TEXTUAL COHESION AND THE TEACHING OF SCIENTIFIC ENGLISH

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1. Introduction

In order to orientate our activities as teachers of ESP, one of the first things we have to ask ourselves is what makes teaching English to students of science different from teaching general English. This has a lot to do with what students are doing in subjects other than English as this is obviously an ancillary subject in most science degree course. ESP teachers must, therefore, always take into account what the various subject teachers require from their students with regards to English. We have found that there are two major aspects to take into account when shaping our teaching procedures. One is the type of English the students need to know, which, in most cases, is the specific scientific discourse associated with each specialism. The other is the range of linguistic skills that the students need to improve on. In this respect, most students will be asked, above all, to read scientific texts in English. Another skill which is highly valued by subject teachers is the ability to translate English texts to the students' L_1. Less importance is given to aural comprehension or to writing in English, although post-graduate students may have to write articles, or, at least, abstracts in English at some time in their careers. Few students get the opportunity to study at a European or American university so oral skills are almost always neglected.

Therefore, as the majority of students are able to satisfy the demands made on them by subject teachers if they are able to read and understand texts in English, we have decided to concentrate our efforts on improving

the students' reading skills.[1] We believe that this entails making students aware of the characteristic vocabulary and grammatical structures of scientific texts, the way they are designed from a rhetorical point of view, the purpose for which they are written, and their intended audience. To achieve this aim, researchers must determine what makes texts of this type different from others on all these levels so as to establish priorities on what should be taught and the time to be allotted to diverse language learning activities.

In this paper we are going to concentrate on textual coherence in written scientific discourse within the general theoretical framework of genre analysis. Therefore, after a brief overview of genre theory, and how it can be useful in determining what to study in scientific discourse, we will look at the characteristics of anaphoric devices called A-nouns and analyze their occurrence in ten articles taken from the magazine *Scientific American* with a view to establishing links between these devices and the scientific sub-genre "popular science" articles.

2. Genre Analysis

Genre and register, similar or sometimes even synonymous terms, have been used in many fields of linguistics: Sociolinguistics: Trudgill (1974), Wardaugh (1986); English for Specific Purposes: Swales (1990), Dudley-Evans (1986); Critical Linguistics: Fowler (1983), Fairclough (1995); and within the Systemic-Functional school: Kress (1985), Ventola (1984); Martin (1992), Eggins (1994), Downing (1995), Vázquez (1995). We shall be looking at genre only from the Systemic-Functional perspective. There are two reasons for this decision, the first is that the way "genre" and "register" have been used in the above schools has been, in most cases, so different that it makes comparisons between them either impossible or confusing. The second, and most important, reason is that the Systemic-Functional approach has the necessary theoretical apparatus to be able to attempt to come to grips with how genre is instantiated through rhetorical structure and linguistic form.

The analysis of genre in systemic-functional circles has gone through various stages since Hasan (1978: 230) used genre as a synonym of register.[2] Although it is not made explicit, by either Halliday or Hasan, register and

[1]This article is not the place for a critique of the teaching of English in science degrees but the amount of time alloted to the learning of English in science degrees rules out the possibility of spending time on all the skills.

[2]See Ventola, 1994 for a critique of the early systemic model.

genre do seem to occupy the same conceptual space in their early work in this area. Several authors, Martin (1992), Ventola (1984), Eggins (1994), have subsequently suggested that register is not a synonym of genre but an intermediate level that exists between the latter and language. An example of the usefulness of considering register as a separate level is given by Downing (1995: 23). She points out that in sports commentary the sporting event taking place constitutes one activity or field, while the commentary on it, constitutes another field. At the same time, the commentary belongs to the mode of discourse, that is, the part language is playing in the communication. Thus, as genre covers both linguistic and non-linguistic activity it is deemed to be on a hierarchically higher level —the context of culture— than register, which would correspond to the more specific context of situation (Downing 1995: 18). The third, and least abstract level, language, was originally one of the variables of register, that is, mode of discourse. However, Ventola (1984: 112), following Martin (1985), claims that language is on a less abstract level than register and genre; i.e., it is the realisation of register and, therefore, ultimately of genre.

