelled). Conversely, corpus linguistics accounts for differences in frequency and also indicates that some configurations of grammar and lexis are more likely to co-occur than others (Hunston 2013: 635). In this study, corpus linguistics accounts for the occurrences of those lexicogrammatical

choices, giving quantitative information on the number and frequency of occurrence of the different projecting structures, processes and participants.

The combination of both qualitative, more intuition-based approaches (cf. Semino and Short 2004) together with quantitative approaches to analyse language help us to gain a deeper insight and to shed light not only on the lexicogrammatical resources used, but also on the implications of those various linguistic strategies for the intertwining of the several voices which contribute to the building and development of science popularization discourse as narrative. In this study, these two approaches combine to shed light on how journalists construe and position their voice in relation to the voices integrated in the text to build up the discourse of science dissemination. From a qualitative viewpoint, we are analyzing how attributed meaning is construed, by paying attention to the interaction of certain lexicogrammatical resources in context which construe specific configurations of the different verbal and mental processes used by the journalist together with their associated participants and projected speech to integrate the voices of others. From a quantitative viewpoint, the compilation and analysis of the corpus provides us with useful data on the frequency of use of projection clusters or configurations of different types of elements which co-occur and also on the type and frequency of use of each of the three elements these clusters comprise. Additionally, as Hunston very accurately puts it, the way ideology is delivered in a text is by means of exploiting the distinction but also the blurring of voices, or the distinction but also the merging of attribution and averral (2013: 628-629).

The use of previously established categories in the study of the corpus compiled implies that this study is corpus-based (cf. Tognini-Bonelli 2001), since data obtained from the *TG_Sci* corpus have been used to validate and refine previously established hypotheses on how attributed and averred meanings are construed in the dissemination of science.

However, this study can also be said to be corpus-driven (Tognini-Bonelli 2001), especially in relation to the analysis carried out in order to set the boundaries of, and thus to tag the units of voice. This is due to the fact that some of the new categories included in the annotation scheme proposed in this dissertation derive from analysis of the corpus and the necessity to tag the new categories identified only once the texts were carefully analysed and tagged for the categories previously established.

5.2 Corpus and methodology

To better characterize the phenomena of attribution and averral in science popularizations there was a need to compile a corpus of texts since there are no corpora of science popularizations available. In addition, this subsection describes the steps followed and the difficulties encountered when designing and developing the annotation scheme proposed for the analysis of units of voice in this text type.

5.2.1 The *TG_Sci* corpus: Compilation and design

The study of units of voice has been carried out in a corpus of 180 texts retrieved from the electronic version of the British newspaper *The Guardian* (https://www.theguardian.com/science) from January 2014 to September 2015, with an even distribution of popularizations for each of the months during this period. The corpus consists of 121,908 running words and 11,261 word types. As stated before, the main focus lies on analysing the different units of voice which make up the texts, exploring the projection clusters which can be found and, in turn, describing them by paying attention to how the three previously mentioned elements co-occur and display.

The *TG_Sci* corpus consists of a total number of 1,625 units of voice, which comprise cases of both attribution and averral:

	***TG_Sci* corpus**
Cases of attribution	1625
Cases of averral	2353
Tokens of Units of Voice (UV)	1495

Table 10. Units of voice in the *TG_Sci* corpus

Table 10 shows the total number of units of voice and the cases of attribution and averral found in the *TG_Sci* corpus. Units of voice can be divided into *simple* and *complex* depending on whether one or more cases of attribution and/or averral can be identified in them. Typically, units of voice classified as *simple* comprise cases of Narration by the journalist (averral), cases of Indirect Speech (attribution) or cases of Direct Speech (attribution). Units of voice which are classified as *complex* are made up of more than one case of attribution, typically Indirect Speech followed by Direct Speech, or also cases of attribution where there is embedded averral in the form of Narration from the journalist.

The choice of only one newspaper stems from the fact that "pot-pourri" descriptions (Hyde 2002: 27) are to be avoided as much as possible when attempting to describe how projection works in popularizations from different newspapers. As Hyde posits, there are two dimensions which need to be taken into account when isolating and describing text types; these two dimensions are the extratextual, referring to "the contextual, situational, social and pragmatic aspects of textual activity" (27), and the intratextual, dealing with questions related to "the internal, more purely linguistic aspects of texts, the multiple strands of lexis, grammar and discourse" (27). Hyde notes that with

knowledge of these two dimensions we are more or less able to distinguish and characterize text types (2002: 28). However, if other variables such as culture have to be considered, things become more difficult. Hence, this study only focuses on one newspaper, to avoid making generalizations and presenting too broad a description on a text type whose characteristics may vary according to the publication. In turn, the choice of *The Guardian* was based "on its historical background and its standing in the sociopolitical and cultural context" (Williams Camus 2013: 63). As discussed previously, a revolution in the publication of newspapers at the turn of the 20th century took place and, from the very beginning, *The Guardian* not only covered news about science, but made an effort to transmit "some ongoing sense of where the sciences stood on major issues" (Bowler 2009: 197). It is one of the leading journals in the United Kingdom for the transmission of science and a quality broadsheet targeted to a "relatively educated audience" (Kim and Thompson 2010: 62). *The Guardian* was founded in 1821 by mill-owners under the name *Manchester Guardian*, it forms part of the *Guardian Media Group* and it is politically aligned to the left. In 2016 the newspaper in print had an average daily circulation of 162,000 copies. The coverage of science news is extensive, both in print and electronic format, and the articles are written by journalists who are specialized in different scientific fields, such as biology, space, health, archaeology, astronomy, medical research, psychology, neuroscience, wildlife, microbiology, science policy, genetics, physics, climate change, or history of science. The section on science in this newspaper is, in turn, divided into several subsections which include a *blog network,* hosting "talented writers who are experts in their fields, from mathematics, particle physics and astronomy, to neuroscience, science policy and psychology" (*The Guardian*). The writers in this subsection are free to write without editorial interference. Other subsections also integrate *News* (latest news in

different scientific domains), *Key issues*, *In depth*, *Opinion*, and *Pictures and video*. The subsection named *News* is the one from which the texts compiled have been retrieved. It is interesting to point out that, very recently (year 2016), *The Guardian* included a new section entirely devoted to the environment as separated from the section on science, so that all news related to the environment, pollution, climate change and so on, are included independently under this new section.

The writers of science popularization articles sign their articles with their own name and they also include 'science editor' as their job description and to identify with the information given in the article. Some of the writers whose scientific written production is extensive and, as such, have been included in the *TG_Sci* corpus are Ian Sample, Sarah Boseley, Adam Vaughan, Maev Kennedy, or Hannah Devlin.

Popularization articles were compiled from all authors signing articles in the period chosen (January 2014 to September 2015) to obtain a fairly representative sample of how scientific findings are narrated and how attribution sources are used in the British press. Press releases were not considered for compilation, even if they appeared in the section on science because they belong in a different text type. The topic of the articles was not considered a relevant feature for compilation either, since the topics dealt with in popularizations are varied and it is not relevant for studying how attributed meaning is construed in the dissemination of science. Admittedly, some scientific issues such as climate change, astronomy, genetically modified food and crops, and anthropology are more prominent and more present than others, but this does not affect the way attribution is construed. Headlines and leads were also discarded because it is better to analyse them separately, as a unit of voice on their own (cf. García Riaza and Pérez-Veneros 2012). Pictures and their corresponding captions illustrating the information given were also discarded since the multimodal dimension of popularizations fell

outside of this study. In addition, in line with Bell's (1991) classification, headlines and leads, pictures, and captions to photographs are considered a different type of news (*Miscellaneous or residual* news) which need to be analysed separately. Last but not least, information about the author of the article, the date and the time when the article was first published were not considered relevant features in relation to the study of the units of voice because no differences were expected regarding how attribution and averral are construed.

5.2.2 Methodology

In order to analyse the units of voice making up the discourse of science popularization articles there is a need to identify and tag the elements comprising each unit of voice in order to delimit their scope and to be able to identify them in a more accurate way. In addition, this tagging has to be done manually because attribution and averral are discursive units of a higher rank than discrete lexicogrammatical units such as processes or participants and, consequently, as Halliday and Matthiessen note, "automatic analysis gets harder the higher up we move along the hierarchy of stratification" (2004: 49). As such, lexical patterns or some certain low-ranking patterns in lexicogrammar do not require tagging to be analysed, but high-level units have to be analysed manually and, if pervasive, in small samples of texts (Halliday and Matthiessen 2004: 49)[10].

There is a need to study each science popularization article as a whole, since the main focus was placed on identifying signals which indicate that there is a change in voice and that a new participant and process is integrated into the text; that is, a unit of voice ends and a new one begins. One of the problems which led to the analysis of text as a whole was that if the focus was only placed on generating, for example, word-lists out

[10] cf. Elorza and Pérez-Veneros 2014

of the verbal and mental processes used in the corpus, the results obtained would be biased since they would also include processes integrated in quotations, as part of the original message from the attribution source, but not as part of the journalist's production as the writer of the text. In the case of participants, since there is not a pre-generated list of possible participants which can appear as attribution sources in texts, the possibility of searching for a specific participant as the node and its span was not contemplated. Finally, when studying the logico-dependency relations established among clauses in the text, a similar problem rises. The corpus tool can provide information about the frequency of appearance of the different types of speech presentation, but there is a need to identify those relations first and to tag them accordingly. The other main reason to study the text as a whole is the fact that I also aim at exploring how journalists' epistemological positioning is integrated in science dissemination and how the projection of voices in the text helps the journalist guide readers through it by leading them to take a certain positioning on the information presented. To do this, there is a need to study how projection manifests itself along the whole text by also taking into account the journalist's voice; therefore, considering not only attribution but also averral.

What follows is a description of the steps taken and the general procedure followed to compile and subsequently analyse the *TG_Sci* corpus:

Step 1 – Corpus compilation and annotation scheme

The *TG_Sci* corpus was compiled while a provisional annotation scheme was suggested for the subsequent tagging of the corpus:

<J> - Journalist's voice

<N> - Narration

<JW> - Journalist's Wording

<NRSA> - Narrator's Representation of Speech Act

<NRSAT> - Narrator's Representation of Speech Act with Topic

<IS> - Indirect Speech

<FIS> - Free Indirect Speech

<W> - External source's wording

<DS> - Direct Speech

<FDS> - Free Direct Speech

<PQ> - Partial quotation

<JRW> - Journalist's Rephrasing of Wording (combined structure)

<NRV> - Neutral verbal and mental processes

<SRV> - Stance verbal and mental processes

<H> <N> - Human Named participant

<H> <SN> - Human Semi-named participant

<H> <P> - Human Pronoun participant

<H> <I> - Human Institution participant

<M> - Material participant

<SaC> - Sayer as Circumstance

Step 2 – Testing the feasibility of the annotation scheme

While the *TG_Sci* corpus was being compiled, a pilot corpus consisting of 10 popularizations was used to test the feasibility of this annotation scheme. The results obtained from the analysis of this pilot corpus led to the conclusion that the annotation scheme needed to be revised and new tags added to classify new elements not taken into account in the original annotation scheme. Additionally, the tagging of this pilot corpus also revealed that there was a need for identifying a high-rank unit made up of the elements analysed to clarify the line between cases of attribution and cases of averral. This is the reason why the tag <UV> corresponding to unit of voice was created, even if the results obtained from this pilot corpus also pointed to the existence of some ambiguous cases between attribution and averral, for which the tag Free Direct Speech vs. Narration <FDS-N> was created and considered a unit of voice on its own. What follows is a list of the new tags created after testing the provisional annotation scheme:

<UV> - Unit of Voice

<eNRSA> - Embedded Narrator's Representation of Speech Act

<eNRSAT> - Embedded Narrator's Representation of Speech Act with Topic

<eIS> - Embedded Indirect Speech

<eDS> - Embedded Direct Speech

<JEW> - Journalist's Evaluation of Wording (combined structure)

<FDS-N> - Free Direct Speech vs. Narration

<eN> - Embedded Narration

<NP> - Noun of projection (with embedded fact)

<NF> - Noun of fact (with embedded fact)

<AC> - Attributive clause with embedded fact

The lack of existing tools appropriate to the analysis of units of voice in polyphonic texts has made it necessary to develop a specific annotation scheme of lexicogrammatical choices made in the construal of voice in polyphonic texts. For this reason, this annotation scheme (see Table 11 at the end of the chapter) is presented as a proposal for voice annotation in polyphonic texts, rather than just an ad-hoc tool whose usefulness is restricted to this study. In the following section of this chapter a full account of this annotation scheme is presented.

Once this new annotation scheme was established, the same pilot corpus consisting of 10 popularizations was re-used to test the feasibility of the new scheme. The preliminary results obtained from this analysis (Pérez-Veneros 2014, 2015) showed that the revised annotation scheme proved useful for the purposes of identifying units of voice and tagging and analysing their elements.

Step 3 – Intensive manual analysis: Reading and tagging

With the new annotation scheme ready, all texts were read once to get an impression of the different voices present in the text and their integration to construe meaning.

The units of voice found in each text were tagged, by taking into account when there was a change in the voice narrating events, whether it was the journalist or any of the external voices encoded. To be able to tag these units, there was a need to identify their constituent elements by analysing them through projection clusters, the methodological construct proposed for the analysis of voice in this dissertation.

The annotation process with the new scheme was carried over a period of 15 months, beginning in the summer of 2014 with the annotation of the texts compiled from January to June of that year. In the summer of 2015, when 150 texts were already tagged and analysed, there was enough data to be able to predict that no new categories would appear in the units of voice identified. This is the reason why the corpus is made up of 180 texts, since the annotation scheme proved useful for tagging units of voice and the data compiled in the first 150 texts were sufficient to expect no variations in the categories established after the testing of the second pilot corpus.

Step 4 – Analysing the units of voice

Once the different units of voice were identified, each was analysed in terms of how projection was realized. As such, when cases of pure narration were found (the journalist averring in his/her own voice), the stretch of text was tagged as Narration. Conversely, when information was attributed to external sources of information, the corresponding projection cluster was identified and its elements analysed. Therefore, projection clusters were tagged for processes and their corresponding participants, and

for the projecting structure used to integrate the voices of others, according to the cline of speech presentation which is presented in Section 5.4.1 of this chapter. As stated before, the tagging was done manually since attribution and averral belong to a rank higher than more discrete units such as participants or processes.

Step 5 – Using AntConc to obtain word-lists and tag concordances

All texts were analysed with the corpus tool AntConc (Anthony 2014) to retrieve quantitative data on the projection clusters identified and their corresponding processes, participants and projected speech present in the *TG_Sci* corpus. In order to obtain frequency of appearance of the three elements making up the projection clusters the tags used to annotate the corpus were chosen as the node in concordance search.

The generated word-lists correspond to the type of neutral or stance verbal and mental processes found in the corpus and which provide information on the most frequent types of processes used by journalists who disseminate science. In order to obtain results on how the three elements in the projection clusters co-occur, I first identified the process and participant by looking at the concatenation of tags in the corpus. Figure 3 below shows the tags <H> <N> as one example of the node used for the identification of participants and the subsequent analysis of the other two elements (process and type of speech presentation) as the span of that node:

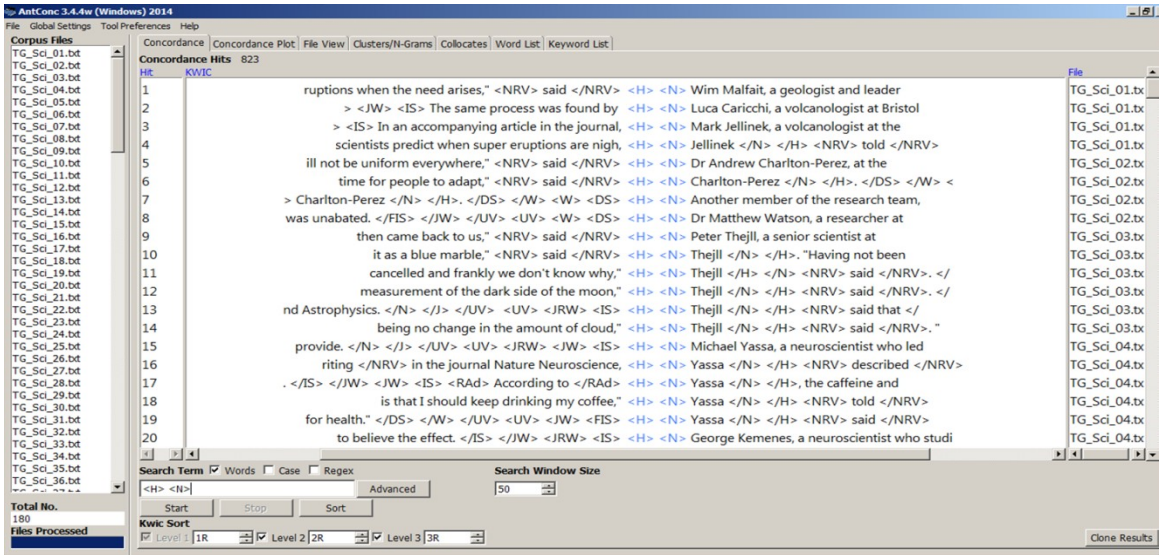

Figure 3. Tag concordance for the identification of Human Named participants in the *TG_Sci* corpus

Once every participant and process in each projection cluster was identified, each case was studied separately to establish the pattern of co-occurrence of elements that that specific projection cluster followed. This represented a long process since in each projection cluster the three elements co-occurring were identified and selected accordingly as belonging to a specific projection cluster depending on the co-occurrence of elements integrated in it.

5.3 Annotation scheme for the analysis of units of voice: A proposal

Corpus annotation of units of voice involves the identification and analysis of each unit of voice in each text of the corpus by means of intensive reading and manual tagging. Therefore, once the different units of voice were isolated, an analysis and identification of the elements making up each projection cluster was done. This means analysing the verbal and mental processes, their associated participant(s) and whether there is a case of attribution or averral.

In the case of attribution, I distinguished between cases of hypotaxis, parataxis, combined structures and Free Direct Speech vs. Narration. Once the type of taxis was identified, I also tagged the verbal or mental process present and its associated participant(s). It is also important to make clear that the projected messages where not labeled Verbiage and Matter, even if the message was construed either as a noun group or as a prepositional phrase, respectively. When a projected clause is used, "this is not analysed as a participant in the verbal process, so it is not labeled Verbiage" (Thompson 2004: 102) and the corresponding processes and participants in the projecting clause are analysed separately. Even in cases where noun groups and prepositional phrases were used as messages of the processes, the continuum of speech presentation suggested by Semino and Short (cf. Chapter 4, Section 4.2) proved more useful, so that a finer-grained classification of projected clauses could be provided. This was done to shed a brighter light into the projected structures used by journalists to convey scientific meaning, going beyond labeling these structures as Verbiage, Matter or, conversely, Projected.

Regarding averral, a distinction between cases of Narration, Embedded Narration, nouns of projection (with embedded fact), nouns of fact (with embedded fact) and attributive clauses with embedded facts was done. When averral is identified, it is necessary to take into account that no verbal or mental process and its corresponding participant(s) can be identified, since it is only the voice of the journalist which can be heard. However, as it is suggested in this annotation scheme, there are cases of nouns of projection (with embedded fact), nouns of fact (with embedded fact) and attributive clauses with embedded fact which the journalist integrates into his/her own narration as a way to justify and support that narration through the most mediated forms of

projection found in the cline of speech presentation proposed for the analysis of units of voice.

In addition, it needs to be pointed out that the notion of 'embeddedness' is used in two different situations. There are cases of embedded speech which have been tagged as <e__> and which make reference to those cases of discourse presentation in which another case of discourse presentation is integrated, and which correspond to the category of embedded speech proposed by Semino and Short (2004) and Urbanová (2012) (cf. Chapter 4) :

> (61) **<JW> <IS> Janet Kelso, a co-author on the study, said <JW> <eIS> that analyses of the largest chunks of Neanderthal DNA found that the Oase man had a Neanderthal ancestor four to six generations back in his family history. </eIS> </JW> </IS> </JW>** That suggests modern humans mixed with Neanderthals soon after they first spread across Europe. (TG_Sci_151)

In these cases, the relation established between the Indirect Speech and the Embedded Indirect Speech is a hypotactic one, so that one clause depends on the other.

Embedding as the mechanism where a clause does not hold a dependency relation with another clause, but works as a constituent of that clause (Halliday and Matthiessen 2004) is found in cases which have been described as nouns of projection (with embedded fact), nouns of fact (with embedded fact), and attributive clauses with embedded fact. The cases of embedding found in the *TG_Sci* corpus always refer to a lexical element in the clause which is postmodified by an embedded fact, as in example (62), where the noun *belief* is postmodified by an embedded fact which extends on the meaning of the *belief:*

(62) The levels fluctuated wildly among the dead babies, while they were comparatively stable among those who lived into childhood or adolescence. The findings overturn the previous **<NP> belief that high nitrogen levels are generally an indicator of good nourishment </NP>** – including a diet rich in fish among the Londoners. (TG_Sci_129)

5.3.1 Attribution

Under the phenomenon of attribution cases where the journalist integrates information which can be clearly attributable to external sources of expertise are included. I have distinguished among hypotaxis, parataxis, combined structures and Free Direct Speech vs. Narration as the four main ways through which science popularization journalists include the voices of others into the article.

5.3.1.1 Hypotaxis

As Halliday and Matthiessen state, hypotactic projection is identified when one clause depends on the other. This implies having a dominant clause (α) and a dependent clause (ß). As stated before, studying projection means going one step further in the study of experiential meaning, since the focus is not on the real world, but on a previous representation of that real world. Hence, what is found is that the dominant clause is the projecting one, typically including a verbal process and its associated participant(s). The dependent clause is the projected one, where the writer construes the message attributed to some external source.

For the purposes of this study, I am following the range of options proposed by Semino et al. (1997) and Semino and Short (2004) (cf. Chapter 4). The following categories of hypotactic projection have been found and tagged in the corpus:

Journalist's wording <JW>

Narrator's Representation of Speech Act <NRSA>

'Embedded' Narrator's Representation of Speech Act <eNRSA>

Narrator's Representation of Speech Act with Topic <NRSAT>

'Embedded' Narrator's Representation of Speech Act with Topic <eNRSAT>

Indirect speech <IS>

'Embedded' Indirect speech <eIS>

Free Indirect Speech <FIS>

'Embedded' Free Indirect Speech <eFIS>

The examples which follow reproduce complete units of voice in order to show the intertwining of the different features analysed with the exception of those cases where the unit was too long, in which an excerpt containing the relevant feature was preferred.

-Narrator's Representation of Speech Act <NRSA>

(63) **<JW> <NRSA> Stephen Whitehead, chief executive of the Association of the British Pharmaceutical Industry welcomed Nice's guidance </NRSA> </JW>** but

said Britain was lagging behind Europe when it came to uptake of new oral anticoagulants called on clinicians to "ensure they do not prevent patients, who would benefit from these medicines, having access to them." (TG_Sci_40)

-Narrator's Representation of Speech Act with Topic <NRSAT>

(64) **<JW> <NRSAT> Kevin McConway, professor of applied statistics at the Open University, warned against reading too much into the results. </NRSAT> </JW>** "Maybe this is something in the way spices are used in Chinese cooking, or [it is] related to other things people eat or drink with the spicy food. Maybe it has something to do with the sort of people, in China, who tend to eat more spicy food […] (TG_Sci_165)

-Indirect Speech <IS>

(65) **<JW> <IS> Dr Joshua Larsen, of the school of geography planning and environmental management at the University of Queensland, said the report provides important new evidence. </IS> </JW>**

"We have a record back 125,000 years and by and large, the extents of water remain the same until 48,000 years ago, which is when the lakes disappeared and never came back," Larsen, a co-author of the report, told Guardian Australia […] (TG_Sci_110)

-Free Indirect Speech <FIS>

(66) Greaney said what might have happened to the missing stones remained a puzzle. **<JW> <FIS> They could have been removed and used as stone for local houses or even roads. But the lack of a decent-sized hosepipe means the idea that the circle**

was deliberately left incomplete can probably be discounted. </FIS> </JW> (TG_Sci_51)

5.3.1.2 Parataxis

According to Halliday and Matthiessen (2004), clauses hold paratactic relation when they have equal status; that is, they do not depend on one another and the distinction between them is merely based on the order in which the speaker/writer has decided to integrate them. Since there is no relationship of dependency between them, they are referred to as clause 1 and clause 2, rather than as clause α and clause ß. When we project meaning, paratactic relations between clauses also take place. In this case, the projecting clause is independent of the projected clause. Typically, paratactic relations appear in quotes, where the projected paratactic meaning does not need to fit in with the projecting clause in register, Mood, etc. Following the cline of speech presentation previously presented, the labels to tag cases of paratactic projection are the following:

External source's wording <W>
Direct speech <DS>
'Embedded' Direct speech <eDS>
Free Direct Speech <FDS>
'Embedded' Free Direct Speech <eFDS>
Partial quotation <PQ>

Examples of units of voice in which paratactic relations were found and the tags used to analyse them can be found in what follows:

-Direct Speech <DS>

> (67) **<W> <DS> Professor Andrew Coates, a planetary scientist at University College London's Mullard Space Science Laboratory, said: "The most likely type of life on Mars was primitive forms emerging 3.8 billion years ago, when Mars was very different to now, with water on the surface, a thick atmosphere and a magnetic field. At the same time primitive life was emerging on Earth." </DS> </W>
>
> The European Space Agency's planned ExoMars mission may provide more answers when it drills up to two metres beneath the surface after its arrival in 2019, he predicted. (TG_Sci_147)

-Partial quotation <PQ>

Partial quotations have been included under the logico-dependency relation of parataxis because, even if they do not hold a paratactic relation with the main clause in which they are integrated, they are comparable to quotations which appear as part of reports (Thompson 2004; cf. Chapter 4, section 4.1) or as part of paraphrases and summaries (Thompson 1996; cf. Chapter 4, section 4.2).