Our position is similar to that of Ventola (1984) and Martin (1985) in that we believe that language does form a separate level from register. The components of register, field, mode, and tenor, all influence the language we use in a particular context of situation, but not to the extent that they dictate the exact surface forms used. Language is, therefore, the non-automatic verbal instantiation of each configuration of register occurring in what Hasan calls a "specific extralinguistic situation" (Hasan 1978: 231). This view allows us to see language as what it is —yet another variable, which is, intrinsically connected to a particular genre, or register, but also separate from it. This means that in identical communicative situations from the point of view of genre and register, the surface forms used —part of the language level— may be, and normally are, different every time. How any genre, say travel agency service-encounters, commercial letters or research articles are instantiated in language constitutes a complex issue as many variables have to be taken into account. The language used in a particular genre is hardly ever predictable because of the mediation of register which explains the problems researchers come across when an "attempt to make social categories match up with linguistic patterns" is made (Downing 1995: 25).

According to Vázquez (1995: 28), an important part of human discourse is missing in the systemic view of genre we have seen above. He argues that the intentions of speakers or writers, namely, their communicative goals are not taken into account. He explains that this may be due to Halliday's reluctance to use terms employed in the field of pragmatics. Downing agrees and

claims that Halliday has "consistently avoided admitting to a psychological construct such as purpose or intention" (1995: 24).

Like Vázquez we think that all communication, with a few possible exceptions, is goal-oriented, that is, it is produced for a purpose within a specific context and with a given audience in mind.[3] Texts are "cultural artefacts" to borrow one of Malinowski's terms (1923) and, as such, can be defined as purposeful objects constructed and used by humans towards a definite end—scientific texts are no exception to this rule. Attempts have been made to assign purpose —a synonym of goal— to field (Goatley 1994), and genre (Martin 1992). However, different genres exist because we have different goals, not the other way around, thus we believe that goals cannot be subsumed under any of the headings seen above. Goals exist before any activity, linguistic or otherwise.

3. Goals and scientific discourse

The primary aim of a scientist is to add to the specialist knowledge of the world through experimentation and research and to communicate this knowledge to the rest of the scientific community. Traditionally, the vehicle used to communicate research results is the scientific article which is characterised by three goals: objectivity, clarity and conciseness. In accordance with our view of genre, the above goals of scientific texts and the general strategies used to implement them eventually lead to certain surface forms, be they lexical, syntactic or rhetorical becoming the preferred way to get the job done.[4] Thus, for instance, the first goal —objectivity— is exemplified by the use of passives, nominalization and the absence of "personal" verbs such as "wish", "feel" (Biber 1995).

The other two goals, clarity and conciseness, which we are mainly interested in, have several consequences, especially with regards to the rhetorical nature of scientific discourse. Digressions and rhetorical embellishment, for instance, are normally avoided in academic articles whereas formal language, due to its unambiguity, is the norm —though the odd stretch of colloquial language is not unknown. Moreover, discourse topics, which are normally set out at the beginning of the text, are adhered to throughout the rest of the article.[5]

[3] Vázquez Orta (1996) argues for a pragmatic dimension; to be added to the systemic notions of field, tenor and mode.

[4] See Barber, 1964 for an analysis of surface forms in scientific texts.

[5] These characteristics, among others, have prompted some to brand the style of scientific discourse as "anti-rhetoric" (Dillon 1991: 156).

There are limits to this striving for economy. At the beginning of an article the author is normally compelled to give the reader a general outline of what the article will be about and sometimes what led up to it being written. At the micro-textual level, repetition, in the strict sense of the word, is also common as re-entry of entities is necessary for topic maintenance.[6] Taking into account that scientific articles are characterised by their adhesion to one main topic and the need to connect old and new information unambiguously, re-entry can be viewed as a product of both clarity and conciseness.

There are, conceivably, many other ways to organise the information in a text but the strategies described above are the ones that most writers follow. This is probably because they are either learned or acquired within a communicative situation and so a particular strategy or textual device becomes associated with a text designed for a specific goal. In the case of some genres, i.e. curricula, letters of application, abstracts, we can all call to mind several linguistic features —vocabulary items, syntactic structures, etc.— which are associated with them. Thus, surface forms pertaining to the language level become associated with the more abstract concept of genre. One of our tasks in this paper is to isolate some of the surface forms which characterise scientific discourse, more specifically one of the ways anaphoric relations are realised in scientific texts.