Elorza and Pérez-Veneros (2014a) distinguish between two types of partial quotations in popularizations depending on their communicative function:

-Partial quotations used by journalists to 'label' the world, as in:

(68) A French writer and adventurer plans to explore one of the most remote parts of the Peruvian Amazon in search of a **<PQ> "lost" </PQ>** or **<PQ> "secret city" </PQ>** that may have been built by the Incas, but there are <NP> fears that the expedition could endanger the health of isolated tribes that have never been exposed to common human diseases. (TG_Sci_28)

(69) And as the truffle season gets into full swing, French sellers are seeking to identify the smells that make the highly prized tuber melanosporum or black truffle – found in south-west France and known as the **<PQ> "black diamond" </PQ>** – distinct from its distant and considerably cheaper cousin, the tuber indicum from Sichuan and the Himalayan foothills. (TG_Sci_12)

-Partial quotations to introduce scientific jargon, as in:

(70) Most common eruptions happen when molten rock flows into **<PQ> "magma chambers" </PQ>** underneath volcanoes and produces enough pressure to blast through the surface layer of rock that lies on top. But the same process fails to explain super eruptions. (TG_Sci_01)

This type of partial quotations corresponds to what Thompson (1996) classifies as *technical terms*, defined as terms not familiar to the reader but which need to be included as part of the scientific jargon used to describe the event narrated.

To this classification, we could add cases where partial quotations are taken as examples of direct speech which interrupt the discourse of the journalist because he/she considers the original words as the best way to convey the meaning he/she wants to convey (cf. Thompson 2004). By including the external words as a partial quotation, the journalist detaches from the information included and, as such, cannot be held responsible for them:

(71) The world is at growing risk of **<PQ> "abrupt, unpredictable, and potentially irreversible changes" </PQ>** because of a warming climate, America's premier scientific society warned on Tuesday. (TG_Sci_24)

(72) Glikson had been aware of a second scar in the west of the basin that showed **<PQ> "similar seismic and magnetic signatures" </PQ>**, but which had not been sufficiently tested. Evidence the two were caused by the same asteroid was published this month in the journal Tectonophysics. (TG_Sci_121)

As Elorza and Pérez-Veneros (2014a) posit, partial quotations are more discrete than clauses or propositions, and they do not present the canonical 'projecting clause + projected clause' structure analysed in this dissertation. Admittedly, the journalist integrates them to attribute the information to external sources of expertise, but they do not represent units of voice by themselves; they are integrated as part of the unit of voice since they do not hold any logico-dependency relation with the clause they are integrated in. As such, they do not contribute to the unfolding of attributed meaning in the text since they do not develop the argument and hence, even if the journalist makes use of them to sometimes detach from the information narrated, they are not accounted for as part of the results of the analysis carried out in this dissertation.

5.3.1.3 Combined structures

This category is based on what Smirnova's (2009) identifies as combined structures in her study on reported speech as an element for argumentation in newspaper discourse. She describes three types of structures which can be found in news reports, namely *literal structures* (quotations or direct speech); *liberal structures* (indirect speech) and a combination of both, where we can find a structure made up of indirect speech followed

by direct speech; that is, attributed information appearing in hypotactic relation followed by attributed information holding a paratactic relation.

In popularizations, two different types of combined structures have been identified (cf. Elorza and Pérez-Veneros 2014a), one of which is comparable to Smirnova's combined structures and to what García Riaza (2012) acknowledges as *double reports*, while the other presents some differences to it. Combined structures in popularizations constitute units of voice by themselves by means of which the journalist is able to epistemologically position him/herself towards the issues narrated but, at the same time, justifying that positioning so as not to be held responsible for the evaluation made.

-Journalist's Reformulation of Wording <JRW>

The journalist rephrases the words previously uttered by others, typically in indirect or Narrator's Representation of Speech Act with Topic presentation and then he/she includes the original words uttered in paratactic projection (direct mode) with the intention of justifying and illustrating the journalist's previous reformulation. The unit of voice analysed in this case comprises both the report made by the journalist (attributed information) and the subsequent quotation of the words coming from the external source of attribution (attributed information). Typically, evaluation on the part of the journalist is construed by means of the choice of the verbal process (cf. Elorza and Pérez-Veneros 2014a):

> (73) <JRW> (<IS> + <DS>) → **<JRW> <JW> <IS>** The researchers said that finding evidence for brutal violence among early humans was not altogether surprising. **</IS> </JW> <W> <DS>** "Violence is a very usual behaviour for animals," said Sala. "It's

not surprising that interpersonal violence took place." **</W> </DS> </JRW>** (TG_Sci_142)

(74) <JRW> (<IS> + <DS>) → **<JRW> <JW> <IS>** Yuval Dor, a professor of biology at the Hebrew University of Jerusalem, who has discussed the results with Segal, but is not a collaborator, said the work had tremendous potential. **</IS> </JW> <W> <DS>** "This may open up new ways to design nutrition to control the outcome much better," he said. "It could be of huge value for pre-diabetics as well as for people with both type 1 and type 2 diabetes" **</DS> </W> <W> <FDS>** who have to control their blood sugar levels. **</FDS> <DS>** "Eran may come up with an entirely new, simple and feasible way of achieving this," he said. **</DS> </W> </JRW>** (TG_Sci_146)

-Journalist's Evaluation of Wording <JEW>

The journalist construes a narration which contains some kind of evaluation before introducing a quotation. The unit of voice analysed comprises both the narration by the journalist (averral) and the subsequent quotation integrating the external words (attributed information). Typically, evaluation is found in the journalist's words, in what he/she narrates. The evaluation is embedded within the narration, so that it is not open to question (cf. Hoey 2000), but it is later on justified by the inclusion of the original words uttered. Between the journalist's narration and the subsequent form of paratactic projection, an evaluative space is opened (Elorza and Pérez-Veneros 2014a; Thompson 1996; Thompson and Ye 1991) which the journalist takes advantage of to act as mediator of the information integrated by interpreting it:

(75) <JEW> (<N> + <DS>) → **<JEW> <J> <N>** Running at a higher energy than ever, the Large Hadron Collider will give researchers a chance to study the particles in more detail, and to look for other varieties of pentaquark. **</N> </J> <W> <DS>** "Having

found one, it's highly likely there are others out there," said Wilkinson. **</DS> </W> </JEW>** (TG_Sci_158)

As stated before, this type of combined structure adds to the classification established by Smirnova, since this structure is made up of a case of averral followed by a case of attribution, instead of finding two cases of attribution of the information.

5.3.1.4 Free Direct Speech vs. Narration

In order to identify where the text presents a change of voice or a transition between one voice and another, we cannot rely only on formal features, since text progression needs to be taken into account as well (Thompson and Zhou 2000). As stated before, and as Elorza and Pérez-Veneros (2014b) also contend, we need to operate with a discursive unit rather than with a structural one. This is why the unit of voice is the core unit of analysis in popularizations. What has been found in popularizations when tagging and analysing the articles is that there are cases in which the journalist is clearly averring in his/her own voice; this narration is followed by a stretch of text which ideally would still be the journalist narrating, yet there are some indications pointing to the fact that it could also be considered a case of Free Direct Speech, since there is no projecting clause for the journalist to indicate to the reader that an external source of information is speaking in paratactic mode and yet there are some indications, such as changes in verb tense or the use of personal pronouns and determinants, which point to the integration of an external source:

(76) In the meantime, scientists plan to look for other, indirect signs, that a planet may be well-suited for life. Kipping is searching through the Kepler data for hints that some planets have moons, which can improve their odds of being habitable. **<W-J> <FDS-N> Our own moon stabilises Earth's tilt, making the temperatures far less erratic**

than they would be otherwise. Alien planets that share a solar system with a gas giant like Jupiter are also interesting, because the vast size of the planet acts as a shield against devastating asteroid and comet impacts. </FDS-N> </W-J> (TG_Sci_95)

In example (76), the first two stretches of text clearly belong to the journalist's voice reporting what some scientists want to do. However, the use of the possessive determinant *our* in the third paragraph makes it difficult for the reader to identify the voice as the journalist's or if it is actually Kipping directly talking to the audience, albeit in free speech form of presentation, so that both the voice of the journalist and the voice of the external source are blurred through the absence of indication of whom that voice belongs to. Merging of voices of this kind is quite frequent in the *TG_Sci* corpus, and they were tagged in the corpus as being considered ambiguous between Free Direct Speech and Narration instead of placing them under one tag or the other since it is precisely this blurring of voices which makes the journalist align or detach from the information more effectively. This is so because since it is difficult to delimit and define the unit of voice, it is also difficult to attribute it to a specific source and, hence, the journalist can position him/herself towards the information without being held responsible for the claims made.

5.3.2 Averral

Averral makes reference to writers, in this case science journalists, using their own voice to narrate in the text. Cases of Narration are those most frequently included under this phenomenon, although nouns of projection (with embedded fact), nouns of fact (with embedded fact) and attributive clauses with embedded fact were also classified under averral since these most mediated projections of meaning appear as part of the

journalist's narration of events. Besides, even if these cases project meaning, they do not do so in the same way as cases included under attribution, since there is no clause nexus linking projecting and projected clauses to integrate and construe meaning. Those meanings are packaged and embedded as part of the journalist's voice, as if he/she were averring them, as in (77) *There are biologically plausible reasons* ***why smoking may be linked to psychosis*** (TG_Sci_156).

5.3.2.1 Narration

To this category belong cases where the journalist is averring or narrating events using his/her own voice. Cases of Narration sometimes also appear as embedded in cases where voices are attributed to external sources of information.

Journalist's voice <J>
Journalist's narration <N>
Journalist's 'embedded' narration <eN>

-Narration

(78) **<J> <N> Lying on their left sides, curled together, the two skeletons on display for the first time at the British Museum look peacefully laid to rest. But the razor-sharp stone flakes scattered around and among the bones are the remains of ancient weapons, with a myriad breaks and slash marks on the skeletons. The two are among the oldest war dead in the world, men who died a brutal death after violent lives 13,000 years ago. </N> </J>** (TG_Sci_48)

5.3.2.2 Nominalizations and embedded projection

-Nouns of projection and nouns of projection with embedded fact

Noun of projection <NP>

The same tag was used for both nouns of projection and nouns of projection with embedded fact. Once all cases were identified and tagged, a distinction was made between the two cases.

Nouns of projection are considered nominalizations of a previous agnate congruent verbal or mental process. Nouns of projection are grammatical metaphors of the ideational type, since they are 'packaging' the world and causing the previous congruent projection nexus to act as Thing in the real world[11], as in examples (79) and (80) below:

> (79) The **<NP> revelation </NP>** comes from two years of measurements by an international team of astronomers who installed a telescope and a sensitive camera at the Mauna Loa Observatory in Hawaii, run by the US National Oceanic and Atmospheric Administration. (TG_Sci_03)
>
> (80) His **<NP> comments </NP>** came during a debate that culminated in a vote approving the creation of a working group on the environment to monitor the church's action on climate change and other environmental issues. (TG_Sci_15)

Nouns of projection with embedded fact present a noun of projection as a nominalization of a previous verbal or mental process and the noun of projection acts as Head of the noun group. This noun group is postmodified by an embedded fact which integrates information related to and expanding the previous noun of projection. The tag used to label nouns of projection with embedded fact is the same as for nouns of

[11] cf. Chapter 4, Section 4.1; Thompson 1994a

projection (<NP>) but it includes the noun group and its postmodification by the embedded fact, as in:

> (81) Life would struggle to gain a foothold on Enceladus if it had no internal heating system because the Saturnian moon is too distant to be warmed by the sun. Hsu and his colleagues reached the **<NP> conclusion that Enceladus has a warm ocean under 25 miles of icy crust </NP>** after months of work to trace the origins of tiny particles of silicon dioxide that had been collected by Nasa's Cassini probe. (TG_Sci_116)

> (82) The levels fluctuated wildly among the dead babies, while they were comparatively stable among those who lived into childhood or adolescence. The findings overturn the previous **<NP> belief that high nitrogen levels are generally an indicator of good nourishment </NP>** – including a diet rich in fish among the Londoners. (TG_Sci_129)

-Nouns of fact and nouns of fact with embedded fact

Noun of fact <NF>

Similar to the tags used for nouns of projection, nouns of fact and nouns of fact with embedded fact were identified by using the same tag, and the distinction was established later.

Nouns of fact are considered impersonal projections, but not nominalizations of previous processes (Halliday and Matthiessen 2004). They are presented as already belonging to the world of Things[12].

In example (83) below, taken from the *TG_Sci* corpus, what we hear is the voice of the journalist averring, except for one attributed structure (see the sentence in italics). In

[12] cf. Pérez-Veneros in press; Thompson 1994a

both cases of averral we find two nouns of fact which compact meaning through the labels *problems* and *issue*. Thanks to the use of these nouns, the journalist is able to act as mediator of the information, by interpreting the external knowledge as problems and *issue.* However, later on he/she expands that packaging, by making clear what the problem is and what issue is more mundane. Conversely, he/she is acting as mediator of the information by evaluating the problem as 'toughest' and the issue as 'mundane'.

Furthermore, the noun of fact *problems* is acting as Value of an identifying process whose Token is the actual information on the problem. By the time the readers get this information, it has already been labeled as 'problems' by the journalist. Besides, the adjective 'toughest' is placed in pre-modifying position, it is taken for granted and, hence, it is not open for the readership's evaluation:

> (83) One of the toughest **<NF> problems </NF>** the scientists face is how to find reliable signals of illness in a fuzzy mass of brainwaves. But that is not all. *They also need to know which conditions can be improved by activating certain genes in particular parts of the body.* Another **<NF> issue </NF>** is more mundane. Over time, implants get covered with fibrotic scar tissue, which would hamper the release of any proteins from the implant. (TG_Sci_73)

In example (84) below we find a noun of fact with embedded fact. The noun of fact *evidence* is postmodified by the embedded fact *that milk made for female and male babies is consistently different*. Moreover, the noun group which consists of the noun of fact *evidence* as Head represents the Existent in an existential process, an environment in which 'fact' clauses can occur and which is favoured by the noun *evidence* (cf. Halliday and Matthiessen 2004: 475):

(84) Tests on mothers' milk in both monkeys and humans have showed that levels of fat, protein, vitamins, sugars, minerals and hormones vary enormously, but there is **<NF> evidence that milk made for female and male babies is consistently different </NF>**. The make-up of the milk has a direct impact on the child's growth, but also on his or her behaviour and temperament, which may last for the rest of their life. (TG_Sci_17)

-Attributive clauses with embedded fact:

Attributive clause with embedded fact <AC>

Attributive clauses with embedded fact are 'attributive' clauses where the Carrier is typically realized by a nominal group, and the Attribute is a nominal group with an embedded fact clause, in this case 'intensive', with an adjective as Head of the adjective group.

In examples (85) and (86) below the adjectives *uncertain* and *categorical* act as Attributes in a relational attributive process and they are the Head of the adjective group. Both Attributes present an embedded fact which provides further information on the categorization of scientists as *uncertain* in the first example and as *categorical* in the second:

(85) Scientists have been **<AC> uncertain whether land-based food could act as a substitute for their rich winter diet </AC>** (TG_Sci_124)

(86) The scientists were **<AC> categorical that geoengineering should not be deployed now </AC>**, and was too risky to ever be considered an alternative to cutting the greenhouse gas emissions that cause climate change. (TG_Sci_104)

5.3.3 Tagging verbal and mental processes

The main focus when tagging verbal and mental processes was placed not only on how the projecting verbs in the corpus are interpreted in relation to the events narrated, but also how they contribute to construe an experiential representation of the journalist's epistemological positioning. Even if this dissertation mainly explores how attributed meanings are construed from an experiential viewpoint and how they contribute to the visibility of the journalist's stance in the text, it is important to analyse how the verbal and mental processes used to project also evaluate the information by expressing the journalist's attitudinal polarity towards the projected information (cf. Thompson 1996 on the dimension of Attitude presented in Chapter 4).

Some of the verbs which appear in this context of science dissemination are not easily classifiable (cf. Moyano 2013, 2015). I refer to verbs such as *show*, which are considered to *Show the effect of what was said* according to Thompson's classification (1994b). However, as Martin and Matthiessen (1991 quoted in Moyano 2015: 171) and Halliday and Matthiessen (2004: 172 on "The grammar of experience") posit, these verbs could be said to be located in a cline where typical verbs of saying are placed at one end and relational identifying elements at the other. Moyano establishes a criterion by which processes associated with a human participant are treated as being closer to the verbal extreme of the cline, while processes associated to a material entity are closer to the relational end. Nevertheless, as Moyano (2015: 173) also signals, these verbs can also be placed in the context of projecting voices in the text and, as such, also convey the meaning of *say*. In these cases, decisions on how to classify these verbs will depend on how the co-text is interpreted. Verbs such as *show* and *find* were considered processes projecting meaning depending on the co-text and depending on whether they presented associated participants or not. Thompson's (1994b) classification covers

verbal, mental and relational processes to project meaning, but he focuses on the function these verbs carry out. Since my main focus is on the neutral or non-neutral aspect of verbs, Thompson's classification proves helpful and fruitful for these purposes.

Processes are classified according to their illocutionary force or absence of it. I relied both on Thompson's classification (1994b) and a revised version (cf. Elorza and Pérez-Veneros 2014a) to clearly distinguish between neutral and non-neutral processes, which runs as follows:

5.3.3.1 Neutral verbal and mental processes

Neutral verbal or mental process <NRV>

-Neutral hearsay

> (87) Prof Piers Forster, at the University of Leeds, **<NRV> said </NRV>** : "This is a great paper as it changes the perspective on geoengineering and as such reminds us what a ridiculous idea trying some technological fix to counter carbon dioxide could be." (TG_Sci_72)

-Neutral continuative

> (88) "In the air force we do a lot of intelligence missions and we have a lot of analysts on the back end who are looking for targets, which can be vehicles, buildings or whatever," **<NRV> said </NRV>** Andy McKinley, who led the research with Lindsey McIntire, a psychologist at Infoscitex, a technology company in Dayton.
>
> (89) "This type of image analysis task is not well suited to automation. There's no computer algorithm that can go in and autoselect targets for you, it's a human

endeavour. If we can help people pay attention for long periods of times, that‘s really important,” he **<NRV> added. </NRV>** (TG_Sci_79)

-Neutral report of speech or writing

(90) “This study, without compromising the physical integrity of the roll, has not merely discovered traces of the ink inside it, but has also helped identify with a certain likelihood the style of handwriting used in the text, along with its author,” the authors **<NRV> write. </NRV>**

“It holds out the promise that many philosophical works from the library of the ‘Villa dei Papiri’, the contents of which have so far remained unknown, may in future be deciphered without damaging the papyrus in any way,” they **<NRV> add. </NRV>** (TG_Sci_99)

-Neutral mindsay

(91) Researchers **<NRV> believe </NRV>** the mirror could slash the amount of energy used to control air temperatures in business premises and shopping centres by doing away with power-hungry cooling systems. (TG_Sci_82)

-Showing how the message fits in

(92) Public Health England **<NRV> responded </NRV>** to the WHO announcement by accepting the 10% limit recommendation. It went further, adding that it "will carefully consider the suggestion that a further reduction of sugar to below 5% of total energy intake per day would have additional benefits." (TG_Sci_22)

-Showing whether a report is of speech or of writing

(93) If Van Gogh's illness was a blessing, the artist certainly failed to see it that way. In one of his last letters, he **<NRV> voiced </NRV>** his dismay at the disorder he fought for so much of his life: "Oh, if I could have worked without this accursed disease - what things I might have done." (TG_Sci_144)

5.3.3.2 Stance verbal and mental processes

Stance verbal or mental process <SRV>

-Showing the speaker's purpose

(94) But Caldeira, who was on the committee, **<SRV> argued </SRV>** that it made sense to study those consequences now. "If there are real show stoppers and it is not going to work, it would be good to know that in advance and take it off the table, so people don't do something rash in an emergency situation," he said. (TG_Sci_104)

-Showing the manner of speaking

There are no occurrences of this type of verbal process in the corpus. Verbs showing the manner of speaking typically appear in fictional writing to represent some non-speech qualities of the words uttered by different characters in literary fiction (cf. Caballero 2015). Under this subcategory Thompson (1994b) includes verbs such as *storm, sob, bark, hiss, or howl* (see Chapter 4, Table 7). These are considered behavioural processes through which the writer gives information on human physiological processes. They are distinguished from pure mental processes in that they signal the outward physical signs of those mental processes. Apart from indicating that something was said, they contribute to the construal of interpersonal meaning by describing the original source's

beahviour. The non-occurrence of these processes in popularizations can be a symptom of the fact that, even if journalists are present in this text type, their status as mediators of the information as compared to the scientists' status does not allow them to provide the reader with information linked to emotions and appraisal.

-Showing what was said through the reporting verb

(95) Some Republican members of Congress **<SRV> dismissed </SRV>** the findings of the report. Deb Fischer, a Republican Senator from Nebraska, **<SRV> attacked </SRV>** the science as "politically charged" and "far from settled" as well as Obama for bypassing Congress and using his executive authority to act on climate change. (TG_Sci_32)

-Attention to the speaker's or writer's words

(96) István Szapudi, who led the work at the University of Hawaii at Manoa, **<SRV> described </SRV>** the object as possibly <PQ> "the largest individual structure ever identified by humanity." (TG_Sci_125)

-Showing the reporter's attitude

(97) Scientists **<SRV> claim to </SRV>** have detected the first stirrings of neural activity that flicker across the brain when a person thinks up a joke. (TG_Sci_76)

(98) There is still a risk of blood clots, they **<SRV> point out </SRV>**, and different versions and doses of the pill carry different risks of stroke and heart attack. How and why the pill carries some risks and other benefits is not well understood.

"Even if the biological mechanisms remain elusive and the existing evidence falls short of wider recommendations for [prescribing the pill to prevent cancer], women need to be more aware of the unintended benefits and the risks of oral contraceptives, so that they can make informed decisions," they conclude. (TG_Sci_164)

-Showing no acceptance of responsibility

(99) Astronomers have discovered **<SRV> what they say </SRV>** is the largest known structure in the universe: an incredibly big hole.

The "supervoid", **<SRV> as it is known </SRV>**, is a spherical blob 1.8 billion light years across that is distinguished by its unusual emptiness. (TG_Sci_130)

These two cases in example (99) are not considered processes as such, but Thompson (1994b) classifies them as reporting signals through which the writer detaches from the information given and, as such, is not liable for it.