4. A-nouns

The re-entry devices which we shall be looking at, **Anaphoric Nouns**, were identified by Francis (1986) in the monograph of the same name. In her analysis of A-nouns in newspaper editorials, she found that these noun phrases, a combination of content and structure words, play a part in holding the text together while at the same time developing it. To achieve A-noun status Francis claims that a noun:

> must be functioning as a pro-form and as such be anaphorically cohesive devices, referring metadiscursively to a stretch of discourse preceding it in terms of how the writer chooses to label or interpret the latter for the purposes of his/her argument. In other words [they] must be presented as synonymous with the proposition(s) immediately preceding. (Francis 1986: 3)

The following excerpt, taken from a newspaper editorial from her corpus, illustrates what she means. The definite noun phrase, *this line of rea-*

[6] We have taken the term "re-entry" from Jordan (1984).

soning, in the second paragraph, refers back to the whole previous paragraph while at the same time carrying the discourse forward.

1 Now, according to the pessimists, this superiority gives rise to an extreme peril. In practice, the missiles carried by submarines or bombers do not have the accuracy of ground-based missiles. Once the Minutemen have been eliminated, the American retaliation, aimed at the broad target of towns, would trigger the 'mutual destruction' for which no statesman could assume responsibility.

According to *this line of reasoning*, the destruction of the Minutemen would amount to disarming the United States, which would be left with nothing but the means to negotiate for defeat, if not surrender.

(*Encounter* June-July 1982: 14)

A further example of A-nouns can be seen in excerpt 2, taken from our corpus of scientific articles. The noun phrase *all those findings*, like the A-noun above, refers back to an entity that has already been mentioned, in this case a single noun phrase, *their results*, Thus, the A-noun gives the author the opportunity to connect the results of other researchers with the experiments that he is carrying out:

2 Yet *their results*, too, support the idea that much (though not all) of the functional specificity of the HOM proteins resides in the small differences within or immediately adjacent to the homeodomain regions.

To us, *all those findings* also suggested that certain long-shot experiments already ongoing in our laboratory, for which we had only faint hopes of success, actually had a chance of yielding interpretable results. Those experiments involved functional assays of mouse and human homeodomain proteins in *Drosophila* embryos.

("The Molecular Architects of Body Design", 40)

5. A-nouns, identity chains and similarity chains

What constitutes an A-noun is not as straightforward as it may seem from the examples above. First of all, we must distinguish between the open-class items in A-nouns, which function as anaphors, and those that do not, for example, lexical items in a text which are collocationally related. A useful concept to be able to distinguish between these two types is that of "chains" suggested by Halliday & Hasan (1985). There are two main types of chains. The first, called "identity chains", contain items which refer back to a particular antecedent. According to Hasan, these elements are truly anaphoric and are the only ones which refer to elements outside the text. The second,

"similarity chains", are made up of items that refer to the class that the antecedent belongs to, but not to the antecedent itself, and, therefore, not to an outside referent. The relations found in similarity chains are referred to as co-classification, i.e., substitution, ellipsis, and co-extension —a term that refers to the relationship obtaining between members which are in the same general field of meaning.

If we look at examples taken from our corpus, we will see that there are several words that come from a similar field and make up various similarity chains: *clinical trials, cancer-fighting oligonucleotides, patients, acute myelogenous leukemia, scientists, cells, bone marrow*, etc. It is clear that the expressions above belong to the field of medical science and, without doubt, tell the reader just that. But relations existing between items belonging to the same semantic field are not, as we said above, cohesive. Although Halliday & Hasan claim that in a coherent text "one says similar kinds of things about similar phenomena" (1985: 92), the occurrence of a certain set of words says more about the lexical content of a genre of a particular text than whether it is coherent or not -a point made by McCarthy (1991: 65). Hatakeyama et al. (1985) do not reject taking similarity chains into account when analyzing coherence and cohesion. However, they claim that the relations obtaining between words belonging to the same semantic field, "connex" expressions, are "weak" links and contrast with the "strong connexity" of the elements in identity chains. Strong connexity exists between antecedents and demonstrative pronouns such as *this, that, these, those* and pronouns like *he, she*, etc. This strong relation also exists between A-nouns and their antecedents by virtue of the fact that they are generally preceded by determiners. Observe, for example, the relationship between the A-noun in 3, *the experiment*, which refers back to *One of these tests*, which in turn re-enters *Clinical trails*.