-Showing the effect of what was said

(100) Previously, Japanese researchers **<SRV> have shown </SRV>** that cannabis appears to interact with taste receptors to enhance the sweet taste in foods, thus boosting certain cravings. Other work **<SRV> has shown </SRV>** that mice given THC (tetrahydrocannabinol), one of the active ingredients in cannabis, had an enhanced sense of smell and an overactive "reward" system, which provides hints to why some people find eating especially gratifying when under the influence. (TG_Sci_108)

5.3.4 Tagging participants

For the analysis of participants I followed the classification proposed by Halliday and Matthiessen (2004), distinguishing between Human and Material entities. Since Human participants are much more present in the corpus, and they are presented through different encodings, a more delicate and fruitful sub classification of Human participants was also used, following Thomas and Hawes (1997) and Hawes and Thomas (2012), who distinguish between Human Named, Human Semi-named, Human Institution and Human Pronoun participants.

The following tags are used for the classification of the participants found in the *TG_Sci* corpus:

Human participant <H>
Named Human participant <N>
Semi-named Human participant <SN>
Pronoun Human participant <P>
Institution Human participant <I>
Material participant <M>
Sayer as Circumstance <SaC>

5.3.4.1 Human Named participants <H> <N>

(101) (name + position + affiliation) → **<H> <N> Stephen Whitehead, chief executive of the Association of the British Pharmaceutical Industry </N> </H>**, welcomed

Nice's guidance but said Britain was lagging behind Europe when it came to uptake of new oral anticoagulants. called on clinicians to "ensure that they do not prevent patients, who would benefit from these medicines, having access to them". (TG_Sci_40)

(102) (surname) → **<H> <N> Tully </N> </H>** said the research will help scientists understand why the Milky Way is hurtling through space at 600km a second towards the constellation of Centaurus. Part of the reason is the gravitational pull of other galaxies in our supercluster.

"But our whole supercluster is being pulled in the direction of this other supercluster, Shapley, though it remains to be seen if that's all that's going on," said **<H> <N> Tully. </N> </H>** (TG_Sci_52)

5.3.4.2 Human Semi-named participants <H> <SN>

(103) The rejuvenating effect can be traced to increased blood flow in a specific region of the brain, say **<H> <SN> the researchers**. **</SN> </H>** (TG_Sci_66)

(104) **<H> <SN> Climate skeptics </SN> </H>** suggested the incident disproved global warming, even though the ship's encasement was caused by the wind blowing ice around, making this a weather problem rather than a climate impact. (TG_Sci_93)

5.3.4.3 Human Pronoun participants <H> <P>

(105) Stevenson believes the mystery customer may have been a curator at the Ashmolean Museum in Oxford, Joseph Grafton Milne, who died in 1951, but was recorded as visiting Petrie in Egypt in the 1890s. The link between the distinctive pots: the Ashmolean has a bowl from Milne's collection from the same grave as Funnell's pot, and **<H> <P> she </P> </H>** thinks it is probable Milne obtained both from Petrie. (TG_Sci_37)

(106) The discovery may have implications for prenatal testing and for genetic counsellors who may be able to test patients for TUBB5 mutations, **<H> <P> he </P> </H>** said. But **<H> <P> he </P> </H>** said parents could not pass the faulty gene on to their children and the mutation occurred during pregnancy. The cause is unknown. (TG_Sci_39)

5.3.4.4 Human Institution participants <H> <I>

(107) **<H> <I> The UN's Intergovernmental Panel on Climate Change (IPCC) </I> </H>** addressed the warming pause issue in its 2013 climate report, pointing out that the Earth is going through a solar minimum and that more than 90% of the world's extra heat is being soaked up by the oceans, rather than lingering on the surface. (TG_Sci_14)

(108) **<H> <I> The Church of England </I> </H>** has said that it will, as a last resort, pull its investments from companies that fail to do enough to fight the "great demon" of climate change and ignore the church's theological, moral and social priorities. (TG_Sci_15)

(109) In a draft updated guideline on sugar consumption, **<H> <I> WHO </I> </H>** recommended on Wednesday that no more than 10% of our calories should come from sugar, but suggested less than 5% would be preferable. (TG_Sci_22)

5.3.4.5 Material participants

Material participants (<M>) can be treated as metonymic entities standing for their human counterparts (Bednarek[13]) so that they would be acting as a 'disguise' for the experts' voices (Elorza in press). Conversely, they can also be seen as nominalizations

[13] My gratitude to Prof Monika Bednarek for this suggestion made in the discussion part of a paper presented by the author of this dissertation as part of the 42nd International Systemic Functional Linguistics Congress held in RWTH Aachen University in July 2015.

of processes (cf. Thompson 1994a) by means of which the journalist 'packages' the information which has been previously presented (anaphoric position) or which will be later developed into fully projected forms (cataphoric position) (cf. Pérez-Veneros in press). Examples (110), (111), (112) and (113) below present cases of Material participants as the participants 'speaking' in the units of voice:

(110) **<M> Tests on mouse embryos </M>** confirmed that the gene can have a profound impact on brain development. Embryos injected with the gene grew larger brain regions and some developed the crinkled brain surface that humans have. The folds allow more brain tissue to fit into the same sized skull. (TG_Sci_112)

(111) In lab experiments, the scientists confirmed that they could make similar particles by mixing silicon-bearing rocks with water and holding them at high temperature and pressure. The best conditions were salty and alkaline, according to **<M> a report in the journal, Nature. </M>** (TG_Sci_116)

(112) **<M> Previous research </M>** also suggested that humans are evolving more quickly now than at any time since the split with the ancestors of modern chimpanzees 6m years ago. **<M> The study, by the University of Wisconsin, </M>** found that at least 7% of human genes have undergone recent evolution. (TG_Sci_122)

(113) **<M> The results </M>** showed that while brain stimulation appeared to help those who needed it most, it impaired the performance of others. **<M> Measurements of cortisol, a stress hormone, </M>** found that brain stimulation let anxious students control their anxiety, but prevented the less worried students from doing the same. (TG_Sci_84)

5.3.4.6 “Sayers as Circumstance”: According to

According to embodies the main example of Sayer as Circumstance of Angle (<SaC>). It was classified under the heading of ‘Participants’ because it is the constituent of the clause where the Sayer is construed. However, *according to* is at the same time acting as Circumstance of Angle and it is used to integrate projected meaning which is in turn attributed to a new participant. Hence, *according to* could be said to play a double role: that of participant (Sayer) and that of a Circumstance signalling that a new voice is being integrated to project meaning:

> (114) About one in five people inherits a single copy of the gene variant, or allele, known as KL-VS, which improves heart and kidney function, and on average adds about three years to human lifespan, **<SaC> according to </SaC>** Dena Dubal, a neurologist at University of California, San Francisco. (TG_Sci_101) (Neutral)

Table 11 below shows the annotation scheme proposed in this dissertation for the analysis of units of voice in polyphonic texts and which has been followed in this work for the analysis of units of voice in popularizations:

		DESCRIPTION OF TAG	CODING
		Unit of Voice	<UV> </UV>
Attribution	Hypotaxis	Journalist's Wording	<JW> </JW>
		Narrator's Representation of Speech Act	<NRSA> </NRSA>
		Embedded Narrator's Representation of Speech Act	<eNRSA> </eNRSA>
		Narrator's Representation of Speech Act with Topic	<NRSAT> </NRSAT>
		Embedded Narrator's Representation of Speech Act with Topic	<eNRSAT> </eNRSAT>
		Indirect Speech	<IS> </IS>
		Embedded Indirect Speech	<eIS> </eIS>
		Free Indirect Speech	<FIS> </FIS>
		Embedded Free Indirect Speech	<eFIS> </eFIS>
	Parataxis	External source's wording	<W> </W>
		Direct Speech	<DS> </DS>
		Embedded Direct Speech	<eDS> </eDS>
		Free Direct Speech	<FDS> </FDS>
		Embedded Free Direct Speech	<eFDS> </eFDS>
		Partial Quotation	<PQ> </PQ>
	Combined structures	Journalist's Rephrasing of Wording	<JRW> </JRW>
		Journalist's Evaluation of Wording	<JEW> </JEW>
	Free Direct Speech vs. Narration		<FDS-N> </FDS-N>
Averral	Journalist's voice		<J> </J>
	Narration		<N> </N>
	Embedded Narration		<eN> </eN>
	Noun of projection (with embedded fact)		<NP> </NP>
	Noun of fact (with embedded fact)		<NF> </NF>
	Attributive clause with embedded fact		<AC> </AC>
Verbal and mental processes	Neutral verbal or mental process		<NRV> </NRV>
	Stance verbal or mental process		<SRV> </SRV>
Participants	Human participant		<H> </H>
	Human Named participant		<N> </N>
	Human Semi-named participant		<SN> </SN>
	Human Pronoun participant		<P> </P>
	Human Institution participant		<I> </I>
	Material participant		<M> </M>
	'Sayer as Circumstance': According to		<SaC> </SaC>

Table 11. Annotation scheme for the analysis of units of voice: A proposal

The following science popularization article (TG_Sci_68) represents an instance of how the popularizations were tagged with the annotation system previously described:

<teiHeader> The Guardian – John Vidal – 31 October 2014 </teiHeader>

<HL> **Ozone hole remains size of North America, Nasa data shows**

Antarctic hole in protective layer of gas stands around same level as 2010, 2012 and 2013, but scientists say recovery is on track </HL>

<UV> <JW> <IS> The Antarctic ozone hole, which was expected to reduce in size swiftly when manmade chlorine emissions were outlawed 27 years ago, is stubbornly remaining the size of North America, <NV> <M> new data from Nasa </M> </NV> <SRV> suggests </SRV>. </IS> </JW> </UV>
<UV> <J> <N> The hole in the thin layer of gas, which helps shield life on Earth from potentially harmful ultraviolet solar radiation that can cause skin cancers, grows and contracts throughout the year but reached its maximum extent on 9 September when monitors at the south pole showed it to cover 24.1m square km (9.3m sq miles). This is about 9% below the record maximum in 2000 but almost the same as in 2010, 2012 and 2013.
But scientists remain <AC> unsure why the hole has not reduced more since the Montreal Protocol agreement was signed by countries in 1987 </AC> . </N> </J> </UV>

<UV> <J> <N> This global treaty is considered one of the world's most successful, having been pushed through in record time. </N> </J> <JW> <NRSA> <M> It </M> <SRV> bans </SRV> the use of ozone-depleting chlorofluorocarbons (CFCs), </NRSA> </JW> <J> <N> substances that were widely-used in household and industrial products such as refrigerators, spray cans, insulation foam and fire suppressants. </N> </J> </UV>

<UV> <W> <DS> "The ozone hole area is smaller than what we saw in the late-1990s and early 2000s, and we know that chlorine levels are decreasing. However, we are still uncertain about whether a long-term Antarctic stratospheric temperature warming might be reducing this ozone depletion," <NRV> said </NRV> <H> <N> Paul A Newman, chief scientist for atmospheres at Nasa's Goddard Space Flight Center in Greenbelt, Maryland </N> </H> . </DS> </W> </UV>
<UV> <W> <DS> "It's broadly on track [to reduce in size]," <NRV> said </NRV> <H> <N> Dr Jonathan Shanklin, emeritus professor at the British Antarctic Survey in Cambridge, one of the three scientists who discovered the hole in the 1980s. </N> </H> "We knew it was always going to take a long time to recover because the CFCs were long-lived." </DS> </W>

<JRW> <JW> <IS> <H> <P> He </P> </H> <NRV> said </NRV> the reason why it was not healing more quickly was because the interaction between climate change and the ozone hole was complex. </IS> </JW> <W> <DS> "The ozone hole itself is affecting the climate of Antarctica and Australia, and is being affected by it. It is changing the wind systems.

"As the ozone hole [gradually] fills in, so we can expect, over the next 50 or so years, the effects of climate change to increase. We will see different patterns of climate change".</DS> </W> </JRW> </UV>

<UV> <J> <N> Last month </N> </J> <JW> <IS> <M> the UN Environment Programme (Unep) </M> and <H> <I> the World Meteorological Organisation (WMO) </I> </H> <NRV> said </NRV> there were <PQ> "positive indications" </PQ> that the ozone layer was on track to recovery, </IS> </JW> <J> <N> but </N> </J> <JW> <IS> <SRV> warned </SRV> it might take a further 35 years or more to recover to 1980 levels. </IS> </JW> <JW> <IS> <H> <P> They </P> </H> <NRV> said that </NRV> without the Montreal Protocol atmospheric levels of ozone depleting substances could have increased tenfold by 2050. </IS> </JW>

<JW> <IS> <SaC> According to </SaC> <M> Unep </M> , by 2030 the treaty will have prevented two million cases of skin cancer annually, averted damage to human eyes and immune systems, and protected wildlife and agriculture. </IS> </JW> </UV>

As seen from the example given, the first tag appearing in each unit of voice is the one indicating that a unit of voice starts <UV>. After that, the following tags correspond to identifying either a case of averral <J> <N>, or attribution <JW> + the corresponding type of speech presentation. If a case of averral is identified, we can also identify cases of nouns of projection, nouns of fact or attributive clauses with embedded fact integrated in the journalist's narration as in:

> (115) <UV> <J> <N> The hole in the thin layer of gas, which helps shield life on Earth from potentially harmful ultraviolet solar radiation that can cause skin cancers, grows and contracts throughout the year but reached its maximum extent on 9 September when monitors at the south pole showed it to cover 24.1m square km (9.3m sq miles). This is about 9% below the record maximum in 2000 but almost the same as in 2010, 2012 and 2013.
>
> But scientists remain **<AC> unsure why the hole has not reduced more since the Montreal Protocol agreement was signed by countries in 1987. </AC>** </N> </J> </UV>

Conversely, if a case of attribution is identified, the corresponding tagging refers to the type of speech presentation, the verbal or mental process identified and the type of participant. In addition, if it is a case of combined structure, the two parts of the structure are also tagged for the three elements making up the projection clusters, as seen in this excerpt taken from the text above:

(116) **<JRW> <JW> <IS>** <H> <P> He </P> </H> <NRV> said </NRV> the reason why it was not healing more quickly was because the interaction between climate change and the ozone hole was complex. **</IS> </JW> <W> <DS>** "The ozone hole itself is affecting the climate of Antarctica and Australia, and is being affected by it. It is changing the wind systems.

"As the ozone hole [gradually] fills in, so we can expect, over the next 50 or so years, the effects of climate change to increase. We will see different patterns of climate change".**</DS> </W> </JRW>** </UV>

Finally, if *according to* is identified, it is tagged as <SaC> and as being part of a case of Indirect Speech presentation, with their corresponding participant also identified and tagged:

(117) **<JW> <IS> <SaC>** According to **</SaC>** <M> Unep </M> , by 2030 the treaty will have prevented two million cases of skin cancer annually, averted damage to human eyes and immune systems, and protected wildlife and agriculture. **</IS> </JW>** </UV>

In each unit of voice, there is a concatenation of tags which identify and better describe the phenomenon tagged, whether it is attribution or averral. In turn, the tagged texts in the corpus provide us with information on how attribution and averral work in science popularization articles and how the journalists are also present in the text.

This chapter has outlined the methodological approaches followed, with the combination of computer assisted and manual analysis of data. I have also characterised the corpus used in this research, which comprises 1,625 units of voice. The qualitative results of the study have also been presented, described and exemplified through the presentation of a proposal of an annotation scheme for the tagging of the categories found within the units of voice identified in the corpus. The next chapter will present the quantitative results of this research and the implications the resulting gathering of data entail for the better characterization of how science dissemination is carried out and how journalists construe attributed meanings in the British press.

Chapter 6
Results

This chapter presents the quantitative results of the study on how attributed meaning is construed in the *TG_Sci* corpus, by focusing on whether the journalist is either narrating or projecting somebody else's words or ideas; the verbal and mental processes used, and the type of associated participant to which the information is attributed. Besides, I will focus on the co-occurrence of these three rhetorical resources by accounting for the projecting clusters which appear in the units of voice identified in the *TG_Sci* corpus and which allow the journalist to construe scientific meanings while interacting with his/her readership by attributing or averring information.

6.1 Logico-dependency relations: Taxis

Hunston (2000) distinguishes between averral and attribution; that is, between the writers narrating events using their own voice or, conversely, attributing the information to external sources. In the articles analysed, being polyphonic in nature, there is a need to distinguish between cases of averral and attribution. As such, there is a need to make a distinction between the journalist narrating events and cases where the journalist is projecting meaning, whether it is through paratactic or hypotactic projection.

Type of taxis		Tokens
Attribution (2353 → 61.2%)	Hypotaxis	1332 (34.7%)
	Parataxis	776 (20.1%)
	Combined structures	208 (5.4%)
	Free Direct Speech vs. Narration	37 (1%)
Averral (1495 → 38.8%)	Narration	1350 (35.1%)
	Nouns of projection and nouns of projection with embedded fact	92 (2.4%)
	Nouns of fact and nouns of fact with embedded fact	36 (0.9%)
	Attributive clauses with embedded fact	17 (0.4%)
Total		3848 (100%)

Table 12. Types and tokens of taxis in the *TG_Sci* corpus

Table 12 indicates that the number of occurrences of the journalist averring (38.8%) is lower than the number of occurrences where the journalist is projecting meaning which is attributed to external sources of expertise (61.2%). In popularizations, journalists rely on the voices of others to give credibility and reliability to the information narrated, even if their own voice to narrate events also plays an essential role in meaning construal. If we compare now the cases of projection found in the *TG_Sci* corpus, we can state that cases of hypotactic projection (34.7%) outnumber cases of paratactic projection (20.1%), where the journalist is literally reproducing the words of others. As such, the journalist's voice is not only present thanks to the fact that he/she sometimes narrates events using his/her own voice, but also through the use of different hypotactic structures through which he/she is rephrasing the information and acting as mediator of that information for the lay reader.

Turning to the cases of projected meaning, there is a need to distinguish among the several cases of speech presentation according to the continuum of speech presentation

suggested by Semino et al. (1997) and Semino and Short (2004) to get a better picture of how attributed meanings are construed in popularizations. It is necessary to point out that occurrences tagged as Journalist's Rephrasing of Wording and Journalist's Evaluation of Wording, labeled combined structures, have been accounted for separately since they present a combination of forms of speech presentation. Along the same line, nouns of projection and nouns of fact have been taken into account as yet another way for the journalist to project meaning in text, but they have been accounted for as separate from the total number of cases of attributed meaning, since they typically occur within cases of narration and, as such, are analysed under averral.

6.1.1 Attribution

Resulting data indicate that there are 2353 cases (61.2%) in which the journalist is attributing meaning instead of using his/her own voice to narrate events. Conversely, these meanings can be projected either hypotactically or paratactically.

6.1.1.1 Hypotaxis

Hypotactic projection occurs when one clause depends on another, hence presenting a dominant clause (α) and a dependent clause (ß). The dominant clause is the projecting one, typically including a verbal or mental process and its associated participant(s). The dependent clause is the projected one, where the writer integrates meaning which has previously been uttered somewhere else.

Results on the type of hypotactic projection found in the corpus can be seen in Table 13:

Hypotactic mode of projection	Tokens
Narrator's Representation of Speech Act (NRSA)	48 (3.8%)
Embedded Narrator's Representation of Speech Act (eNRSA)	20 (1.5%)
Narrator's Representation of Speech Act with Topic (NRSAT)	69 (5.2%)
Embedded Narrator's Representation of Speech Act with Topic (eNRSAT)	23 (1.7%)
Indirect Speech (IS)	998 (75%)
Embedded Indirect Speech (eIS)	102 (7.6%)
Free Indirect Speech	69 (5.2%)
Embedded Free Indirect Speech (eFIS)	0 (0%)
Total	1332 (100%)

Table 13. Types and tokens of hypotactic mode of projection in the *TG_Sci* corpus

Each case of speech presentation (Semino and Short 2004) presents both projecting and projected clauses to integrate meaning, with the exception of Free Indirect Speech, in which no projecting clause can be identified. In the next pages, I will explore each of the cases in turn.

-Narrator's Representation of Speech Act

The journalist's interpretation of the words of others is conveyed through a verbal process with illocutionary force and projected meanings appear as almost fully-packaged. Typically, the process is non-neutral, so that the journalist is not only conveying his/her own positioning towards the matter through the interpretation and packaging of words, but also through the choice of verb:

(118) **<JW> <NRSA> Other climatologists cautiously welcomed the research. </NRSA> </JW>** "The possibility of deliberate intervention to 'engineer' our climate is undoubtedly scary, but climate change causes problems for both people and ecosystems,

especially if it is large and rapid and whether it is warming or cooling," said Prof John Shepherd, at the University of Southampton. "We need to be prepared, so far as possible, and explorations like this are desirable, even if some people find them distasteful." (TG_Sci_71)

Example (118) is an example of NRSA, since we find the verb *welcome*, through which the journalist is conveying the illocutionary force of the utterance even if the audience gets no information of the words which were said since they are omitted (cf. Thompson 1996 on the dimension of Message) and 'packaged' in the process used. Furthermore, in this example we also find an attitude stance adverbial (*cautiously*), which also gives an indication of how the journalist interprets the information coming from the external source of information (Prof John Shepherd), even if later he/she actually reproduces the original words as a way of supporting the previous interpretation of them.

-Embedded Narrator's Representation of Speech Act

Typically, they are embedded within some other form of speech presentation, and they present the same structure as Narrator's Representation of Speech Act (NRSA):

(119) Experts were cautious about the results of the trial of an antibody known as aducanumab, which involved just 166 patients. But the dearth of drugs to halt or even slow the progress of dementia – of which Alzheimer's is the most common type –means **<JW> <eNRSA> that any positive results <SRV> will be greeted </SRV> with enthusiasm. </eNRSA> </JW>** (TG_Sci_119)

In example (119), the case analysed is embedded in a case of Indirect Speech presentation, to which it holds a hypotactic relation. In addition, the verb *greet*

'packages' the words which were originally said so that the reader has no specific information about them.

-Narrator's Representation of Speech Act with Topic

Apart from having a verbal or mental process with illocutionary force, there is a brief indication of the topic of the original utterance. This would correspond to Thompson's (1996) *summaries* (see Chapter 4). The meaning conveyed through the words chosen by the journalist to project a previous representation of the world is less packaged than in NRSA, but still the journalist has more freedom to interpret the original words as he/she wishes to. As Thompson (1996) points out, summaries or NRSATs typically consist of a message in the form of a noun group or a prepositional phrase which follows the process chosen:

> (120) **<JW> <NRSAT> Previous research had suggested the involvement of cosmic rays, highly energetic particles from deep space. </NRSAT> </JW>** In this scenario, the solar wind should protect Earth because it carries a magnetic field that was expected to deflect the cosmic rays, which would lower the rate of lightning strikes. (TG_Sci_35)

In example (120), the writer uses the verb *suggest* together with a brief indication of what the suggestion is about. The reader does not find a rephrasing of the words which were uttered, but a representation of those words through the nominal group *the involvement of cosmic rays*, which summarises what the suggestion is about.

-Embedded Narrator's Representation of Speech Act with Topic

They follow the same structure as NRSATs but they are embedded in other forms of speech presentation. Interestingly, they also happen to be embedded in narration, when the journalist is using his/her own voice to narrate events. Typically, this is done through elaborating clauses:

> (121) With its echoes of Thomas Malthus, **<JW> <eNRSAT> who warned of the unsustainability of rapid population growth in the 18th century, </eNRSAT> </JW>** the report warned that the current demographic momentum means that there are no easy policies to change the size of the human population substantially over coming decades, short of extreme and rapid reductions in female fertility. (TG_Sci_67)

In example (121) we find that there is a case of eNRSAT embedded within the words of the journalist who, apart from using a verbal process with illocutionary force (*warn*), is also giving the audience a hint of the words uttered by Thomas Malthus by interpreting them as *the unsustainability of rapid population growth in the 18th century*. In addition, this case of Embedded Narrator's of Speech Act with Topic is construed through hypotactic expansion, in this case elaborating on Thomas Maltus as the participant who gave the warning.

-Indirect Speech

The journalist is rephrasing or paraphrasing the words of others. This projection of meaning is one of the less packaged ones because, even if the writer is not reproducing the original words, the rephrasing carried out not only mentions the topic of the original utterance, but also a more or less accurate rephrasing of them:

(122) **<JW> <IS> Goesmann confessed that he lost a five Euro bet that Philae would never wake up after its batteries ran out. </IS> </JW>** "I'm very bad as a prophet, but I hope we hear more," he said. If Philae had landed where mission scientists had intended, it would have died from overheating months ago. (TG_Sci_163)

In example (122) we see how the journalist is rephrasing the words originally uttered by Goesmann, and not just packaging meaning or introducing the topic of the utterance in a very general way. Even so, in this example it is interesting to point out that the journalist uses a verbal process with illocutionary force as *confess* is. This means that the writer of this popularization is interpreting Goesmann's words as a confession and not as a statement with any further meaning conveyance.