3 Clinical trials of cancer-fighting oligonucleotides are beginning, too. One of *these tests* is being carried out in patients afflicted with acute myelogenous leukemia, a rapidly progressing cancer of the blood. In *the experiment*, a group at the Nebraska University Medical Center is collaborating with scientists at Lynx Therapeutics in Hayward, Calif., to examine the ability of an antisense oligonucleotide to destroy cancer cells in the body and in a procedure knows as ex vivo bone marrow purging.

("The New Genetic Medicines", 52)

Exophoric reference, although it can be realised by what look like A-nouns (definite article + noun), does not create what Halliday (1976) calls "texture" and therefore does not contribute to textual cohesion. Halliday

claims that only endophoric reference —reference relationships within the text— is truly cohesive. More importantly, from our point of view, if a cohesive device has its referent outside the text, it cannot be an A-noun, as an A-noun always re-enters an entity mentioned in the text.

6. A-nouns versus simple repetition

One of the more laborious tasks during our analysis of the corpus was to filter out all the A-nouns that were repetitions or near repetitions of nouns that appeared previously. Below (4) is an example of simple repetition; *These molecules* refers back to *the atmospheric molecules* in the previous sentence:

4 First the device fires a powerful laser beam into the sky to excite the *atmospheric molecules. These molecules* then emit light, the intensity and wavelength of which are indicative of density and temperature conditions at their location. ("Liquid Mirrors", 53)

We believe that by eliminating simple repetition, which normally involves lexical items that are characteristic of a particular field of scientific endeavour, there is a better guarantee of finding A-nouns that could transcend one particular text, one particular scientific sub-genre. From a strictly pedagogical viewpoint, making students aware of more complex types of A-nouns would make drawing their attention to simple repetition superfluous.

7. Semantic relations between A-nouns and their antecedents

After selecting the A-nouns which met our criteria, we examined the multiple relationships that exist between A-noun heads and their antecedents. The pedagogical rationale behind such an analysis is to show students the many ways in which ideas can be linked in a text. Hasan (1985) identifies several kinds of the cohesive relations held by lexical items in texts: repetition, synonymy, antonymy and hyponymy, meronymy, and instantial semblance. Of the relations obtaining between antecedents and A-nouns, we believe that several could cause non-native students comprehension problems, none more so than instantial semblance, due to its *ad hoc* nature. The example below of instantial semblance from our corpus clearly shows the potential difficulties for students. The appearance of the demonstrative "these" is

the only clue that the reader should look for an antecedent in the preceding text:

5 So similar, in fact, that —as our work has shown —curious experimenters can use some human and mouse *Hox genes* to guide the development of fruit-fly embryos.

The story of *these universal molecular architects* usually begins with the pioneering genetic studies of ...

("The Molecular Architects of Body Design", 36)

The remaining relations between antecedent and A-noun should cause the students fewer problems. The following are examples of some semantic relations from our corpus: synonymy: *the same deformities = a variety of head abnormalities;* antonymy: *that variation = the results are not (constant);* and hyponymy: *these instruments = telescopes* . Because of the difficulties involved in seeing the connection between A-nouns with their antecedents — rather than in spite of them— we feel that most students enjoy analyzing such semantic relationships and in the process of doing so learn one of the many ways in which texts cohere.

8. Semantic status of A-nouns

From the point of view of research into genre we decided to analyze our corpus using the semantic classification of the A-noun heads proposed by Francis (1986). The analysis was carried out as we wished to discover the differences between the A-nouns that appear in the scientific texts we analyzed and those discovered in Francis's corpus. The first four groups of A-nouns she distinguishes are metadiscursive nouns, that is, nouns of cognition and verbal activity. The first of these groups is made up of "utterance" nouns. This set is itself subdivided into "illocutionary" nouns, related to performative verbs such as *accusation, criticism, disclosure, emphasis,* etc., and rather more general verbal activity nouns such as: *account, corollary, discussion,* etc. A second group, "cognition" nouns, includes words such as *abstraction, comparison, fabrication, insight,* etc. The third group encompasses text nouns: *passage, section, words,* etc. The fourth group, "ownerless" nouns is problematic as it includes words such as *fact* and *issues* which are not "associated with a particular writer or source" and exist in the world outside discourse. A way of distinguishing between cognition nouns and ownerless nouns is that we can precede the former with possessive, as in *her claim*, but not with the latter **her fact*, for example.