In the *TG_Sci* corpus there are also cases of Indirect Speech in which the projecting clause appears at the end of the rephrasing. To some scholars (Leech and Short 2007 [1981]; Semino et al. 1997) this is a case of indirect speech in which the 'normal' or 'by default' structure followed has been reversed. They also suggest a possible 'free indirect speech' reading, since there is evidence of "considerable ambiguity between the narration forms and the Free Indirect forms" (Semino et al. 1997: 41). This is related to Keizer (2009) and Urbanová's (2009) interpretation of this structure type, which she considers to be a free indirect speech construction with a reporting frame. Thompson (1994b, 1996) argues that this type of structure is indistinguishable from an averral at the beginning, leading readers to think that it is the voice of the writer that is being heard. However, they have to adjust this view when they reach the end and they find the projecting clause, with the consequence that "readers are perhaps more likely to accept the reported clause as objective fact" (Thompson 1994b: 79). Along the same line, Vandelanotte (2004) points out that this can also be considered a case of Distanced Indirect Speech, through which the journalist is somehow 'appropriating' the words of

others by placing the message in thematic position and only after it has been presented does the reader realize that the voice being heard is not the journalist's, but one coming from an external authorized source of information.

Interestingly, this structure is mostly located on the first paragraphs of popularizations, which can be seen as a symptom of the journalist making his/her readers interpret that information as his/her own, so that it is only at the very end of the paragraph that the audience interprets that information as coming from an outside source:

> (123) **<JW> <IS> The tranquil chorus of the natural world is in danger of being lost to today's generation as people screen out the noises that surround them, <H> <SN> a senior US researcher warns. </IS> </JW>**
>
> **<JW> <IS> Rising levels of background noise in some areas threaten to make people oblivious to the uplifting sounds of birdsong, trickling water, and trees rustling in the wind, which can often be heard even in urban centres, said Kurt Fristrup, a senior scientist at the US National Park Service. </IS> </JW>** (TG_Sci_107)
>
> (124) **<JW> <IS> The extinction of Australia's megafauna, including giant birds, wombats and crocodiles, may have been driven by the disappearance of the continent's vast inland lakes around 50,000 years ago, new research suggests. </IS> </JW>** (TG_Sci_110)

In examples (123) and (124), it is only at the end of the sentence that the reader interprets the information as coming from an external source. The journalist 'appropriates' the words of others from the very beginning of the text by putting the emphasis on the message, on the rephrasing of the words uttered, and later on he/she allows the audience to interpret those words not as coming from the journalist, but from experts.

(125) Skelton said the next steps are to understand better exactly how the chemical spikes occur and then to see if these can be observed in other parts of the world. **<JW> <IS> The rock in Iceland is of only one type, basalt, and it may be that in places where there is a mix of rock types the chemical changes will be even more marked, he said. </IS> </JW>** (TG_Sci_55)

The first voice we can hear in (125) is the voice of Skelton and the voice of the journalist, since he is reproducing the words of this scientist. However, as the text develops we find more information about the same scientific topic, but without any reference to whom that voice belongs since there is no signalling of a change in voice. Hence, the voice could belong either to the scientist, since he was the one previously speaking, or the journalist. The journalist does not reveal the identity of the source until the reader has finished reading the information, where he/she finds the projecting clause attributing information to an external source.

-Embedded Indirect Speech

Cases of Embedded Indirect Speech appear when embedded in any other form of speech presentation. What were typically found in the *TG_Sci* corpus were cases of indirect speech as embedded in cases of indirect speech:

(126) Fox said **<JW> <eIS> he hoped that natural selection would ensure that the genotypes of wall browns that try to squeeze an extra generation into the year are selected out of existence </eIS> </JW>** "but whether the butterfly can adapt and not fall into this trap is a big question – some species adapt and thrive but lots of species become extinct." (TG_Sci_92)

Example (126) is a case of Indirect Speech embedded in another case of Indirect Speech, and then the journalist rephrases the words uttered by Fox. It is interesting to

note that the journalist also integrates part of the speech by Fox as it was originally conveyed, maybe because that information is more controversial than the one rephrased by the journalist and he/she detaches him/herself from it by directly quoting Fox.

-Free Indirect Speech

There is no projecting or projected clause but the co-text of the unit of voice considered Free Indirect Speech together with some formal changes in the language lead to the identification of some forms of FIS present in the *TG_Sci* corpus:

> (127) The researchers found KP had evolved a thick, sticky sugar "coat" which stopped it drying out. **<JW> <FIS> That contributed to the formation of biofilms of the bacteria, which are hard to remove from hospitals with traditional cleaning methods. As a result infection control procedures such as hand-washing were vital to prevent an outbreak. </FIS> </JW>** (TG_Sci_150)

In example (127) we find a case of hypotactic projection embodied in Indirect Speech presentation which is followed by what appears to be a Narration by the journalist since there is no indication of a projection of meaning taking place. However, because the verb tense is kept in the past and then changes to the present and because of some expressions used in the text (e.g. *which are hard to remove from hospitals with traditional cleaning methods; as a result*), we can conclude that this is a case of free presentation of the words originally uttered, since there are signals pointing to a blurring of voices present through the use of a free form of speech presentation.

6.1.1.2 Parataxis

Out of the 2353 cases of attributed information, 776 cases belong to paratactic projection. Clauses are said to be in paratactic relation when they have equal status; that is, they do not depend on one another and the distinction between them is merely based on the order the speaker/writer has decided to convey them. Since there is no relation of dependency between them, they are referred to as clause 1 and clause 2, rather than as clause α and clause ß.

Following the cline of speech presentation previously presented, the cases of paratactic projection in the *TG_Sci* corpus include four different types, as Table 14 below shows:

Paratactic mode of projection	**Tokens**
Direct Speech (DS)	744 (95.8%)
Embedded Direct Speech (eDS)	8 (1.1%)
Free Direct Speech (FDS)	24 (3.1%)
Embedded Free Direct Speech (eFDS)	0 (0%)
Total	776 (100%)

Table 14. Types and tokens of paratactic mode of projection in the *TG_Sci* corpus

-Direct Speech

The journalist is literally reproducing the words uttered by the original authorised sources of information:

> (128) If the scientists are right in exonerating black rats, or other European rodents, it would slash the chances of a future outbreak happening again. **<W> <DS> "There's no reason to assume there will be a major plague outbreak in Europe, simply because**

we don’t have the right small rodent species there,” said Stenseth. </DS> </W> (TG_Sci_109)

Some scholars (de Oliveira 2007; de Oliveira and Pagano 2006) posit that the use of direct speech increases the writer’s distance from the information integrated in the quotation so that the writer (in this case the journalist) is not held responsible for the words uttered, because he/she detaches from them.

Writers of popularizations rely heavily on paratactic projection to convey meaning, since popularizations are supposed to be factual texts which need to include external and authorized sources of information to justify and give credibility to scientific knowledge. However, what can be found in this text type is that the journalist includes a quotation not just to show that he/she is relying on faithful sources of attribution, but also because he/she wants to justify their own previous interpretation of the information. This is very much related to what has been labeled combined structures (Elorza and Pérez-Veneros 2014a; Smirnova 2009; see Chapter 5) and which will be addressed later in this chapter.

-Embedded Direct Speech

(129) Sykes, who is also publishing a book on yetis this autumn– **<W> <eDS> "I wouldn't have done this as a young man, before I had an established reputation as a scientist," he admitted </eDS> </W>** –said he was struck that science was accused by yeti enthusiasts of rejecting the notion of their existence. "This conflicts with the basic tenet that science neither rejects nor accepts anything without examining the evidence," the team wrote. (TG_Sci_41)

In example (129), there is a case of Direct Speech embedded in a case of Indirect Speech presentation as a way for the journalist to include the literal words uttered by Sykes on how he would have felt about publishing a book on yetis if he had been younger and not a proper scientist. These words can be interpreted as a way for the journalist to bring the expert and the audience closer, by presenting the expert in a more personalized way, as he/she narrates his own feelings and opinion on the event.

-Free Direct Speech

Typically, cases of Free Direct Speech are found after cases of Direct Speech, since there are no signals showing a change of voice or the transition is not explicitly signaled:

> (130) **<W> <FDS> One thing is for sure, says Dilcher, </FDS> </W>** "we need to understand as much as we can about flowering plant evolution because right now we're facing a world crisis." **<W> <FDS> Most modern flowering plants need animal pollinators to reproduce, with bees serving that role for many of our most important crops. Yet bees are declining in the US and Europe. </FDS> </W>**
>
> "This plant shows us where it all began," says Dilcher. "If we know more about their evolution, we might come across alternative pollinators that are hidden out of sight today but played a role in the past that we could encourage again." (TG_Sci_167)

Example (130) integrates two cases of Free Direct Speech. Both cases lack quotation marks but the reader can still attribute the words to the external source of information, Dilcher. In the first case, it is because the projected words are followed by a projecting clause, and then by a literal quotation. In the second case, even if there are no quotation

marks or projecting clause present, the topic of flowering plants does not change and the audience still attributes those words to the source who was uttering the previous words.

6.1.1.3 Combined structures

Type of combined structure	Tokens
Journalist's Rephrasing of Wording (JRW)	150 (72.1%)
Journalist's Evaluation of Wording (JEW)	58 (27.9%)
Total	208 (100%)

Table 15. Types and tokens of combined structures in the *TG_Sci* corpus

Two different types of combined structures are identified, namely Journalist's Rephrasing of Wording (JRW) and Journalist's Evaluation of Wording (JEW). In Journalist's Rephrasing of Wording, we typically find a case of hypotactic projection where the journalist does not reproduce the previously uttered words literally, but partially interprets them, sometimes by also making use of verbal or mental processes with illocutionary force. The second part of the structure plays the role of supporting and validating the previous partial interpretation done by the journalist, so that he/she cannot be held responsible for the information. Results reveal that this is the most frequent combined structure (72.1%) found in popularizations, more than double that of cases of Journalist's Evaluation of Wording (27.9%). Furthermore, in most of the cases the hypotactic projection is realized by a case of Indirect Speech, although we can also

find cases of Narrator's Representation of Speech Act (NRSA) and Narrator's Representation of Speech Act with Topic (NRSAT):

> (131) **<JRW> <JW> <IS> Ramirez agreed that in future, the findings could have clinical applications. </IS> </JW> <W> <DS> "The big thing technologically is we don't have a good non-invasive way of manipulating brain activity. One day it should be possible though," he said. </DS> </W> </JRW>** (TG_Sci_114)

In example (131), the journalist integrates the words uttered by Ramirez through indirect speech by using the verbal process *agree*. This verb conveys more information than simply signaling that the journalist is projecting somebody else's words; it involves the journalist's interpretation that the scientist was in favour of the subsequent statement that the findings could have clinical applications. However, to support that interpretation and to mediate with the audience, the journalist includes the original words uttered by this expert.

Cases of Journalist's Evaluation of Wording are found in those structures consisting of journalist's Narration followed by paratactic projection. The first part of the structure is entirely devoted to the journalist's narration or averral while, at the same time, he/she evaluates the scientific knowledge transmitted. However, as a way of detaching him/herself from this evaluation, he/she literally reproduces the words uttered by an authorised source of information to justify and support why he/she narrated the scientific events the way he/she did:

> (132) **<JEW> <J> <N> It should also be possible to predict the type of lightning. </N> </J> <W> <DS> "We saw an increase in the cloud-to-ground lightning strikes, which are the classic bolts that cause most damage and fatalities, when there were cosmic rays coming into the Earth's atmosphere," said Owens. "If there**

are not cosmic rays coming down, then the electrical charge might discharge into the clouds around it to produce more sheet lightning." </DS> </W> </JEW> (TG_Sci_78)

(133) **<JEW>** <J> <N> The idea that chameleons can camouflage against any background is a myth, however. </N> </J> <W> <DS> "I'm sorry to say this isn't true," said Milinkovitch. "Typically they are extremely well camouflaged in their relaxed state, because they are green against a background of leaves, and they are as noticeable as possible when displaying." </DS> </W> **</JEW>** (TG_Sci_115)

In examples (132) and (133) we can observe how the journalist is narrating information and evaluating it at the same time. In example (132) he/she uses the adjective *possible*, while in (133) he/she uses the noun *myth*. The second part of both combined structures is devoted to justifying why he/she interprets the information previously pointed out as *possible* and as a *myth*. As such, he/she distances from the information conveyed, by demonstrating that that interpretation is not his/hers. Nevertheless, his/her interpretation of the knowledge is the first information the reader gets, and it is the reading favoured by the journalist that is first stored in the reader's mind.

Focusing on the empirical data obtained, Journalist's Rephrasing of Wording cases (72.1%) are more frequent than Journalist's Evaluation of Wording cases (27.9%). This can be a symptom of the fact that, even if journalists have the opportunity to evaluate the information in this text type, press conventions and the status ascribed to authorised sources of information are still a pressure on the way they construe meaning. By using Journalist's Rephrasing of Wording, journalists are rephrasing knowledge, but the presence of scientists is still there. Conversely, by introducing Journalist's Evaluation of Wording structures, journalists are completely in charge of narrating the information and, as such, their presence and view on the issues under comment are more salient.

6.1.1.4 Free Direct Speech vs. Narration

Cases labeled as ambiguous between Free Direct Speech or Narration comprise those units of voice in which typically an external source of information is speaking in hypotactic projection but the following sentence presents problems as to whether it is still attributable to that same source, since there are no signals indicating that that is the case. The lack of projecting clause nexus can either point to a case of narration or a case of free direct speech without quotation marks or projecting clause clearly stated:

> (134) Rundlöf said the field trial was not sensitive enough to detect anything less than a 20% drop in colony strength. **<W-J> <FDS-N> Honeybee colonies are larger and contain far more worker bees than wild bees, meaning it would take longer for neonicotinoids to impact the hives. </FDS-N> </W-J>** (TG_Sci_131)

In example (134), we find a case of Indirect Speech followed by a statement which could be considered Narration, because there is no indication otherwise of any projecting structure to integrate meaning. However, by paying attention to the content, it is as if the journalist wanted to integrate the original words stated by the scientist to justify and support the previous information given in indirect speech form. Hence, it could be considered a case of direct speech without quotation marks or projecting clause.

In addition, contrary to what Semino and Short (2004) posit, instead of finding free direct speech always following another form of speech presentation which clearly present a source of attribution, the cases in the *TG_Sci* corpus are also likely to precede or follow a form of narration, so that the journalist is playing with the two extremes of the continuum at the same time, with his/her own voice and the most free form of presenting external sources' voices.

6.1.2 Averral

Under this label, we find cases where the journalist is not attributing information to external sources but averring it by using his/her own voice. Cases of fully packaged projected meaning are also included under this category since they do not present any projecting clause nexus and they typically appear as being part of the journalist's narration.

6.1.2.1 Narration

Results indicate that there are 1495 cases in which the journalist is using his/her own voice to narrate events. He/she is averring meaning. Out of these cases, 1284 tokens belong to pure narration, while 66 tokens represent the number of cases in which journalists include their own voice as embedded within cases of projected meaning. Interestingly, these embedded narrations are logico-semantically presented through expansion and embody cases of:

-The journalist adding some extra-words to link his/her narration to the subsequent integrated words, so that the discourse is coherent. They typically construe that information through expansion, by the use of elaborating or enhancing clauses:

> (135) Oxford University researchers say in the past 10 years, taking the pill has prevented 200,000 cases of womb cancer in high-income countries. In 2008, </N> </J> <JW> the Oxford epidemiologists, **<J> <eN> analysing the data from 45 studies involving 100,000 women, </eN> </J>** found that regular use for 15 years can halve the risk of ovarian cancer. (TG_Sci_164)

-The journalist is describing scientific terms which are difficult for the lay reader to understand. These cases can be integrated through enhancing or elaborating clauses:

> (136) Brain scans of more than 400 healthy men and women aged 53 and over found that those who carried a single copy of a particular gene variant had a larger brain region that deals with planning and decision making. Further tests on the group </M> <NRV> found that those with an enlarged right dorsolateral prefrontal cortex (rDLPFC), **<J> <eN> as the brain region is known, </eN> </J>** fared better on a series of mental tasks. (TG_Sci_101)

> (137) The scientists drew up a list of 18 biological markers that together reflect a person's biological age. They included measures of kidney and liver function, cholesterol levels, cardiovascular fitness and the lengths of telomeres, **<J> <eN> which are protective caps that sit on the ends of chromosomes. </eN> </J>** (TG_Sci_155)

In example (136) the clause *as the brain region is known* is an enhancing clause, while in example (137) the non-defining relative clause *which are protective caps that sit on the ends of chromosomes* is elaborating on the noun *telomeres*. Furthermore, the noun group *protective caps* located inside the elaborating clause is again elaborated by the embedded clause *that sit on the ends of chromosomes*.

-The journalist is commenting on the words of others through the use of enhancing clauses:

> (138) The apparent use of a murder weapon, **<J> <eN> even if it was only a stone, </eN> </J>** and the apparent repeated blows to the head hints that humans were turning their increasingly sophisticated intellect towards violent ends as well as towards cooperation and survival. "It implies a clear intent to kill," said Sala. </UV> (TG_Sci_142)

In this example, it is difficult to attribute the voice to the journalist or to the external source of information since there are no explicit signals to indicate so. Therefore, it is a way for the journalist to include more easily his/her view on what he/she is talking about.

6.1.2.2 Nominalizations and embedded projection

Cases of nouns of projection and cases of nouns of fact are accounted for as separate from the cases of hypotactic projection. The main reasons for this decision have to do with the fact that they entail cases of fully packaged meaning, where there is no projecting and projected clauses to be distinguished. Furthermore, these cases typically occur within cases of journalist's Narration and they occur as embedded within the voice of the journalist.

Meanings are experientially conveyed as processes together with their associated participants and circumstances later to be packaged as nominalizations through the resources of grammatical metaphor. This is what is known as the nominalization of experience (Halliday 2004; Klein and Unsworth 2014). Thompson (1994a) suggests going a step further into this nominalization of experience when he proposes that the representation of a previous representation of experience can also be packaged and nominalized; the projection of meaning can be nominalized in the same way as the normal representation of experience (see Chapter 4, Section 4.1).

In some cases these fully-packaged forms of projected meaning tend to appear at the beginning of popularizations, in cataphoric positions, and are later on developed as fully hypotactic and paratactic projected forms. What we find in these cases is a nominalization of a previous representation of experience (Pérez-Veneros in press;

Thompson 1994a) which is later on expanded. Conversely, these nominalizations can appear in anaphoric positions, once meanings have previously been construed through hypotactic and paratactic modes of projection to be later on encapsulated as accepted meaning. The types of packaged meaning distinguished and their tokens of appearance in the *TG_Sci* corpus are summarised as follows:

Type of packaged meaning	Tokens
Nouns of projection	48 (33.1%)
Nouns of projection with embedded fact	44 (30.3%)
Nouns of fact	10 (6.9%)
Nouns of fact with embedded fact	26 (18%)
Attributive clauses with embedded fact	17 (11.7%)
Total	145 (100%)

Table 16. Types and tokens of 'packaged' meaning in the *TG_Sci* corpus

-Nouns of projection and nouns of projection with embedded fact

Nouns of projection as fully-packaged nominalization and nouns of projection with embedded fact make up almost 2/3 of all nominalizations in popularizations. They congruently derive from a verbal or mental process which projects meaning, typically hypotactically, and which the journalist packages as a nominalization to include as part of his/her own narration. As such, readers can hear his/her voice narrating scientific knowledge and it is the view of the journalist as mediator of the information that readers obtain first. However, journalists make use of these nouns of projection as a way to

echo the voices of others in their own narration, to justify that what they are saying has already been said somewhere else and hence, they are not to be held responsible for it:

(139) <J> <N> The **<NP> revelation </NP>** comes from two years of measurements by an international team of astronomers who installed a telescope and a sensitive camera at the Mauna Loa Observatory in Hawaii, run by the US National Oceanic and Atmospheric Administration. </N> </J> (TG_Sci_03)

(140) <J> <N> The **<NP> conclusion </NP>** follows genetic tests that show one of the earliest modern humans to live in Europe was the great-great grandson of a Neanderthal. Or perhaps the great- great-great-great grandson. </N> </J> (TG_Sci_151)

In examples (139) and (140) the journalist is using the nouns of projection *revelation* and *conclusion* as a way to package previously presented meaning. These nouns are included as part of his/her own narration but, precisely through their integration in his/her speech, he/she signals to the reader that the *revelation* and the *conclusion* come from external sources of information. Conversely, he/she is also giving his/her own interpretation, since the previous projected meaning has been interpreted as *revelation* and *conclusion* and not as some other noun of projection.

(141) <J> <N> A French writer and adventurer plans to explore one of the most remote parts of the Peruvian Amazon in search of a "lost" or "secret city" that may have been built by the Incas, but there are **<NP> fears that the expedition could endanger the health of isolated tribes that have never been exposed to common human diseases. </NP>** </N> </J> (TG_Sci_28)

(142) <J> <N> The **<NP> claim that the Inuit have 50 words for snow </NP>** has endured for decades, but it now looks as if the Scots have beaten that figure. </N> </J> (TG_Sci_180)

In examples (141) and (142) above, we find two nouns of projection which are expanded through two embedded facts. Both nouns are used within the journalist's narration but, in this case, the journalist elaborates on the projected meaning packaged as *fears* and *claim* through two embedded facts which make clear for the audience which are the *fears* or the *claim* the writer is addressing in the article. These two nouns actually come from two stance processes *fear* and *claim*, so that the journalist clearly highlights that his/her interpretation of the projected meaning as *fears* and *claim* is sufficiently justified, by including the embedded facts which make reference to the words uttered by the experts. In the second example, this situation is even more salient since the journalist supports his/her interpretation of the information as a *claim* by rephrasing what researchers said about the Inuit not being the people with more words for snow.

-Nouns of fact and nouns of fact with embedded fact

Nouns of fact and nouns of fact with embedded fact are less common in the *TG_Sci* corpus. These nominalizations do not come from a previous verbal or mental process, but from some interpretation of information carried out by the journalist and which he/she typically justifies later on by either rephrasing or actually reproducing the original words uttered which led him/her to interpret the information in that way:

> (143) <J> <N> The images produced by the x-ray machine gave the scientists rare **<NF> clues to the author of the scrolls. </NF>** On close inspection, </N> </J> they found that the handwriting style of the rolled-up scroll was similar to that of another Herculaneum papyrus written by the Epicurean philosopher Philodemus, who may have written the text in the first century BC. (TG_Sci_99)

These examples are interpreted as nouns of fact because the journalist uses them to package meanings which are afterwards referred to again with a full explanation. It is the journalist's interpretation of the scientific knowledge as *issue* and as *clues*, but he/she justifies that interpretation by integrating information which expands on the *issue* and on the *clues.*

> (144) <J> <N> Tests on mothers' milk in both monkeys and humans have showed that levels of fat, protein, vitamins, sugars, minerals and hormones vary enormously, but there is **<NF> evidence that milk made for female and male babies is consistently different. </NF>** </N> </J> (TG_Sci_17)

Example (144) presents an existential process whose participant, the Existent, is embodied by the noun of fact *evidence.* This noun is chosen by the journalist as the lexical form for the packaged projected meaning but, in this case, the journalist hints at the *evidence*, by including what type of evidence it is, so that reference to the information coming from external sources of attribution is also integrated into the journalist's narration.

-Attributive clauses with embedded fact

The *TG_Sci* corpus also presents cases of attributive clauses with embedded fact. As Halliday and Matthiessen posit (2004: 474), these are 'attributive' clauses where the Carrier is typically realized by a nominal group, in this case denoting a scientist, and the Attribute is a nominal group with an embedded fact clause, in this case 'intensive', with an adjective as Head of the adjective group:

> (145) <JEW> <J> <N> Jason Rohr of the University of South Florida, lead author of the study, published as a letter in the peer-review journal Nature on Thursday was **<AC>**

cautious about the prospect of immunising wild populations </AC>, which will be the next subject of research. </N> </J> "We are planning on testing whether simply dumping dead Bd into waterbodies will induce acquired immunity and reduce chytrid growth on frogs. If it does, then it might be worth isolating the antigen on chytrid and synthesising it. Theoretically, this antigen could then be released at locations where amphibian species are at risk." </JEW> (TG_Sci_47)

(146) <J> <N> The scientists cannot be **<AC> sure that the birds picked up infrasound waves from the storm </AC>**, but </N> </J> previous work in pigeons has suggested that birds might use infrasound to help them navigate. Infrasound waves range from about 0.5Hz to 18Hz, below the audible range of humans. (TG_Sci_89)

Examples (145) and (146) present two 'attributive' clauses in which the Carrier is a scientist and the Attribute is a nominal group with an embedded fact clause whose Head is an adjective (*cautious* and *sure*). By embedding a fact in that Attribute, the journalist is reporting what the experts are cautious about and what they cannot be sure about. The journalist is interpreting the scientists' reactions as *cautious* and as *not sure* but he/she justifies that interpretation by integrating external meaning referring to those adjectives, together with further projected meaning before or after them to more deeply explain and support his/her choice of those attributes.

6.2 Processes

This section analyses the type of verbal or mental process journalists use to frame and introduce the words of the authorial sources of information. I specifically focus on the meaning conveyed in the process, whether it is neutral or is analysed as carrying some evaluative charge. The classification used to categorise the processes found in the

TG_Sci corpus follows the one suggested by Thompson (1994b) and later on revised and more fully adapted by Elorza and Pérez-Veneros (2014a). This classification distinguishes between neutral and stance processes, also classifying the type of neutral or the type of stance process integrated in the text. This section presents the types and tokens of processes found in the study and the implications of those findings for the general analysis on how projection is deployed in science popularization articles.

6.2.1 Neutral verbal and mental processes

This subsection presents the total occurrences of neutral verbal and mental processes and discusses the most frequently used ones for the journalist to integrated attributed information.

	Types	**Tokens**
Neutral hearsay	Say	1002 (79.6%)
	Tell	58 (4.6%)
	Ask	6 (0.5%)
	Speak	1 (0.08%)
Neutral continuative	Add	68 (5.4%)
Neutral report of speech or writing	Write	29 (2.3%)
Neutral mindsay	Believe	52 (4.1%)
	Think	13 (1.1%)
	Know	9 (0.7%)
	Learn	1 (0.08%)
Showing how the message fits in	Conclude	12 (0.95%)
	Agree	3 (0.2%)
	List	1 (0.08%)
	Respond	1(0.08%)
Showing whether a report is of speech or of writing	Voice	1(0.08%)
	Blog	1(0.08%)
Total	1258 (100%)	

Table 17. Types and tokens of neutral verbal and mental processes in the *TG_Sci* corpus

The neutral hearsay verbal process *say* (79.6%) outnumbers the other neutral processes as the main one chosen by science journalists to project the words of others, whether it is through paratactic or hypotactic projection. This verb is the basic reporting signal used to indicate that the speaker/writer is simply reporting what was said by a previous source, but he/she does not want to convey any more information about that source's purpose, manner of speaking or intention (Thompson 1994b: 34). This verbal process is followed in frequency by the also neutral hearsay *tell* (4.6%), through which the speaker/writer is also highlighting the fact that he/she is simply reporting other people's words but he/she also wants to mention the hearer/reader (Thompson 1994b: 34). Cases of *tell* in the *TG_Sci* corpus are typically followed by *The Guardian* as the receiver of the information:

> (147) "What this report shows is that climate change is happening now in our own backyards," <H> <N> Thomas Karl, the director of the climatic centre at the National Oceanic and Atmospheric Administration, **<NRV> told </NRV>** the Guardian. "There are a number of changes that have become faster and more apparent and stronger than we first anticipated." (TG_Sci_33)

By specifically having *The Guardian* as the receiver of information uttered by the expert Thomas Karl, the journalist holds him/herself as a reliable mediator of the information since he/she is part of the newspaper staff. As such, the message literally reproduced in paratactic projected form is also presented as more faithful and reliable for the reader. In this way, this expert's voice is more prominent and is the main one heard as if he were speaking to the people working in the newspaper in the 'here and now' space created by the journalist through the use of this paratactic form of projection.

The third most frequent neutral verbal process found is *believe* (4.1%), through which the journalist projects meaning represented as having been thought more than uttered. This process typically appears framing cases of hypotactic projection, since in these cases the journalist is rephrasing the words rather than literally reproducing them:

> (148) The research, which is published in the journal Proceedings of the National Academy of Sciences, also **<SRV> shows </SRV>** that domestic cats have genetic differences in areas related to fear conditioning and memory. The scientists **<NRV> believe </NRV>** changes in memory were another response to being fed and rewarded by humans. (TG_Sci_72)

Table 17 also indicates that the variety of types of neutral verbal and mental processes is not very high, and journalists tend to use the same type of process to integrate the external sources of attribution in the text. From the results obtained, it can also be concluded that there are also a number of *hapax legomena* (words which occur just once in the corpus) which represent the neutral processes that journalists use less frequently to attribute information to others.

6.2.2 Stance verbal and mental processes

	Types	Tokens
Showing the speaker's purpose	Suggest	99 (13.8%)
	Warn	35 (4.9%)
	Hope	25 (3.5%)
	Argue	16 (2.2%)
	Report	15 (2.1%)
	Predict	14 (1.9%)
	Suspect	11 (1.5%)
Showing what was said through the reporting verb	Hail	5 (0.7%)
	Welcome	5 (0.7%)
	Hail as	5 (0.7%)
	Dismiss	3 (0.4%)
	Praise	2 (0.3%)
	Threaten	2 (0.3%)
Drawing attention to the speaker's or writer's words	Describe	23 (3.2%)
	Mean	8 (1.1%)
	Call	7 (0.9%)
	Highlight	5 (0.7%)
	Pinpoint	2 (0.3%)
	Put	2 (0.3%)
	Plan	2 (0.3%)
	Name	2 (0.3%)
Showing your attitude towards what you report	Reveal	19 (2.6%)
	Claim	17 (2.4%)
	Point out	10 (1.4%)
	Note	9 (1.2%)
	Acknowledge	7 (0.9%)
	Indicate	5 (0.7%)
	Admit	4 (0.5%)
	Concede	2 (0.3%)
Showing the effect of what was said	Find	111 (15.5%)
	Show	70 (9.8%)
	See	5 (0.7%)
	Discover	4 (0.5%)
	Shed light on	3 (0.4%)
	Establish	3 (0.4%)
	Set out	2 (0.3%)
Total	715 (100%)	

Table 18. Types and tokens of most frequent stance verbal and mental processes in the *TG_Sci* corpus

In the light of the results obtained, it can be stated that two of the most frequent processes employed by journalists are *find* (15.5%) and *show* (9.8%). Both processes belong to the category *Showing the effect of what was said* which, in general terms, comprises verbs through which the reporter highlights the effect of what the speaker/writer says about someone else, instead of focusing on the words uttered. A close examination of these two verbs and how they work in popularizations however lead us to conclude that this is not the main function they fulfill, since the journalist is not focusing on the effect of the words on someone else. Rather, as Thompson (1994b: 57) notes, these verbs are not necessarily pointing to language events. In the reports where *find* and *show* are used as processes the journalist conveys the fact he/she is not reporting a language event, but typically an experiment or some other way of proving something. Thompson posits that it is only through context that the reader can decide whether the verb is actually pointing to a previous report or not, and in many cases it is not so clear and it remains ambiguous (cf. Moyano 2013, 2015). The occurrences of *find* and *show* in popularizations also point to this ambiguity between the journalist actually reporting experts' words or rather making reference to a different type of proof, such as experiments:

> (149) The link between drinking moderate amounts of alcohol and breast cancer was also identified by the Oxford University-based Million Women Study. They </P> </H> **<SRV> found </SRV>** there were 11 extra breast cancers for every 1000 women aged under 75 for each additional drink consumed per day. Although the increased risk might appear small, they said, the numbers of women who drink alcohol made it an important public health issue. (TG_Sci_168)

In example (149) the process *find* clearly points to some specific data more than to words previously uttered by scientists. However, the fact that after the clause in which

found is used the reader finds another case of hypotactic projection whose verbal process is *say* leads the reader to interpret the previous process *find* as also referring to uttered words more than to the data gathered from a study.

There are also cases where the verb *find* simply refers to the fact that the scientists or experts conducting an experiment or a research actually discovered or proved something, so that the verb *find* is not a verbal process, but a material one, with its corresponding Actor and Goal:

> (150) <J> <N> Pearson and his team were testing the diamond to **find** minerals they could use to work out its age. But by chance they discovered a speck of mineral called ringwoodite, a type of olivine that forms under extremely high pressures. The mineral inclusion was too small to see with the eye. </N> </J> (TG_Sci_23)

Here the meaning of *find* is equivalent to the meaning of *making a discovery* and has nothing to do with the journalist employing it to report attributes' words.

A similar situation is found with use of the process *show*, which sometimes is ambiguous between signalling that the journalist is reporting others' words or others' results or data gathered:

> (151) The results **showed** that while brain stimulation appeared to help those who needed it most, it impaired the performance of others. Measurements of cortisol, a stress hormone, found that brain stimulation let anxious students control their anxiety, but prevented the less worried students from doing the same. (TG_Sci_84)

The verbal process *show* in this case points to the fact that the journalist is reporting the words of the experts, more than making reference to specific data from the experiment carried out. The words included in the projected clause give the reader the impression that he/she is reading what other people stated before, more than what results pointed to.

Another verbal process which appears with a high frequency in the *TG_Sci* corpus is the verb *suggest* (13.8%), which belongs to the category *Showing the speaker's purpose*. Through this type of verb, the speaker/writer acknowledges the purpose of the original speaker when uttering the words. However, it is difficult for the reporter to be totally accurate to the original speaker's purpose, because he/she may have had a different purpose in mind at the time the words were uttered. As such, with these verbs, it can be actually the reporter's interpretation of the purpose that is conveyed in the verbal process (Thompson 1994b: 38). With verbs such as *suggest* and *warn* the interpretation of the journalist may be the main one conveyed, instead of the original expert's purpose:

> (152) The findings **<SRV> suggest </SRV>** hormonal contraceptives can interfere with the way women assess male attractiveness and so how satisfied they are with their partner. While relationships are usually built on a range of traits, the researchers **<SRV> warn </SRV>** that contraceptives can have an unexpected influence on what women look for in a partner. (TG_Sci_77)

Example (152) above presents the two previously mentioned processes *suggest* and *warn* as chosen by the journalist to present 'the words' of the findings, and also the words of the researchers. Ideally, the original speaker's purpose was to suggest and to warn, but it can also be the journalist's interpretation according to the information he/she is reporting. In addition, it is noticeable that most of the occurrences of projection with the process *suggest* present a material entity as the associated participant. This could also be an indication of the journalist wanting to make his/her voice more visible in the text, by interpreting the purpose of the original source and by hiding that original source behind the findings of the study.

The verb *warn* (4.9%) is interpreted in the same way as the verb *suggest.* It could be the researchers' purpose to warn the audience against the influence of contraceptives for

women looking for a partner, or it could also be the journalist's own interpretation of that purpose.

Finally, results also point to the fact that some processes such as *threaten* (0.3%) and *welcome* (0.7%) fulfill a different function, that of *Showing what was said through the reporting verb*, through which the message is not conveyed in a separate projected clause, but is included in the meaning of the verb (Thompson 1994b: 43). I refer to cases tagged as Narrator's Representation of Speech Act (NRSA) and Narrator's Representation of Speech Act with Topic (NRSAT), where processes convey most of the meaning of the previous utterance, and the reader has no information about the words originally uttered. These are the processes, together with the nominalizations of attributed meanings, through which journalists can mediate the most between the scientific community and the lay reader:

> (153) A major field trial of GM wheat that is designed to repel aphids has found the crop is no better protected against the pests than conventional wheat. The results come from two years of trials that compared aphid attacks on standard wheat plants with those suffered by a GM version modified to release a natural aphid repellant.
>
> The publicly-funded trial ran under heavy security at Rothamsted Research in Hertfordshire in 2012 and 2013 after it was targeted by anti-GM campaigners who **<SRV> threatened </SRV>** a day of direct action to trash the crops. The research cost of the trial was £730,000, but that figure is dwarfed by a further £400,000 spent on fencing to protect this and future trials, and an extra £1.8m used to combat threats of criminal damage and vandalism. (TG_Sci_143)
>
> (154) Other climatologists cautiously **<SRV> welcomed </SRV>** the research. "The possibility of deliberate intervention to 'engineer' our climate is undoubtedly scary, but climate change causes problems for both people and ecosystems, especially if it is large

> and rapid and whether it is warming or cooling," said Prof John Shepherd, at the University of Southampton. "We need to be prepared, so far as possible, and explorations like this are desirable, even if some people find them distasteful." (TG_Sci_71)

The journalist chooses the verb *welcome* to summarise how the experts reacted to the research carried out. There is no clue for the reader as to what the originally uttered words were. However, to justify and support his/her choice of verbal process, the journalist cites the original source of information so that the audience corroborates that the journalist's interpretation by using the verb *welcome* and the adverb *cautiously* concur with the words originally uttered.

The number of types of stance verbal and mental processes is higher than the types in the case of neutral processes. However, as Scott and Tribble (2006: 11) point out when defining word-lists, it can be seen how this word-list has a small number of high frequency items at the head (the processes analysed previously), followed by a big tale of *hapax legomena*. The complete list of types of stance verbal and mental processes with their tokens can be found in Appendix 2.

6.3 Participants

For the classification of participants, the distinction established by Halliday and Matthiessen between human and material participants was followed. However, since the frequency with which human participants appear in the *TG_Sci* corpus is higher than the frequency of appearance of material participants, there was a need to establish a finer-grained classification of human participants. For this reason, the classification suggested by Thomas and Hawes (1997) and Hawes and Thomas (2012) was also used.

Type of participant	Tokens
Human Named	796 (39.1%)
Human Semi-named	427 (21%)
Human Pronoun	367 (18%)
Human Institution	29 (1.4%)
Material	417 (20.5%)
Total	2036 (100%)

Table 19. Types and tokens of participants in the *TG_Sci* corpus

Focusing on the data presented in Table 19, Human participants (79.5%) are more frequent than Material participants (20.5%) as embodying the external sources of authorised knowledge. This is reasonable if we take into account that we are dealing with a factual text type in which journalists rely on authorised sources of information to justify and support the information given. Readers expect to find human sources to be responsible for the scientific knowledge disseminated, and journalists normally choose human referents to integrate that knowledge.

Due to the number of human participants found in the corpus and because of the fact that not all of them are presented through the same lexical forms, a more detailed sub-classification of human participants was needed. Following the classification established by Thomas and Hawes (1997) and Hawes and Thomas (2012), and relying on the data gathered from the *TG_Sci* corpus, the classification of participants in popularizations runs as follows:

6.3.1. Human Named participants

As already pointed out, by Human Named participants I make reference to those participants whose full name (name + surname), position and affiliation are given in the text. The *TG_Sci* corpus consists of 796 tokens (39.1%) of Named participants, making them the most frequent type of participant in popularizations:

> (155) "Asteroids have been suggested, along with comets, as a possible source of the water on Earth," said **<H> <N> Michael Küppers, a planetary scientist at the European Space Astronomy Centre in Villanueva de la Cañada in Spain. </N> </H>** "Our detection of water on Ceres makes it more plausible that Earth's water could have come from impacts from these bodies." (TG_Sci_09)

In example (155), the journalist makes reference to the expert, Michael Küppers, by including his name and surname, his position (planetary scientist) and his affiliation (the European Space Astronomy Centre in Villanueva de la Cañada in Spain). Through this information, the voice of the journalist is completely hidden behind the scientist since it is as if through a complete and thorough description of the expert he is closer to the audience, and his voice and identity more visible in the text.

According to the information obtained from the *TG_Sci* corpus, this is the typical pattern of presentation for Human Named participants; that is, full name of the expert followed by his/her position in a specific affiliation. There are also cases where there is only a reference to the surname, but this happens only once the expert has been previously introduced by a full referent. Furthermore, human named participants tend to collocate with cases of paratactic projection, in a similar fashion to the above example.

6.3.2 Human Semi-named participants

Human Semi-named participants make reference to a human entity, but it is lexically realized by a general reference to what that person is, typically *scientist, researcher* or simply *expert.* There are 427 occurrences (21%) of Semi-named participants in the *TG_Sci* corpus, most of them occurring at the beginning of texts to later on being 'narrowed down' to a full and detailed reference to the scientist or expert being previously mentioned:

> (156) **<H> <SN> Scientists </SN> </H>** believe that in our evolutionary past, certain genes that slowed metabolism and boosted appetite would have been beneficial </IS> </JW> the so-called "thrifty gene" hypothesis. While such variants would leave you with less energy for physical and mental exertion, storing energy in fat reserves would help tide you over during times of scarcity.
>
> "We've been on the planet for the past five million years, but only had great food supplied for the past 100 years," said **<H> <N> Hall </N> </H>**. "It's not surprising that we're not genetically ideally adapted to our environment today." (TG_Sci_105)

In example (156), the Semi-named participant *scientists* is used as the attribute for the information rephrased by the journalist. In the next paragraph this participant is given full voice and shape through a specific surname, Hall, who has also being introduced previously in the text by making reference to his full name (Alistair Hall), position (cardiologist) and affiliation (Leeds University).

In popularizations, this is the typical way semi-named participants are used and they normally frame cases of hypotactic projection, where information has started to be interpreted by the journalist and, as such, his/her voice is more present.

6.3.3 Human Pronoun participants

Pronouns are used to substitute for their human equivalents. They are typically employed by journalists once information on the participant has been included and readers are able to discern to whom that pronoun points in the text. There are 367 occurrences (18%) of Human Pronoun participants in the text and they typically co-occur with paratactic projection of speech, especially when these pronouns are *he* and *she*. Conversely, when journalists use the pronoun *they*, they tend to appear with cases of hypotactic projection, especially with what has been labelled indirect speech presentation:

> (157) Fristrup's team combined the sound levels recorded from national parks with similar data from urban settings to create a model of noise levels across the US. **<H> <P> They </P> </H>** predict that noise pollution is growing faster than the US population, and more than doubles every 30 years. "It's not surprising people are putting on earphones or even noise cancelling earphones to try and create a quieter or more congenial environment," **<H> <P> he </P> </H>** said [...] (TG_Sci_107)

As seen from example (157) above, the journalist uses the pronoun *they* in a case of hypotactic projection, and once readers clearly associate the pronoun as referring to the members of Fristrup's team. Later on, the journalist makes use of the pronoun *he* to literally reproduce the words previously uttered by Fristrup, and because it is also clear from the previous paragraph that the pronoun is referring to this expert. In addition, the pronoun *he* appears together with a case of paratactic projection, where the journalist's voice is kept in the background and the words are reproduced as they were originally uttered.

6.3.4 Human Institution participants

These participants embody cases where the journalist, instead of using a human referent, attributes the words to an institution, which could be considered a symbolic representation of all the human members who belong to it. The *TG_Sci* corpus presents 29 occurrences (1.4%) of Institution participants, almost all of them appearing in hypotactic projection:

> (158) Ahead of the online launch of the first part of the thesaurus on 23 September, **<H> <I> the University of Glasgow </I> </H>** said the 421 snow descriptions meant that "Scots beat Inuit in the number of words for snow". The theory that the Inuits have 50 different words for snow originated in 1911, when anthropologist Frank Boas published his Handbook of North American Indians; 80 years later, it was deconstructed by Geoffrey Pullum's The Great Eskimo Vocabulary Hoax. (TG_Sci_180)

As we can see, the University of Glasgow acts as participant in this case, together with a neutral verbal process to project meaning. The journalist attributes the information to an entity which is not a human being, but which is still considered as 'human'.

6.3.5 Material participants

Material participants, such as *reports, studies* or *findings* are considered metonymic entities (see Chapter 5, Section 5.3.4.5) which stand for their human counterparts, acting as a 'disguise' for the actual sources of information (Elorza in press). Conversely, the previously described nouns of projection and nouns of fact can be acting as participants of new processes once they have been fully packaged as nominalization. As such, these nominalizations can play the role of participants in a new projection of meaning (cf. Halliday 2004; Pérez-Veneros in press; Thompson 1994a).

There are a total of 417 occurrences (20.5%) of Material participants in the *TG_Sci* corpus, which greatly contrasts with the number of Human entities (79.5%). This is due to journalists relying on external sources of expertise to justify scientific knowledge, and those sources are more easily conceived by the audience as being human rather than the studies or the research those humans have carried out.

Material entities tend to co-occur with hypotactic projections and they are evenly distributed in the texts:

> (159) **<M> The findings </M>** suggested the more favourable diet was the so-called Mediterranean diet – high in fruit and vegetables and including moderate amounts of meat. Participants who kept that diet reported feeling more healthy and were found to suffer less frequently from chronic diseases. (TG_Sci_19)

In (159), the journalist integrates the voice of the experts through a reference to their findings, by making the findings 'speak' by themselves. The voice behind the actual suggestion is kept hidden behind the findings of that information source and the voice of the material entity comes to the surface. As will be discussed later, this is also a way for the journalist to make his/her voice more salient in relation to the voices of the attributes.

It is important to note that, in some cases, material entities are used because the issue narrated is controversial and the journalist keeps the identity of the scientists hidden behind their study. This is especially salient in one of the popularizations analysed, TG_Sci_33, whose headline reads:

Climate change wreaking havoc in America's backyard, scientists warn

This article deals with climate change and its effects on America, implying that this has started to be a real problem, and not something which does not affect people's daily

lives. Throughout the text, the journalist mainly integrates the voice coming from the report written on this issue, in detriment to the voices of the experts behind the work. This can be a symptom of the journalist not wanting to present the voices of others in a very salient way, keeping them hidden behind the report. It is also interesting to note that when the report acts as the participant whose words are included, information deals with data and general consequences of climate change while, if the journalist presents direct consequences on people's daily life, he/she chooses experts' voices to speak, to make the information more personal and closer to the reader (cf. Bednarek 2016; Bell 1991 on the news value of Personalization). Compare examples (160) and (161):

> (160) <UV> <JW> <IS> Sea-level rise, which could reach 4ft by the end of the century, was already causing dangerous flooding in low-lying areas like Miami, Norfolk, Virginia, and Portsmouth, New Hampshire, **<M> the report </M>** <NRV> said </NRV>. </IS> </JW> <J> <N> Florida alone could face a $130 billion bill for flooding damage by the year 2100. Drought and high temperatures were already baking California and Arizona and prolonging the fire season in other parts of the south-west. </N> </J> </UV>

> (161) <UV> <W> <DS> "I think maybe this report will be the turning point when people finally realise that this is about them," **<H> <N> Susan Hassol, the chief science writer on the report </N> </H>**, <NRV> told </NRV> the Guardian. "It's about them and their lives … Earlier, they had seen it as a distant threat – distant in time, distance in space, this is about poles, this is about island nations. They haven't seen it as a threat in their own backyard." </DS> </W> </UV>

Example (160) presents a compilation of the areas where sea-level rise is a problem, including data on the money one of these areas should spend on damage because of this

problem. Conversely, in example (161) the audience can listen to the words of a scientist elaborating on the direct consequences of climate change for people.

This text also presents an extremely non-frequent case, which is when a material participant speaks in paratactic projection while, at the same time, addressing the public in a more personal and direct way instead of dealing with numbers and general data:

> (162) <UV> <J> <N> The report for the first time looks at what America is doing to cut the emissions that cause climate change, and to protect people from its consequences in the future. </N> </J> <JRW> <JW> <IS> **<M> It </M>** <NRV> said </NRV> all Americans are experiencing and will continue to experience the effects of climate change. </IS> </JW>
>
> <W> <DS> "Climate change, once considered an issue for a distant future, has moved firmly into the present," **<M> the report </M>** <NRV> said </NRV>. "Corn producers in Iowa, oyster growers in Washington state and maple syrup producers in Vermont are all observing climate-related changes that are outside of recent experience." </DS> </W> </JRW> </UV>

In example (162) the *report* 'speaks' directly to the audience, illustrating the threat of climate change by giving real examples of producers who have started to have problems related to this issue. This is a non-frequent case and more data would be needed to confirm if, when articles deal with challenging and controversial topics, it is always the case that journalists opt for more detached ways of integrating entities in the text.

6.3.6 “Sayers as Circumstance”: According to

According to is the par excellence Sayer as Circumstance of Angle used to make reference to the words of others and, as results indicate, it typically frames cases of hypotactic projection, especially indirect speech, being placed either in thematic or rhematic position:

***According to* patterns**	**Tokens**
IS + according to + IS	2 (2.4%)
According to + IS	10 (12.2%)
IS + according to	68 (83%)
eIS + according to	1 (1.2%)
FDS + according to	1 (1.2%)
Total	82 (100%)

Table 20. *According to* patterns followed in the *TG_Sci* corpus

Results show that *according to* typically co-occurs with cases of indirect speech presentation and, focusing the attention on the pattern followed, it typically appears in rhematic position (83%) (cf. García Riaza 2010, 2012), after the words of the external sources of information have been integrated:

> (163) The kind of muddy waters often seen around the Great Barrier Reef increase disease rates in fish and damage their gills, **<SaC> according to </SaC>** reef scientists. </SN> (TG_Sci_148)

The fact that this Circumstance appears in rhematic position and, as such, the rephrasing of the words of others occupies thematic position could be a symptom of the journalist giving more importance to the message itself rather than placing his/her attention on the source of that message. The main focus is on the words, on the rephrasing carried out by the journalist and on how the message fits in with the rest of the discourse developed by the journalist. As de Oliveira and Pagano (2006: 642) state, indirect discourse minimizes the distance between the writer and the external sources, so that the journalist feels more confident to 'appropriate' the voices of others for his/her own benefit. Furthermore, this minimization of distance is intensified by the fact that the participants co-occurring with *according to* are typically material entities (cf. García Riaza 2012). In the *TG_Sci* corpus, there are 27 cases where human participants are used together with this Circumstance, contrary to the 55 cases in which *according to* is presented to integrate scientific knowledge coming from a source which is non-human. Furthermore, out of these 55 cases, 45 follow the structure of hypotactic projection (indirect speech) + *according to*, so that the journalist is minimizing distance and 'appropriating' the discourse of others by rephrasing the information and attributing it to a source which is material, so that the presence of the expert behind that information is not as salient as if a human entity had been used:

> (164) Polar bears face starvation as their frozen habitat shrinks because they will not adapt to land-based foods, **<SaC> according to </SaC>** new research. (TG_Sci_124)

6.4 Projection clusters

There are specific patterns which science journalists follow when projecting scientific meaning in texts. These clusters consist of the three rhetorical resources previously

addressed. I have analysed the three elements in conjunction because the series of patterns they follow are frequent and, therefore, constitute one of the defining features of popularizations.

6.4.1 Co-occurrence of taxis and participants

	Paratactic projection	**Hypotactic projection**
Human	762 (98.2%)	857 (68%)
Material	14 (1.8%)	403 (32%)
Total	776 (100%)	1260 (100%)

Table 21. Co-occurrence of taxis and participants in the *TG_Sci* corpus

	Paratactic projection	**Hypotactic projection**
Named	475 (62.3%)	321 (37.4%)
Semi-named	67 (8.8%)	360 (42%)
Pronoun	218 (28.6%)	149 (17.4%)
Institution	2 (0.3%)	27 (3.2%)
Total	762 (100%)	857 (100%)

Table 22. Co-occurrence of taxis and types of human participants in the *TG_Sci* corpus

Tables 21 and 22 present the data gathered on the interaction between the participants present in the *TG_Sci* corpus in relation to the type of projection in which they appear. The first noticeable feature is that Human participants tend to be present both in hypotactic and in paratactic projection with more or less the same frequency, even if

they are more present in the case of paratactic projection (98.2%). Conversely, Material participants are mainly used in hypotactic projection. We could say that Material participants normally do not co-occur with processes when these processes introduce a case of paratactic projection.

Since Human participants are far more present than Material ones, and they are more varied in terms of their lexical form, I also studied the frequency of appearance of the different types of Human participants established. Table 22 indicates that Human Named participants appear introducing cases of paratactic and hypotactic projection with more or less the same frequency. It is noticeable however that they are especially present in paratactic projection (62.3%), which indicates that when there is a full reference to the experts (through their full names, position and affiliation) it is expected that their words are literally reproduced, so that they are closer to the audience, the presence of the journalist is completely hidden and the voices of the experts come to the surface, as if they were directly speaking to the audience without any intermediary.

Human Semi-named participants appear much more frequently in hypotactic projection (42%) and it is less common that participants who are referred to as *researchers* or *experts* appear in paratactic projection. This is because the journalist has partially interpreted the information not only through the use of hypotactic forms of projection, but also by making use of participants whose lexical referent is not so explicit. Along the same line we find Institution participants, which are again more present in hypotactic projection of meaning (3.2%).

Conversely, Pronoun participants are more present in cases of paratactic projection (28.6%), most likely due to the fact that they substitute for their human counterparts, as a way of not repeating the same reference. Since paratactic projection is quite common

in popularizations, journalists cannot simply use the same type of lexical item to make reference to the external sources of information. Hence, they use pronouns as substitutes for those full references. This could also be the reason why Pronoun participants are more common in paratactic projection.

Turning our attention to the interaction of specific cases of paratactic and hypotactic projection with participants, results suggest that, as was stated before, Human participants tend to appear in cases of paratactic projection (762 occurrences), specifically with what I have termed direct speech (96.3%). Material participants (14 occurrences) are almost absent from this option for projecting meaning, as can be seen in Table 23:

	Human participants	**Material participants**
Direct Speech (DS)	734 (96.3%)	10 (71.4%)
Embedded Direct Speech (eDS)	6 (0.8%)	2 (14.3%)
Free Direct Speech (FDS)	22 (2.9%)	2 (14.3%)
Embedded Free Direct Speech (eFDS)	0 (0%)	0 (0%)
Total	762 (100%)	14 (100%)

Table 23. Co-occurrence of participants and paratactic projection in the *TG_Sci* corpus

In the case of hypotactic projection, the majority of participants appear in cases of Indirect Speech, where the journalist is reformulating the experts' words and, as such, his/her positioning on the issue narrated is also present. It is interesting to point out the high frequency with which material participants occur in indirect speech presentation

(77.5%), considered to be yet another symptom of the journalist's presence in the text by hiding the voices of experts behind their work. This is also supported by the fact that the journalist rephrases their words instead of integrating them in paratactic projection, decreasing distance between them and the authorised sources of knowledge:

	Human participants	**Material participants**
Narrator's Representation of Speech Act (NRSA)	34 (4%)	14 (3.5%)
Embedded Narrator's Representation of Speech Act (eNRSA)	19 (2.2%)	1 (0.2%)
Narrator's Representation of Speech Act with Topic (NRSAT)	42 (5%)	27 (6.7%)
Embedded Narrator's Representation of Speech Act with Topic (eNRSAT)	14 (1.6%)	9 (2.2%)
Indirect Speech (IS)	686 (80%)	312 (77.5%)
Embedded Indirect Speech (eIS)	62 (7.2%)	40 (9.9%)
Free Indirect Speech	0 (0%)	0 (0%)
Embedded Free Indirect Speech (eFIS)	0 (0%)	0 (0%)
Total	857 (100%)	403 (100%)

Table 24. Co-occurrence of participants and hypotactic projection in the *TG_Sci* corpus

6.4.2 Projection clusters: Interaction of taxis, processes and participants

In this last subsection, I explore the interaction of the three rhetorical resources previously presented, namely the processes employed by journalists to integrate scientific meaning in relation to the associated participants used and the type of projection to convey the words previously uttered.

-Projection clusters with Human Named participants

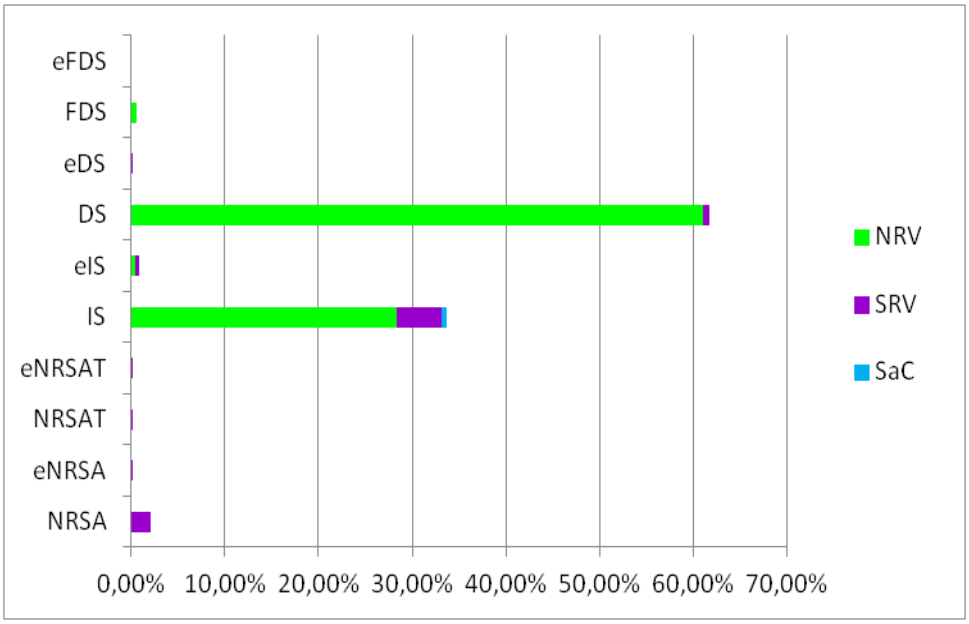

Figure 4. Projection clusters with Human Named participants in the *TG_Sci* corpus

The first thing observed in these projection clusters is the high presence of neutral verbal and mental processes in paratactic projection. Because of the use of Human Named participants the presence of the experts is more salient and visible and the journalist makes them speak through neutral processes and in paratactic projection. In this way, the journalist completely detaches him/herself from the information given, and all the evaluation carried out in these cases depends on the audience who is reading the popularization.

Neutral processes also appear with cases of indirect speech, but the frequency of occurrence is lower than in the case of direct speech. It is also interesting to mention the few cases of Narrator's Representation of Speech Act, which the journalist always introduces with a stance verbal process. These projection clusters are salient because it

comes as no coincidence that when the journalist almost completely packages the information given, he/she also decides to use a stance verbal process through which he/she can also make his/her positioning more visible, even if the information is still attributed to a Human Named source.

-Projection clusters with Human Semi-named participants

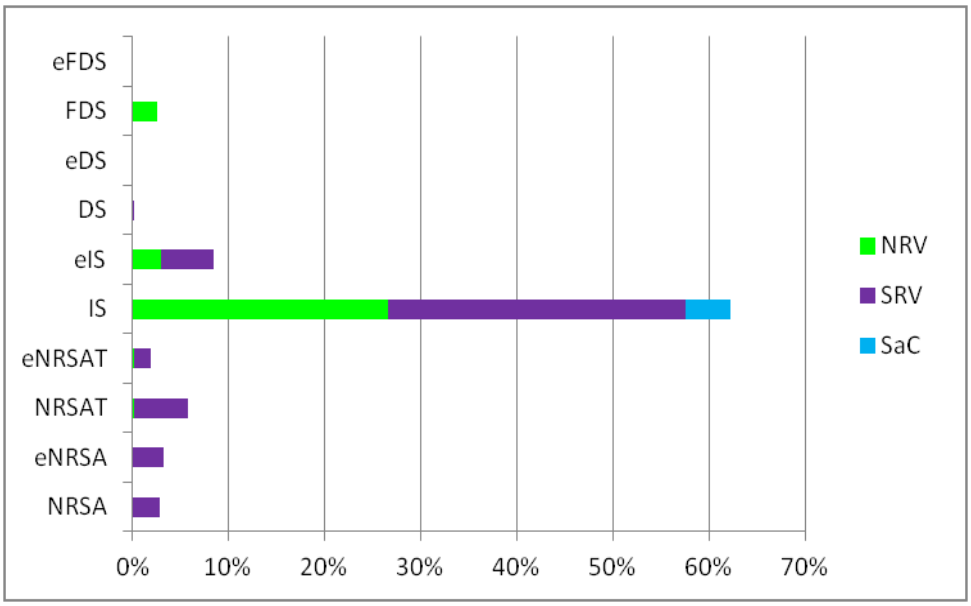

Figure 5. Projection clusters with Human Semi-named participants in the *TG_Sci* corpus

With Human Semi-named participants the situation changes, because most of the time the information is included in hypotactic projection with stance processes, and specifically through cases of Indirect Speech. In Indirect Speech, the journalist partially packages the information; hence mediating and interpreting it. As such, the processes used are also non-neutral in most cases, although there are still cases in which the information is framed through a neutral verbal process. Interesting is also the fact that

the other hypotactic speech presentations co-occur with non-neutral processes, through which again the presence of the journalist is more salient.

Turning the attention to what happens with Semi-named participants in paratactic projection, Figure 4 shows how the corresponding processes are in almost 100% of cases neutral processes. When the journalist decides to encode scientific knowledge through paratactic projections of meaning, he/she completely detaches from the information by also employing neutral processes.

In Figure 4 we can also observe how the Circumstance of Angle *according to* is present as yet another way for the journalist to integrate authorized sources' words when these sources are semi-named ones, appearing in hypotactic projection and specifically in Indirect Speech.

-Projection clusters with Human Pronoun participants

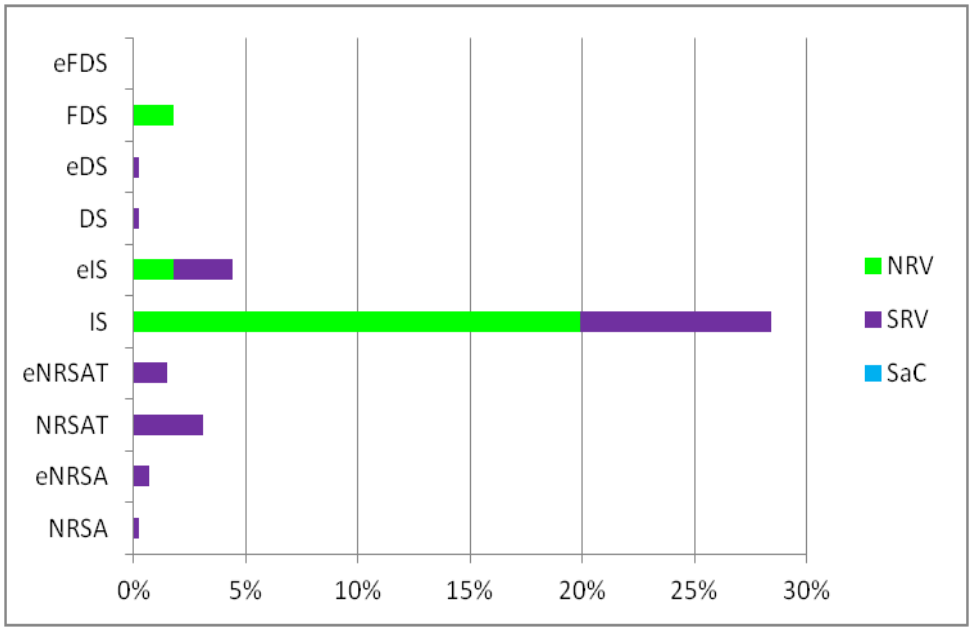

Figure 6. Projection clusters with Human Pronoun participants in the *TG_Sci* corpus

Pronoun participants tend to appear in cases where the projection of meaning is realized through paratactic forms, typically Direct Speech. Results point to the fact that Pronoun participants in paratactic projection co-occur with cases of neutral processes. This is not only the case in Direct Speech since cases of Embedded Direct Speech and Free Direct Speech are also found. Journalists again keep distance from the information included and it is the role of the reader to evaluate the words literally reproduced.

Pronoun participants also appear in hypotactic projection, but it is important to highlight that, in these cases, some of the processes co-occurring with them are stance ones. Again, the presence of the journalist is more visible by using these projection clusters where hypotactic projection co-occurs with non-neutral processes and participants whose visibility and reference is not explicitly present.

-Projection clusters with Human Institution participants

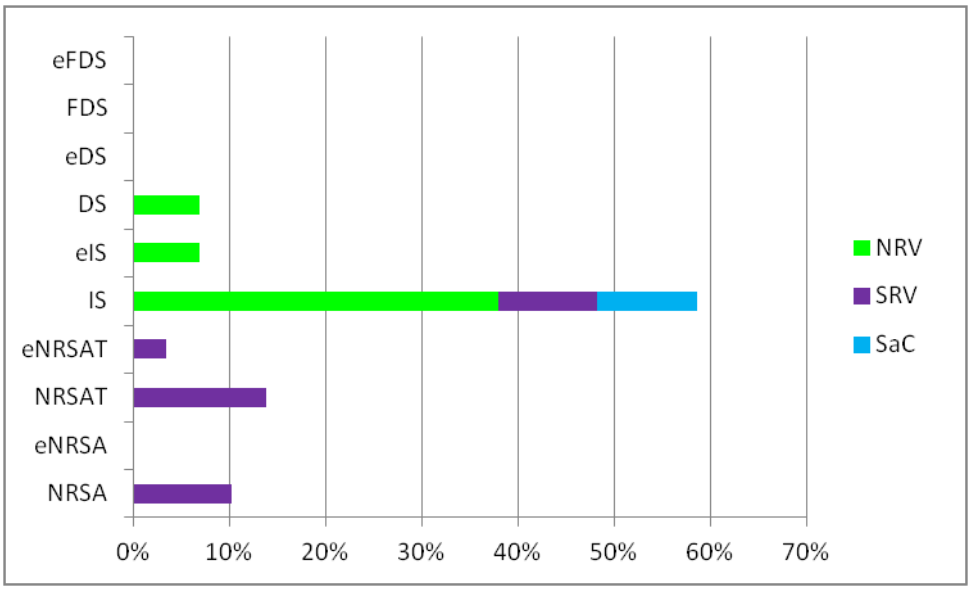

Figure 7. Projection clusters with Human Institution participants in the *TG_Sci* corpus

Institution participants tend to appear in cases of hypotactic projection, especially in Indirect Speech. They co-occur with neutral processes, although non-neutral verbal and mental processes are also employed by the journalist to align or detach from the information encoded. Again we can observe how the rest of cases of hypotactic projection co-occur with stance processes. The presence of *according to* is also important when the journalist attributes the information to institution entities, and it is only used in cases of Indirect Speech presentation, occupying rhematic position.

-Projection clusters with Material participants

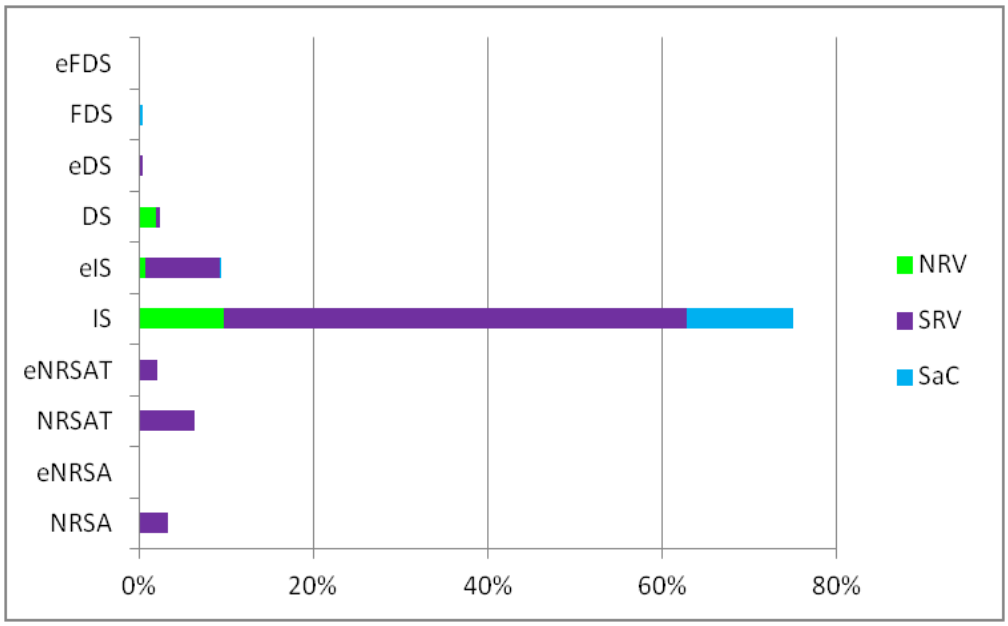

Figure 8. Projection clusters with Material participants in the *TG_Sci* corpus

The most fruitful results are obtained from the analysis on the interaction of Material participants, modes of projecting meaning and the verbal and mental processes used to do so. The projection clusters observed in Figure 8 provides evidence to conclude that

the journalist does play with the voices and with the different ways through which he/she can integrate them into the text in such a way that his/her positioning and view on the scientific knowledge disseminated is also conveyed and contributes to the construal of attributed meaning in the text.

Figure 8 shows that material participants are almost absent in cases where the journalist projects meaning paratactically. However, if they do so, it is interesting to see how the processes used are not only neutral but also stance ones. Even if the journalist keeps distance from the information included in the quotation, there are some cases in which he/she uses a non-neutral verbal process to reproduce the experts' words. This can be due to the fact that, even if there is detachment from the information, the journalist's presence is still there through the use of a stance verbal process.

Nevertheless, the presence of Material participants is stronger when meaning is projected hypotactically, especially in the case of Indirect Speech presentation. Material participants are also present in cases of Embedded Indirect Speech (eIS), Embedded Narrator's Representation of Speech Act with Topic (eNRSAT), Narrator's Representation of Speech Act with Topic (NRSAT), and Narrator's Representation of Speech Act (NRSA). These different projection clusters made up of non-neutral processes which introduce cases of hypotactic projection, together with their associated Material participants all point to the fact that the journalist's presence and positioning is more visible and more salient than in the other projection clusters found in this corpus. Material participants can be seen as standing for their human counterparts, as a kind of metonymy, or also as fully-packaged nominalizations of projections which can act as participants of a new projection. In these cases, the journalist has completely packaged the projected information and they are considered the most mediated type of projection found (cf. Halliday and Matthiessen 2004). Conversely, if material participants are

taken to be standing for their human counterparts, the identity of those experts is hidden behind their investigation, and the presence of the journalist is brought to the foreground in detriment to the experts' presence. At the same time, the processes with which these Material participants are associated are verbal and mental processes showing stance, through which the view of the journalist on the issue narrated can also be stated, even if it is in a subtle mode of interaction. Furthermore, these processes frame cases of hypotactic projection, where the words of others are not literally reproduced, but are reformulated and packaged in different degrees, depending on the speech presentation used.

Other cases of projection such as nouns of projection and nouns of fact (nominalizations or packs of information) are used as part of the Narration by the journalist. In this case, even if in the journalist's voice the reader hears 'echoes' from voices coming from external sources of information, it is still the journalist the one in charge of how to 'package' and interpret those external words. As a matter of fact, nouns of projection and nouns of fact are considered the most mediated type of projection, since it is the journalist's interpretation that is present when deciding how to 'compact' utterances representing the world.

The different clusters of projection found lead us to the conclusion that in popularizations, an attested factual text type, evaluation on the part of the journalist is also present through the inclusion of external voices to the text. Apparently, voices are there to justify and support or challenge the information, but the journalist also plays with them to guide readers through the text in such a way that these readers adopt the journalist's viewpoint on the matter. Through these experiential resources, the journalist is interacting with his/her readers by indicating to them that the information is valid and credible because it comes from external sources of information, while also indicating

how to evaluate and interpret the knowledge encoded. Finally, by placing the different projections of meaning at specific parts of the text, the journalist also indicates how to interpret the information in relation to how the article is structured by the appearance of attributed voices. These voices can give a general view on the issue narrated, they can describe the experiments carried out, they can talk about the hypotheses considered and they can also evaluate the results as positive or negative. In turn, the journalist places these evaluations at specific parts of the text so that the audience construes a specific viewpoint step by step, by listening to the voices which make up the text but which, in the end, the journalist is manipulating to create a kind of 'theatre stage'.

This chapter has presented the results on the study carried out and the implications of it. Results on the three rhetorical resources at the journalist's disposal to project meaning in popularizations, namely verbal and mental processes, their associated participants and the mode of projection to report the information have been provided. Furthermore, the chapter has also presented the results on the projection clusters which can be typically found in popularizations and which serve as the methodological constructs to characterize the various preferred ways for journalists to project scientific knowledge for the lay reader. The next chapter will present some concluding remarks on this study for a better characterization of popularization articles as science dissemination in the written press, together with some pointers to consider for future research in this field of study and potential applications of it.

Chapter 7
Conclusions

7.1 Introduction

This dissertation has aimed at a better characterization of how the phenomena of attribution and averral work in science popularization articles by analyzing the voices which take part and make up the discourse of popularizations. By analysing who is speaking and how the journalist includes the voices of others, a deeper insight is obtained enabling a more accurate description of the journalist's role. This process has also revealed how external sources of information contribute to the construal of attributed meanings in science dissemination in the British press. The motivation for the study was that typically attribution in popularizations has been explored by focusing on the lexicogrammatical resources used to construe this phenomenon in isolation, thus paying attention either to mental or verbal processes, participants, or speech presentation. However, research into the ways in which these resources co-occur and interact comprehensively to construe attributed meanings has not been sufficiently developed. Furthermore, by analysing these resources in isolation, previous research on popularizations has mainly worked at clause level, not taking into account that to get a finer-grained picture of how voices develop and intermingle in the dissemination of science, texts need to be analysed at discourse level. In addition, attribution has traditionally been approached from an interpersonal viewpoint, by exploring how writers establish relationships and interact with their readers by attributing information to others or, conversely, by narrating events to either challenge or support previous knowledge. However, research into how attribution is construed from an experiential

viewpoint and how the co-occurrence of specific experiential resources has an impact on the way journalists position themselves towards the information has not been sufficiently explored. Therefore, this dissertation has explored attribution from an experiential viewpoint, by looking at the ways in which projection is experientially construed in the construal of attributed meanings. This has been achieved through analysis of how the dynamics of projection works in popularizations from an experiential viewpoint, by focusing on the different units of voice present in popularizations and which contribute to the construal of meaning in text. In turn, each unit of voice has been analysed in relation to the projection cluster(s) present, by paying attention to the verbal and mental processes journalists use in order to integrate the words of others, together with the associated participants and the mode of projection to convey previously uttered words. In addition, a proposal of a scheme for the annotation of popularizations has been put forward in order to be able to tag the elements found in projection clusters and which allow the linguist to better identify, delimit and analyse the unit of voice as the core unit giving structure to popularizations.

7.2 General conclusions

Science journalists experientially interact with and contextualise information for their readers by mediating between the scientific community and those readers through a series of resources which allow them (journalists) to construe their own persona as mediators of the information but not through more interpersonal elements to build up interpersonal relationships as other text types, such as editorials, do. By projecting meaning in popularizations and by playing with the words of others to build up the discourse, journalists' voices also play an essential role in meaning construal and in

guiding readers throughout the text. The voice of the journalist, construed as Correspondent Voice (Iedema et al. 1994; Martin and White 2005) is presented as reporting on scientific events in an objective way. Conversely, their voice is also construed as subjective since they act as mediators of science for their readers by interpreting the attributed information. Since popularizations are articles about science written for non-expert audiences, readers expect to find a factual text type where information is supported and justified by attributing it to external sources of expertise. It is through this inclusion of external voices that journalists establish relations and interact with their readers, by indicating to them who is speaking and what information should be considered essential (cf. Dahl and Fløttum 2014). Besides, the integration of external participants is not only carried out to support and give credibility to the information, but also to make the story more personal since, as Parkinson and Adendorff point out, "a proposition associated with a person may be viewed as that person's subjective opinion, perhaps influenced by emotion" (2004: 381; cf. Bednarek 2016; Bell 1991 on news values). Journalists interact with and contextualise knowledge for readers by building up a discourse in which, even if they include voices coming from external sources of information to give credibility and reliability, their voice can also be heard. This conclusion stems from the fact that, apart from being narrators of science and, as such, using their own voices to narrate events, when they include authorial sources they make use of various linguistic devices which still allow them to use their voice to mediate information for the lay reader, thus presenting their epistemological positioning towards the scientific events narrated.

To achieve this interaction, journalists use three experiential lexicogrammatical resources, namely verbal and mental processes, participants and speech presentation to construe attributed meaning. These lexicogrammatical resources co-occur forming

specific projection clusters which help delineate the different units of voice in popularizations, through which the journalist construes polyphony in the texts analysed. Each projection cluster presents a verbal or mental process, a participant and a specific type of speech presentation which are used by journalists to attribute meaning but, at the same time, to act as mediator of the information. Conversely, the journalist is also present in the text by narrating scientific events in his/her own voice even if in these cases he/she also integrates attributed meaning in packaged form to keep the balance between voices.

In light of the results obtained, I conclude that journalists typically integrate meaning through hypotactic projecting structures (34.7%), whereby they both rephrase and interpret the meaning previously stated the meaning previously stated. This is especially noticeable in cases of speech presentation which are located on the left of the continuum of speech, hence an indication of the journalist interpreting and packaging scientific meaning which has been previously presented. As de Oliveira and Pagano (2006: 642) state, the relationship established between the journalist and the authors he/she is quoting is more symmetrical and, as such, he/she can 'appropriate' the voices of others in an easier way, making the external discourse on science dependent on his/her discourse. However, it needs to be pointed out that, in line with what Davidse and Vandelanotte (2010) posit in their study of the use of tense in direct and indirect speech in English, there are still two deictic centres which are clearly distinguishable. These are on the one hand the deictic centre of the journalist and on the other, the speaker(s) whose voices the journalist is relating.

Conversely, there are also cases in which the journalist keeps his/her voice in the background and the voice of the external sources of information comes to the surface of the text through cases of paratactic projection (20.1%), where there is a literal

reproduction of the words originally uttered. By using paratactic projection, journalists detach themselves from the information conveyed (cf. de Oliveira 2007; de Oliveira and Pagano 2006) creating an evaluative space (cf. Elorza and Pérez-Veneros 2014a; Thompson 1996) which the journalist can take advantage of in order to give his/her own view on the issue narrated. Nevertheless, de Oliveira and Pagano acknowledge that, because of popularizations' rhetorical conventions, this space for evaluation "does not contribute to the subversion of social and cultural differences" (2006: 644). The status traditionally ascribed to scientists prevents science journalists from comfortably occupying this space, and they still need to clearly signal who is speaking by making use of direct speech presentation. Still, what has been found in the *TG_Sci* corpus and in previous research (cf. Elorza and Pérez-Veneros 2014a; Pérez-Veneros and Elorza 2014) is that there are cases which have been tagged as combined structures (5.4%), where the journalist is actually taking advantage of this evaluative space to subtly include what his/her alignment is towards the scientific topic under comment. Two different combined structures were identified, namely Journalist's Rephrasing of Wording and Journalist's Evaluation of Wording. In Journalist's Rephrasing of Wording (72.1%), what we typically find is a case of hypotactic projection (especially indirect speech) followed by a case of paratactic projection. In the first part of the structure, the journalist, acting as mediator, rephrases the information coming from external sources of attribution while, in the second part of the structure, he/she includes the actual words uttered as a way to justify the previous rephrasing and interpretation of the information. As such, even if the information rephrased in the first part can be regarded by readers as questionable, it is later on justified by literally reproducing the original words. Even so, the journalist is still able to include his/her own view on the scientific information by using hypotactic projecting forms in the first part, because

he/she is blurring the voices, sometimes also using verbal and mental processes which have illocutionary force and through which he/she is positing his/her own view.

More interesting are the cases of Journalist's Evaluation of Wording (27.9%), where the journalist is acting as narrator of events, and then he/she either supports or challenges his/her previous narration by projecting meaning in paratactic form. In the second part of the structure he/she is detaching from the information included but the evaluative space opened has been already used in the previous narration, where he/she sometimes even presents evaluative elements in a non-challenging position, so that readers take that evaluation for granted (cf. Elorza and Pérez-Veneros 2014a: 297-298; Hoey 2000; see Chapters 3 and 5).

Finally, it is also important to mention the cases which were considered ambiguous between Free Direct Speech and Narration (1%), between the most left and the most right speech presentations in the continuum of speech. These are cases where it is difficult to distinguish whether the speaker is the journalist or an external source of information. As such, journalists can play with the voices in such a way that it is challenging for the reader to recognize the actual source of information. In this way, the writer presents claims on the issue narrated without risking his/her face value, since it is not possible to state whether those words actually belong to the sources of expertise integrated.

Cases where the journalist is using his/her own voice to transmit information are also frequent in the *TG_Sci* corpus (35.1%). In these cases, the journalist narrates events using his/her own voice, or averring them (Hunston 2000). In addition, results also point to the fact that the journalist sometimes also integrates his/her narration in other forms of speech presentation. It is interesting to see how these embedded narrations are logico-

semantically presented through expansion, specifically in elaborating and enhancing clauses. Results also showed that embedded in the cases of pure narration we find the journalist making use of nouns of projection (with embedded fact) (2.4%), nouns of fact (with embedded fact) (0.9%) and attributive clauses with embedded fact (0.4%) through which he/she is also reporting on someone else's words, but through the most packaged and mediated form of projecting meaning. It is expected that journalists make constant reference to authorized sources of information, and narrating events using his/her own voice is something less expected from such text. However, since narration is frequently used, there is a need to include some form of reference to the works of others in that self-speech so that journalists do not absolutely 'appropriate' the experts' words by adapting them to their own narration. For the maintenance of scientists' status in journalists' narration, these reporters include nouns of projection and nouns of fact, since they project meaning even if, at the same time, they represent the most mediated type of projected information. As such, the voice of the journalist can still be heard even if they are justifying their claims by projecting meaning through nominalized forms.

Turning attention to processes, neutral verbal and mental processes (1258 occurrences, which represent 63.8% of the total of processes identified in the *TG_Sci* corpus) outnumber cases of stance verbal and mental processes (715 occurrences, which represent 36.2% of the total of processes in the *TG_Sci* corpus) to project meaning. This is consistent with previous studies in processes used in popularizations in English (Elorza and Pérez-Veneros 2014a; García Riaza 2012) but challenges what previous results have revealed in the case of other languages, for example Spanish. Results of the analysis of processes in Spanish popularizations (Elorza 2010; Pérez-Veneros and Elorza 2014) pointed to the fact that most of the processes used to integrate meaning are non-neutral, belonging to *Showing the speaker's purpose* category of processes

(Thompson 1994b). This can be a symptom either of press conventions varying according to the context of culture or, conversely, an indication of the journalist's presence being more prominent in the Spanish than in the British press. In the light of the results obtained in this dissertation, it can be concluded that journalists typically introduce the words of others by using neutral processes and do not contribute to the construal of interpersonal meaning. This is epitomized by the verb *say* (79.6%), which is the most representative verbal process in the corpus. Nevertheless, there are also occurrences of stance processes, which contribute to the construal of both experiential and interpersonal meanings and which are used by journalists to either support or challenge scientific meanings. The most representative verb in this category is the verb *find* (15.5%), which belongs to the category *Showing the effect of what was said.* As Thompson (1994b) points out, for the analysis of this verb we have to rely on the immediate co-text and the general context in which it is used, since it can either point to a previous language event or to a different type of proof, such as experiments or tests (cf. Moyano 2013, 2015). *Find* is followed in frequency of appearance by *suggest* (13.8%), a verb belonging to the category *Showing the speaker's purpose* and through which the journalist is reporting on the original speaker's purpose when uttering the words. However, as Thompson (1994b) very illuminatingly indicates, it can be difficult for the reporter to know about the original speaker's purpose and, hence, it is sometimes the case that what the audience finds is the reporter's interpretation of the original speaker's purpose. Among the repertoire of verbal and mental processes present in the corpus analysed, no cases of processes *Showing the manner of speaking* were found. This absence, together with the presence of other features such as the ambiguous cases when the voice of the journalist is blurred with that of the source of attribution (analysed as FDS-N), may be statistically marginal, but taken together with the greater

presence of attributed information (two thirds of the units of voice for one third of cases of averral), could be interpreted as indicators that the mediating role of the journalist does not involve the experiential representation of their persona as showing any kind of emotional or egocentric involvement in the processes used for attributing meaning to external sources in their narration of scientific findings.

Focusing on participants, it is observed that Human participants are the most representative (79.5%) used in popularizations as the entities to which scientific meanings are attributed. Journalists especially make use of Human Named participants (39.1%) so that readers have complete information on the source of attribution and, as such, this information is more reliable because it is attributed to someone who has a full name, a position and an affiliation and hence is considered a faithful source of knowledge. Conversely, results reveal that Material participants are also entities to which meaning is ascribed (20.5%), which could be interpreted as a way to avoid mentioning the original source of information, the reasons being to avoid repeating the same, previously used lexical items to refer to that source, or because the journalist avoids mentioning the human entities behind a discovery or a development which entails negative outcomes for the audience's life.

Regarding *according to*, the circumstance of Angle acting as Sayer (cf. Halliday and Matthiessen 2004), results show that it typically appears framing cases of hypotactic projection (98.8%), especially in rhematic position (84.2%) (cf. García Riaza 2010, 2012). In addition, this circumstance is typically followed by a non-human referent, so that the information projected is attributed to a material entity which stands for the experts in charge of the knowledge included in the popularization. These results are consistent with previous results obtained by García Riaza (2012) on the study of the

particle *according to* in the British press, where she also found that this adverbial typically co-occurs with material entities to project scientific meanings.

Finally, this dissertation has also aimed at analyzing the projection clusters in the units of voice identified in science popularization articles and which are used by journalists as mechanisms to, on the one hand, be able to project meaning through different rhetorical resources and, on the other, to contextualise and explain the issue under comment. As stated before, the motivation to study projection clusters is because I aim at exploring attribution and averral from an experiential viewpoint, by analyzing how the experiential elements construing the phenomenon of projection play an essential role in the journalist's interaction with his/her readership and the shaping of his/her own identity and endorsement or challenging of the scientific meanings narrated.

The projection clusters analysed comprise the verbal and mental processes used by journalists to introduce the words of others, together with their associated participants and the mode of projection used to integrate external utterances. Results show interesting patterns of interaction of these three elements which in turn point to the implication that even in a factual text type as popularizations are considered to be, the voice of the writer is still one of the most visible, leading the construal of scientific meaning for the lay reader. Results shed light on the fact that human entities speak both in paratactic and hypotactic modes of projection and they are the most frequent type of entity used by journalists. However, they are more explicitly present in paratactic projection, where they are typically introduced by making reference to their full names, position and affiliation (>60%). Conversely, they are less explicitly present in cases of hypotactic projection. If they are Human Named participants, their lexical realization is through mention of the surname. Semi-named, Pronoun and Institution Human

participants are more common when they represent the participants who speak in hypotactic projecting structures.

Regarding processes participating in these projection clusters, neutral verbal and mental processes almost always frame cases of paratactic projection. Through parataxis the journalist detaches him/herself from the information and the responsibility is given to the authorised sources of information. This fact is strengthened by the use of Human Named participants whose words are introduced by a neutral verbal process. The journalist completely distances from the information by using paratactic structures introduced by a neutral process and uttered by sources of information whose identity is clearly visible and recognizable.

Conversely, when the identity of the outer source is not so clearly presented, journalists tend to make use of both stance and neutral processes, especially in cases where they introduce the words of others with hypotactic structures. Hypotaxis allows the writer to position the experts' discourse and his/her own discourse in a symmetrical position, somehow 'appropriating' scientific discourse and adapting it to the narration. To accentuate this symmetry, journalists use stance processes, which contribute to the construal of interpersonal meaning apart from integrating external discourse. It is of special interest to see how these non-neutral processes collocate with more packaged forms of hypotactic projection, namely cases labeled as Indirect Speech (IS), Narrator's Representation of Speech Act (NRSA) and Narrator's Representation of Speech Act with Topic (NRSAT), with participants presented through Semi-named, Pronoun, or Institution labels. On the contrary, neutral processes in hypotaxis only tend to collocate with Human participants who are classified as Named, since this presentation of participants is the more explicit and the one through which external sources are clearly identified.

The projection cluster which strikes as most unusual because of the experiential elements co-occurring but yet as quite frequent is the one comprised of Material participants, non-neutral processes and cases of hypotactic projection. These three rhetorical resources clearly allow the journalist to incorporate his/her own views into the text through the projection of external scientific meaning. As pointed out before, material entities hide the identity of the experts behind those material participants, so that the scientists responsible for the words uttered are not as visible as when they are introduced as human entities. Furthermore, the choice of stance processes also allows the journalist to construe interpersonal meaning to complement the rephrased discourse. Finally, by integrating external information through hypotaxis, the journalist is able to mediate and interpret the knowledge according to his/her positioning towards it.

In general, when taking the analysed features of attribution in isolation, results suggest that attribution is construed in these texts mainly through a balance between reporting and quoting, through neutral projecting processes, and through Human participants. These results meet previous expectations pointing to the objectivity of the journalists in science dissemination, and seem to suggest that the journalist represents his/her mediating role from an invisible or almost invisible position. However, the analysis has also revealed that, within the unit of voice, the often complex intertwining of attribution and averral shows sometimes an ambiguous blurring between the voice of the journalist and the voice of the external source of attribution, which seems to suggest that the journalist also positions him/herself as literally aligned with the external source, by making both voices literally undistinguishable. In addition, the processes used by the journalist for projecting what others have said are varied, also including stance processes which the journalist uses to construe his mediating role in a more visible way, not really showing his/her personal views or opinions on the narrated information, but

rather contextualising and interpreting its significance for readers, which is consistent with the pedagogic function expected from these texts.

Additionally, results on the projection clusters considered show that journalist tend to construe the sources of attribution by labelling them either by their proper name or by their professional role when quoting them, whereas when reporting what they have said journalists show a much higher preference (up to one third of the total) to refer to material sources (e.g. *the findings*, *the study*, etc.) instead. Journalists also prefer to use projecting processes for quoting which are neutral together with participants construed as Human Named, versus a higher tendency to rely on stance processes when the journalist is reporting, for which they rely more often on the construal of participants as Human Semi-named. The comparison of these shows a clear difference on how the journalist represents his/her mediating role in each case, by not showing any kind of mediating presence in the case of quotes, to presenting a sounder presence as mediator in the case of reports. Finally, the journalist's mediating role is also construed through embedding, particularly through the use of nouns of projection, which construe the journalist's mediation as packaged and, therefore, not open to question, and which can be linked to a more prominent role on the part of the journalist in the control of the information narrated. This experiential account of the construal of attribution in science popularizations shows, in sum, that the intertwining of attribution and averral in the text is used by the journalist to construe a representation of the scientific findings narrated which relies on a mediating role of the journalist in his/her aim to guide lay readers along the narration which is essentially much more dynamic than previous accounts have shown.

This dissertation has presented a study of the dynamics of projection in science popularization articles from the British press aiming at better characterizing the

discourse of science dissemination, since one of its main features is its multi-voiced and polyphonic nature. In addition, this analysis also entails a step further into the distinction of who is speaking from a logogenetic perspective and into the range of options open to the journalist in the construal of scientific experiential meanings for non-expert audiences. I have focused on how journalists represent a previous representation of the scientific sphere while, at the same time, analysing how journalists interact with their readers from an experiential viewpoint by indicating to them what to believe about scientific developments and how scientific knowledge should be interpreted. Last but not least, by projecting external voices at specific parts in the text journalists also evaluate the information through the structure of the text. Typically, hypotactic projections tend to appear in the first paragraphs of the articles, while paratactic projections appear at the end. As such, the journalist's voice and epistemological positioning as mediator is salient from the very beginning, guiding readers throughout the text and aligning readers with the information from the very first paragraph. Conversely, that alignment or detachment from the information, integrated either through narration or through hypotactic projections, is later justified and supported with references to the actual words uttered by the original authorised sources of information.

In popularizations, traditionally considered a factual text type, journalists convey their positioning towards the information by playing with the voices integrated in the text. This constant flow of voices is yet another way of evaluating, not the real world, but a representation of it. Through projection journalists evaluate the scientific world, establish relations with their readers and guide them through the text thanks to the projected meanings conveyed, also manifesting him/herself through the organization of the text (Breivega, Dahl and Fløttum 2002). As Moyano (2015) illuminatingly points

out, the projection of other voices in the text contributes to both the construction of new knowledge (experiential perspective) and the construction of the author and his/her persona along the text (interpersonal perspective). As such, the encoding of voices in popularizations not only contributes to the credibility and faithfulness of the information included, but it is also a device used by the journalist to make sense of the scientific world and to contribute to the construal of attributed meanings, while also giving voice to his/her own persona, epistemological positioning and stance along the text.

This large-scale study has contributed to gaining a deeper insight into how journalists construe their own voice when popularising science, not only through the narration of scientific events but also by attributing information to external sources of expertise. By the analysis of the experiential resources which are used to construe attributed meanings, it is observed that journalists not only present information as deriving from authorised sources of information but also construe their own voice. It could be argued that, from an experiential perspective, the mediating role of the journalist is construed more as an 'institutional' role rather than as an 'individual' one: the journalist's presence in the text aims at contextualising and explaining the scientific findings to readers, rather than expressing his/her own feelings or thoughts about them. Consequently, this seems to indicate that the experiential construal of attribution corroborates the view that the presence of the journalist in the text is sound, but that this presence aims at mediating between the scientists and the readers in an institutional-and-personally-detached way. In addition, this study has demonstrated that attribution needs to be studied at discourse level and by taking into account the context of situation in which the text comes to life (Halliday 1978). This situation has led to the proposal of an annotation scheme for the analysis of units of voice made up of certain lexicogrammatical configurations, which have been labelled projection clusters, and

which have proved more efficient for the analysis of attribution from a logogenetic perspective, as texts show experiential resources working at discourse level as meaning unfolds and which contribute to the construal of attributed meanings.

7.3 Pointers for future research

Interesting issues not covered in this dissertation deal with exploring the integration and unfolding of scientific meanings from a textual viewpoint. To shed more light on how journalists interact with readers and evaluate scientific information, it would also be fruitful to study how Theme and Rheme work when writers project meaning. The journalist's presence or absence from the text is also linked to whether it is the projecting or the projected clause that functions as Theme in scientists' projected voices. As some scholars (de Oliveira 2007; de Oliveira and Pagano 2006; Thompson 1994b) have already pointed out, the position of the projecting clause in relation to the projected one entails some implications for the journalist to convey his/her point of view in a more or less salient way as he/she projects scientific knowledge in the text. This is due to the fact that through placing the projected clause as Theme, the words of others are given more salience and the relationship between the journalist and those voices is more asymmetrical. Conversely, by placing the projecting clause in thematic position, the journalist is 'appropriating' the discourse and adapting it to his/her own discourse by minimizing distance with the external voices.

Another issue which remains for future analysis is to study the logico-semantic relation of expansion in cases where the journalist is averring or narrating events. As was seen from the results, the most frequent relations established in the clause complex are those of elaborating and enhancing expansions, but a finer-grained analysis on all the cases of

narration and embedded narration to see how journalists further elaborate and expand on the information integrated would be needed.

The difficulties of such an analysis are clear, as it requires an intensive manual analysis of the unfolding of meaning for and within each text, and has only been attempted so far in relation to the packaging of attributed voices (Pérez-Veneros in press), but a comprehensive analysis of the three metafunctions as well as of the logical relations, which could offer a much deeper insight into our knowledge of the 'narrative' of scientific meaning, will remain for future research.

7.4 Applications of the study

A number of research fields can benefit from this study, whether it is for compiling more information and using popularizations as learning tools or for applying the methodology followed for the analysis of other textual genres. This dissertation primarily focuses on how projection works in popularizations in relation to the different rhetorical resources journalists have at their disposal to construe scientific meaning. Therefore, fields such as systemic functional linguistics and discourse analysis can benefit from this research to gather more information on how meanings are projected in texts, the ways writers recontextualize those meanings, and the resources at the writer's disposal to establish relationships and interact with readers. In addition, the annotation scheme suggested for the tagging and analysis of the different elements which make up the unit of voice can be applied to different textual genres which can also be defined as polyphonic in nature. This annotation scheme has proved useful for the tagging of units of voice and so it can also be applied to the study of other text types for the exploration of how attributed meanings are construed in other genres.

Furthermore, because of the pedagogical nature of science popularizations (cf. Gallardo 1999; Hernando and Hernando 2006; Parkinson and Adendorff 2004; Unsworth 1998; Williams-Camus 2009), research on pedagogy and teaching of English as a Second Language (ESL) can also benefit from this research. Previous studies (Elorza and García Riaza 2012; Elorza and Pérez-Veneros 2011; Pérez-Veneros 2016) have delved into the question of the use of popularization articles for the teaching of reported language in Spanish high schools by applying a more communicative approach. This text type is considered a fruitful tool for teaching attribution and averral since one of its main characteristics is its polyphonic and multi-voiced nature. Additionally, popularizations present a number of projection clusters other than the ones which are traditionally taught in extremely simplified versions and mainly referred to as direct and indirect speech. In addition, as Pérez-Veneros (2016) suggests, science popularization articles can also be a rich and beneficial tool for those high schools which are following a Content and Language Integrated Learning (CLIL) approach to the teaching of content, especially for subjects such as biology, geology, or physics. Students can learn new vocabulary about science and, at the same time, they learn English in a more relaxed environment, so that the focus is not on the language but on "learning to think in the language" (Marsh 2000). Furthermore, the wide variety of scientific topics which are explored in popularizations can also be a source of extra knowledge to complement the knowledge students acquire in the classroom. Lastly, popularizations can also be useful for the teaching of English writing skills and academic writing. The presence of specific projection clusters can be useful for students to have a deeper knowledge of how attributed scientific knowledge is integrated by studying the most frequent verbal and mental processes used and which associated participants and type of projecting structures journalists employ. The knowledge of how these clusters work can be a

fruitful tool for learning how to make reference to the works of others and so teach them to avoid plagiarism. Furthermore, this text type typically follows the structure of an argumentative text and students can benefit from this fact to develop their own writing skills in academic settings. In turn, they can also learn how to position themselves, how to best contribute to the research field and how to make their voices visible by the use of several resources for reporting stemming from the analysis of popularizations as a genre through which writers can explore the different possibilities open in the construal of attributed meaning.

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Appendix 1

Code	Headline	Author	Date
TG_Sci_01	Geologists identify trigger for apocalyptic 'super eruptions'	Ian Sample	06/01/2014
TG_Sci_02	Geoengineering could bring severe drought to the tropics, research shows	Damian Carrington	08/01/2014
TG_Sci_03	The dark side of the moon is turquoise, say astronomers	Ian Sample	10/01/2014
TG_Sci_04	Coffee may boost brain's ability to store long-term memories, study claims	Ian Sample	12/01/2014
TG_Sci_05	Trees accelerate growth as they get older and bigger, study shows	John Vidal	15/01/2014
TG_Sci_06	Heavy drinking linked to early onset of memory decline in men	Sarah Boseley	15/01/2014
TG_Sci_07	'Falcon cam' reveals how the birds of prey close in for the kill	Ian Sample	16/01/2014
TG_Sci_08	How boots of First World War troops brought a foreign invader to Scotland	Robin McKie	18/01/2014
TG_Sci_09	Ceres, the largest asteroid in the solar system, lets off steam	Ian Sample	23/01/2014
TG_Sci_10	Whoa there! Brain area found to help spot bad decisions	Ian Sample	28/01/2014
TG_Sci_11	Pesticides halve bees' pollen gathering ability, research shows	Damian Carrington	29/01/2014
TG_Sci_12	France's truffle farmers aim to stop inferior Chinese fungi getting a snip	Kim Willsher	31/01/2014
TG_Sci_13	New clue to Voynich manuscript mystery	Alison Flood	07/02/2014
TG_Sci_14	Global warming 'pause' due to unusual trade winds in Pacific Ocean, study finds	Oliver Milman	10/02/2014
TG_Sci_15	Church of England vows to fight 'great demon' of climate change	Sam Jones	12/02/2014
TG_Sci_16	Male sexual orientation influenced by genes, study shows	Ian Sample	14/02/2014
TG_Sci_17	Baby boys and girls should get different formula milk, claim scientists	Ian Sample	14/02/2014
TG_Sci_18	Children of older men at greater risk of mental illness, study suggests	Ian Sample	26/02/2014
TG_Sci_19	Vegetarians more likely to think they are unhealthy, study finds	Maddy French	03/03/2014
TG_Sci_20	Climate forecast for Australia: hot days, higher fire risk, more severe droughts	Paul Farrell	03/03/2014
TG_Sci_21	Diet high in meat, eggs and dairy could be as harmful to health as smoking	Ian Sample	05/03/2014
TG_Sci_22	Messages about reducing sugar intake unclear, say campaigners	Sarah Boseley	06/03/2014
TG_Sci_23	Rough diamond hints at vast quantities of water inside Earth	Ian Sample	12/03/2014
TG_Sci_24	Climate change is putting world at risk of irreversible changes, scientists warn	Suzanne Goldenberg	18/03/2014
TG_Sci_25	Dinosaur dubbed 'chicken from hell' was armed and dangerous	Ian Sample	19/03/2014
TG_Sci_26	Human nose can detect more than 1 trillion smells, scientists discover	Nicola Davis	20/03/2014
TG_Sci_27	South-east of England more vulnerable to heat wave deaths, research reveals	Damian Carrington	23/03/2014
TG_Sci_28	Search for Inca 'lost city' in Amazon may endanger indigenous people	David Hill	07/04/2014
TG_Sci_29	Scientists name world's 100 most unusual and endangered birds	Jessica Aldred	10/04/2014
TG_Sci_30	Archaeologists' findings may prove Rome a century older than thought	John Hooper	13/04/2014
TG_Sci_31	Cadbury crunch: Chocolatier wraps up Easter egg quality at high-tech lab	Helen Massy	16/04/2014
TG_Sci_32	Climate change wreaking havoc in America's backyard, scientists warn	Suzanne Goldenberg	06/05/2014
TG_Sci_33	Western Antarctic ice sheet collapse has already begun, scientists warn	Suzanne Goldenberg	14/05/2014
TG_Sci_34	World's oldest sperm found in Queensland cave	Paul Farrell	15/05/2014
TG_Sci_35	Sun's activity triggers lightning strikes	Stuart Clark	15/05/2014
TG_Sci_36	Girl's skeleton found in cave sheds light on origins of first Americans	Ian Sample	15/05/2014
TG_Sci_37	Battered pot found in Cornish garage unlocks Egypt excavation secrets	Maev Kennedy	26/05/2014
TG_Sci_38	GM contamination rules should be relaxed, says biotechnology scientist	Brendan Foster	30/05/2014
TG_Sci_39	Intellectual disability may be caused by prenatal gene mutation	Melissa Davey	11/06/2014

TG_Sci_40	Doctors advised against aspirin for patients with irregular heart rhythm	Haroon Siddique	18/06/2014
TG_Sci_41	Abominable news: Scientists rule out yetis	Maev Kennedy	02/06/2014
TG_Sci_42	Prehistoric circle dated to same summer as Seahenge neighbour	Maev Kennedy	03/07/2014
TG_Sci_43	Shocking but true: Students prefer jolt of pain than being made to sit and think	Ian Sample	03/07/2014
TG_Sci_44	Dark snow: From the Arctic to the Himalayas, the phenomenon that is accelerating glacier melting	John Vidal	05/07/2014
TG_Sci_45	World's earliest erotic graffiti found in unlikely setting on Aegean island	Helena Smith	06/07/2014
TG_Sci_46	Genes that influence children's reading skills also affect their maths	Ian Sample	08/07/2014
TG_Sci_47	Scientists make breakthrough in fight against deadly amphibian fungus	Fiona Harvey	09/07/2014
TG_Sci_48	Skeletons of war dead from 11,000 BC go on show at the British Museum	Maev Kennedy	14/07/2014
TG_Sci_49	Giant ancient prawn had tiny brain, new fossil shows	Ian Sample	16/07/2014
TG_Sci_50	Global warming slowdown answer lies in depths of Atlantic, study finds	Adam Vaughan	21/08/2014
TG_Sci_51	Dry spell at Stonehenge reveals secrets that has eluded archaeologists	Steven Morris	01/09/2014
TG_Sci_52	Milky Way is on the outskirts of 'immesurable heaven' supercluster	Ian Sample	03/09/2014
TG_Sci_53	Perfect weather yields bumper cereal harvest for British farmers	Damian Carrington	05/09/2014
TG_Sci_54	Artificial sweeteners may promote diabetes, claim scientists	Ian Sample	17/09/2014
TG_Sci_55	Signs in groundwater may help predict earthquakes six months in advance	Damian Carrington	21/09/2014
TG_Sci_56	Rift valleys rewrite moon's fiery history	Ian Sample	01/10/2014
TG_Sci_57	Curiosity improves memory by tapping into the brain's reward system	Ian Sample	02/10/2014
TG_Sci_58	Major study of teenage sleep patterns aims to assess impact on learning	Sally Weale	09/10/2014
TG_Sci_59	35,000-year-old Indonesian cave paintings suggest art came out of Africa	Ian Sample	09/10/2014
TG_Sci_60	Scientists hope to unravel mystery of the 'Titanic of the ancient world'	James Meikle	10/10/2014
TG_Sci_61	Dark matter may have been detected – streaming from the sun's core	Ian Sample	16/10/2014
TG_Sci_62	First act of sexual intercourse 'was done sideways, square-dance style'	Ian Sample	19/10/2014
TG_Sci_63	Siding Spring observatory under threat from coal seam gas light pollution	Oliver Milman	21/10/2014
TG_Sci_64	Bizarre dinosaur reconstructed after 50 years of wild speculation	Ian Sample	22/10/2014
TG_Sci_65	Ancient human bone helps date out first sex with Neanderthals	Ian Sample	22/10/2014
TG_Sci_66	Chocolate component reverses memory loss in older people, claims study	Stuart Clark	27/10/2014
TG_Sci_67	Global overpopulation would 'withstand war, disasters and disease'	Mark Tran	28/10/2014
TG_Sci_68	Ozone hole remains size of North America, Nasa data shows	John Vidal	31/10/2014
TG_Sci_69	Amazon rainforest losing ability to regulate climate, scientist warns	Jonathan Watts	31/10/2014
TG_Sci_70	Brain age tests to be offered to middle-aged in battle against dementia	Mark Tran	03/11/2014
TG_Sci_71	Geoengineering could prevent climate effects caused by gigantic volcanic eruptions	Damian Carrington	06/11/2014
TG_Sci_72	Wild cats were tamed with strokes and treats, genetic analysis suggests	Richard Gray	10/11/2014
TG_Sci_73	Mind control device lets people alter genes in mice through power of thought	Ian Sample	11/11/2014
TG_Sci_74	Rosetta all set for historic but hazardous landing on a comet	Ian Sample	11/11/2014
TG_Sci_75	Lightning strikes will increase due to climate change	Suzanne Goldenberg	13/11/2014
TG_Sci_76	This is your brain trying to be funny	Ian Sample	14/11/2014
TG_Sci_77	The pill affects women's satisfaction with their relationships, research finds	Richard Gray	17/11/2014
TG_Sci_78	Sun's magnetic field sparks lightning on Earth	Richard Gray	19/11/2014
TG_Sci_79	Electrical brain's stimulation beats caffeine – and the effect lasts longer	Ian Sample	19/11/2014
TG_Sci_80	'Happy genes' may increase chances of romantic relationships	Ian Sample	20/11/2014
TG_Sci_81	Antarctic ice is thicker than previously thought, study finds	Oliver Milman	24/11/2014
TG_Sci_82	Mirrors could replace air conditioning by beaming heat into space	Ian Sample	26/11/2014
TG_Sci_83	Grey seals identified as killers behind mystery harbour porpoise deaths	Adam Vaughan	26/11/2014

TG_Sci_84	Warning over experimental brain boost	Ian Sample	09/12/2014
TG_Sci_85	Skull of oldest horned dinosaur in North America found	Ian Sample	10/12/2014
TG_Sci_86	Phthalates risk damaging children's IQ in the womb, US researchers suggest	Ian Sample	10/12/2014
TG_Sci_87	Tropical rainforests not absorbing as much carbon as expected, scientists say	Stuart Clark	15/12/2014
TG_Sci_88	Europe's record hot year made at least 35 times more likely by climate change, say scientists	Fiona Harvey	17/12/2014
TG_Sci_89	Birds detect approaching storm from 900km away	Ian Sample	19/12/2014
TG_Sci_90	Major coral bleaching in Pacific may become worst die off in 20 years	Karl Mathiesen	19/12/2014
TG_Sci_91	Scientists use skin cells to create artificial sperm and eggs	Ian Sample	24/12/2014
TG_Sci_92	Wall brown butterfly 'may be a victim of climate change'	Patrick Barkham	24/12/2014
TG_Sci_93	Rescued scientists bring back a warning from the Antarctic	Ian Sample	25/12/2014
TG_Sci_94	Weight loss drug fools body into reacting as if it has just eaten	Ian Sample	05/01/2015
TG_Sci_95	Kepler 438b: Most Earth-like planet ever discovered could be home for alien life	Ian Sample	07/01/2015
TG_Sci_96	Fossil from Skye is new species of marine predator, scientists say	Ian Sample	12/01/2015
TG_Sci_97	Scientists reveal which coral reefs can survive global warming	Adam Vaughan	14/01/2015
TG_Sci_98	'Superman' pill deaths spark calls for dangerous drugs alert system	Ian Sample	16/01/2014
TG_Sci_99	Words emerge from ancient scrolls charred during eruption of Vesuvius	Ian Sample	20/01/2015
TG_Sci_100	Partners can worsen childbirth pains for the intimacy averse, study finds	Ian Sample	21/01/2015
TG_Sci_101	Gene linked to long life also protects against mental decline in old age	Ian Sample	27/01/2015
TG_Sci_102	Skull discovery suggests location where humans first had sex with Neanderthals	Ian Sample	28/01/2015
TG_Sci_103	Climate change is lifting Iceland – and it could mean more volcanic eruptions	Suzanne Goldenberg	30/01/2015
TG_Sci_104	Scientists urge global 'wake-up call' to deal with climate change	Suzanne Goldenberg	10/02/2015
TG_Sci_105	'Obesity genes' help determine size and shape, study finds	Hannah Devlin	11/02/2015
TG_Sci_106	Possible Anne Boleyn portrait found using facial recognition software	Ian Sample	16/02/2015
TG_Sci_107	Noise pollution is making us oblivious to the sound of nature, says researcher	Ian Sample	17/02/2015
TG_Sci_108	Reefer research: Cannabis 'munchies' explained by new study	Hannah Devlin	18/02/2015
TG_Sci_109	Great gerbils – not black rats – were chief cause of the great plague, study says	Ian Sample	24/02/2015
TG_Sci_110	Drying out of vast inland lakes have caused Australia's megafauna extinction	Oliver Milman	26/02/2015
TG_Sci_111	Global warming slowdown probably due to natural cycles, study finds	Adam Vaughan	26/02/2015
TG_Sci_112	Gene that makes human brain unique identified by scientists	Ian Sample	26/02/2015
TG_Sci_113	Nasa probe spots mysterious shiny patches on dwarf planet Ceres	Ian Sample	26/02/2015
TG_Sci_114	Rodent recall: False but happy memories implanted in sleeping mice	Hannah Devlin	09/03/2015
TG_Sci_115	Crystal amaze: How chameleon changes colour revealed	Hannah Devlin	11/03/2015
TG_Sci_116	Hopes warm for alien life: Nasa probe finds hot springs on Saturn's moon	Ian Sample	11/03/2015
TG_Sci_117	Amazon's trees removed nearly a third less carbon in last decade – study	Karl Mathiesen	18/03/2015
TG_Sci_118	Arctic sea ice extent hits record low for winter maximum	Karl Mathiesen	19/03/2015
TG_Sci_119	Alzheimer's drug trial shows promising early results	Sarah Boseley	20/03/2015
TG_Sci_120	Gold in faeces ' is worth million and could save the environment'	Hannah Devlin	23/03/2015
TG_Sci_121	Evidence of largest asteroid impact zone on Earth found in Australian outback	Michael Safi	24/03/2015
TG_Sci_122	Study shows humans are evolving faster than previously thought	Hannah Devlin	25/03/2015
TG_Sci_123	Discovery uses virus to boil water three times faster	Hannah Devlin	26/03/2015
TG_Sci_124	Polar bears face starvation as unlikely to adapt to a land-based diet, says report	Karl Mathiesen	01/04/2015
TG_Sci_125	Brontosaurus is back! New analysis suggests genus might be resurrected	Hannah Devlin	07/04/2015
TG_Sci_126	Risk of sex offending linked to genetic factors, study finds	Hannah Devlin	09/04/2015
TG_Sci_127	Paracetamol may dull emotions as well as physical pain, new study shows	Ian Sample	14/04/2015

TG_Sci_128	Julius Caesar may have suffered mini-strokes, say doctors	Ian Sample	14/04/2015
TG_Sci_129	Milk teeth of youngest famine's victims reveal secrets of malnutrition	Maev Kennedy	15/04/2015
TG_Sci_130	Astronomers discover largest known structure in the universe is... a big hole	Hannah Devlin	20/04/2015
TG_Sci_131	Bees may become addicted to nicotine-like pesticides, study finds	Karl Mathiesen	22/04/2015
TG_Sci_132	Hopes raised for new genetic therapy to prevent inherited diseases	Ian Sample	23/04/2015
TG_Sci_133	'Bizarre' Jurassic dinosaur discovered in remarkable new finding	Ian Sample	27/04/2015
TG_Sci_134	Remains of oldest known relative of modern birds discovered in China	Ian Sample	05/05/2015
TG_Sci_135	Highest stone circle in southern England found on Dartmoor	Steven Morris	11/05/2015
TG_Sci_136	Antibiotic resistant typhoid spreading in silent epidemic, says study	Ian Sample	11/05/2015
TG_Sci_137	Great escape: Ant uses spring-loaded jaws to jump away from predators	Hannah Devlin	13/05/2015
TG_Sci_138	Man who died 1,500 years ago may have brought leprosy strain to UK	Maev Kennedy	14/05/2015
TG_Sci_139	Home-brewed heroin? Scientists create yeast that can make sugar into opiates	Hannah Devlin	18/05/2015
TG_Sci_140	Stone tool discover pushes back dawn of culture by 700,000 years	Hannah Devlin	18/05/2015
TG_Sci_141	Prehistoric skull with puncture wounds could be world's first murder mystery	Hannah Devlin	17/05/2015
TG_Sci_142	'Stable' Antarctic ice sheet may have started collapsing, scientists say	Karl Mathiesen	21/05/2015
TG_Sci_143	Gender and racial bias can be 'unlearnt' during sleep, new study suggests	Hannah Devlin	28/05/2015
TG_Sci_144	New study claims to find genetic link between creativity and mental illness	Ian Sample	08/06/2015
TG_Sci_145	75-million-year-old dinosaur blood and collagen discovered in fossil fragments	Ian Sample	09/06/2015
TG_Sci_146	Bespoke diets based on gut microbes could help beat disease and obesity	Ian Sample	10/06/2015
TG_Sci_147	Methane in meteorites shows Mars soil could support life, study indicates	Hannah Devlin	16/06/2015
TG_Sci_148	Diseased fish confirm damage to Great Barrier Reef ecosystem, say scientists	Joshua Robertson	17/06/2015
TG_Sci_149	Humans creating sixth great extinction of animal species, say scientists	Adam Vaughan	17/06/2015
TG_Sci_150	Australians lead research into decoding genetic make-up of deadly superbug	Melissa Davey	22/06/2015
TG_Sci_151	My Neanderthal sex secret: Modern Europeans great-great-grandparent link	Ian Sample	22/06/2015
TG_Sci_152	Ancient mystery worm found to have surprise eyes and teeth	Hannah Devlin	24/06/2015
TG_Sci_153	GM wheat no more pest-resistant than ordinary crops, trial shows	Hannah Devlin	02/07/2015
TG_Sci_154	Parkinson's and depression drugs can alter moral judgment, study shows	Ian Sample	25/06/2015
TG_Sci_155	Old before your time? People age at wildly different rates, study confirms	Ian Sample	06/07/2015
TG_Sci_156	Smoking tobacco might increase risk of schizophrenia, say researchers	Sarah Boseley	10/07/2015
TG_Sci_157	Huge and ancient underwater volcanoes discovered off coast of Sydney	Oliver Milman	13/07/2015
TG_Sci_158	Large Hadron Collider scientists discover new particles: pentaquarks	Ian Sample	14/07/2015
TG_Sci_159	Warming of oceans due to climate change is unstoppable, say US scientists	Suzanne Goldenberg	16/07/2015
TG_Sci_160	Science of screaming: Acoustics that trigger our fear centre identified	Hannah Devlin	16/07/2015
TG_Sci_161	Scientists find first drug that appears to slow Alzheimer's disease	Hannah Devlin	22/07/2015
TG_Sci_162	Astronomers find aurora a million times brighter than the northern lights	Ian Sample	29/07/2015
TG_Sci_163	Rosetta probe studies released, revealing fullest picture of comet yet	Ian Sample	30/07/2015
TG_Sci_164	Regularly taking the pill 'helps prevent two forms of cancer' decades after use	Sarah Boseley	05/08/2015
TG_Sci_165	Frequent spicy meals linked to human longevity	Haroon Siddique	05/08/2015
TG_Sci_166	Plague grave excavations contradict tales of naked bodies piled in pits	Mave Kennedy	12/08/2015
TG_Sci_167	Fossilised remains of world's oldest flower discovered in Spain	Helen Thomson	17/08/2015
TG_Sci_168	Daily glass of wine raises risk of breast cancer in women	Sarah Boseley	18/08/2015
TG_Sci_169	FDA approval of 'female Viagra' leaves bitter taste for critics	Sarah Boseley	19/08/2015
TG_Sci_170	Universal flu vaccine a step closer as scientists create experimental jabs	Ian Sample	24/08/2015
TG_Sci_171	House dust can reveal who you live with and what your pet is, study shows	Ian Sample	26/08/2015
TG_Sci_172	Study delivers bleak verdict on validity on psychology experiment results	Ian Sample	27/08/2015

TG_Sci_173	Sleep shortage increases susceptibility to catching a cold, study finds	Ian Sample	31/08/2015
TG_Sci_174	Scientists reveal there are 3tn trees in the world	Adam Vaughan	02/09/2015
TG_Sci_175	Climate change will alter ocean bacteria crucial to food chain – study	Emma Howard	02/09/2015
TG_Sci_176	British cherry harvest hits 30-year high	Rebecca Smithers	07/09/2015
TG_Sci_177	Cocoa, fruit and tea can help keep heart healthy, study says	Ian Sample	09/09/2015
TG_Sci_178	Southern Ocean showing 'remarkable' revival in carbon absorption ability	Emma Howard	10/09/2015
TG_Sci_179	Arctic mosquitoes will increase with climate change, says study	Emma Howard	15/09/2015
TG_Sci_180	Whiteout: New Scottish thesaurus has 421 words for snow	Alison Flood	23/09/2015

Appendix 2

Types and tokens of stance verbal and mental processes in the *TG_Sci* corpus

-Showing the speaker's purpose (x353 tokens): Suggest (x99), warn (x35), hope (x25), argue (x16), report (x15), predict (x14), suspect (x11), call for, confirm (x9), work out (x8), recommend, explain (x6), estimate (x5), want, aim to, speculate, advise, caution (x4), urge, fear, calculate (x3), insist, state, question, stress, call on, doubt, judge, rule out, declare, anticipate, figure out, hint, assess, debate, expect, threaten (x2), consider (x1), assume (x1), recognize (x1), raise (x1), reject (x1), throw (x1), worry (x1), intend (x1), lash out (x1), put the difference down (x1), demand (x1), blame (x1), , hypothesize (x1), fret over (x1), realize (x1), ban (x1), prohibit (x1), theorise (x1), ponder (x1), propose (x1), offer (x1), attribute (x1), appeal for (x1), proclaim (x1), confirm (x1), record (x1), inform (x1), give (x1), announce (x1), wait (x1), determine (x1), decide (x1), regard (x1), analyse (x1)

-Showing what was said through the reporting verb (x28 tokens): Hail as, hail, welcome (x5), dismiss (x3), praise, threaten (x2), accuse of (x1), worry (x1), embrace (x1), attack (x1), dislike (x1), greet (x1)

-Drawing attention to the speaker's or writer's words (x56 tokens): Describe (x23), mean (x8), call (x7), highlight (x5), pinpoint, put, plan, name (x2), address (x1), headline (x1), identify (x1), detail (x1), understand (x1)

-**Showing attitude towards the report** (x76 tokens): Reveal (x19), claim (x17), point out (x10), note (x9), acknowledge (x7), indicate (x5), admit (x4), concede (x2), point to (x1), confess (x1), notice (x1)

-**Showing the effect of what was said** (x202 tokens): Find (x111), show (x70), see (x5), discover (x4), establish, shed light on (x3), set out (x2), persuade (x1), prove (x1), witness (x1), demonstrate (x1)