At the end of the monograph Francis tentatively proposes the existence of a large group of "non-metadiscursive" A-nouns that could be linked to different text types. She suggests that there would be a large number of such A-nouns. The type she has in mind were made up of the following head-words: *development, stage, process, event, step, incident, move, conditions, situation*, etc. The editorial texts from Francis's corpus are quite rich in metadiscursive A-nouns, which are revealed as a characteristic of that genre. In a similar genre, newspaper reports, however, A-nouns of this type are noticeable due to their absence. Reports, unlike editorials, are designed to tell the reader about a particular event, not to put forward views on it (Pennock 1994).

In our science corpus (Figure 1), there are few examples of utterance nouns, just 7 —Francis lists a total of 144 examples of these A-nouns. Quite a large number of cognition nouns were identified in our corpus —38 instances compared to the 62 words in Francis's corpus. We found only one example of a text noun, *term,* and 9 instances of ownerless nouns compared to Francis's total of 13. The overwhelming majority of the A-nouns in the ten texts which made up our corpus are non-metadiscursive nouns, 216 (see examples 2, 3, 5, 6, 7, 8, 9 & 10). This result was not unexpected as the articles which we analyze describe scientific experiments and new technologies and therefore contain A-nouns referring back to stages in several kinds of experiments and the description of physical phenomena and not people's statements. It seems clear from the analysis of our corpus that A-nouns of a non-verbal nature are much more numerous than the utterance A-nouns found in editorials. These results lead us to conclude that while metadiscursive nouns are a characteristic of editorials, non-metadiscursive nouns seem to characterise scientific texts.

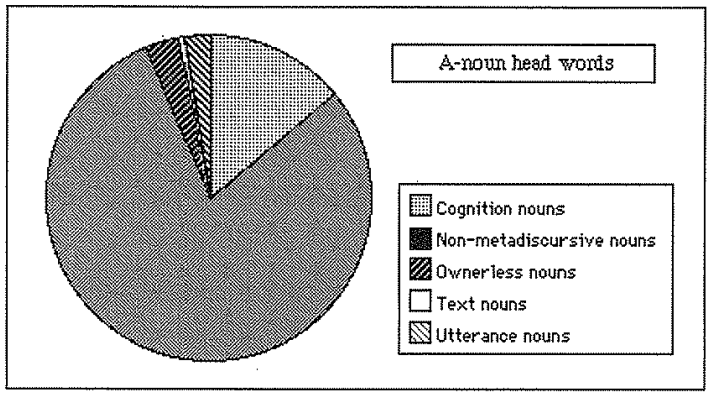

Figure 1

9. Determiners in A-nouns

The next stage of our research was aimed at discovering the most common A-noun determiners in our corpus. The 270 A-nouns that we found follow determiners such as *the, this, these, such,* and *that*. The rest of the A-nouns under the heading "Others" were preceded by possessives, nouns in the genitive case, *both, further, other, so much* and *some*. The remaining nouns were not accompanied by any determiners. Technically, this means that they should not qualify as A-nouns. However, as they function in the same way as A-nouns we have decided to include them. The noun phrase: *Antisense and triplex technologies* is an example of an A-noun without a determiner. It is located in the last paragraph of the article and sums up what has been said in the rest of the preceding pages while, at the same time, allowing the writer to conclude the article:

6 *Antisense and triplex technologies* may be far from perfect now. But if the successes of the past few years are any guide, antisense and triplex agents will be improved rapidly.

("The New Genetic Medicines", 55)

A reference item which was not mentioned by Francis (1986) is the indefinite article, which is not usually thought of as an element of anaphoric reference. We have found one example which meets all the requirements for an A-noun, it re-enters, in this case, the concept of test expressed in the preceding sentence, and enables the writer to continue with the same topic.

7 Using these animals we could assay the ability of the chimeric proteins to act on the regulatory elements of target genes in their normal chromosomal positions and in their natural embryonic environment—*a demanding test* that closely mimics the usual conditions under which these proteins operate. ("The Molecular Architects of Body Design", 39)

What conclusions can we arrive at about the results in Figure 2? First, it must be remembered that we are dealing with determiners in A-nouns and not those used in repetition or in exophoric or cataphoric reference. Including simple repetition might have altered our conclusions but we believe that the overall picture would have been the same. In any case, it is clear from our data that *the, this* and *these* are the most common A-noun determiners in this type of text while there is a surprisingly low number of A-nouns preceded by the demonstratives *that* and *those*.

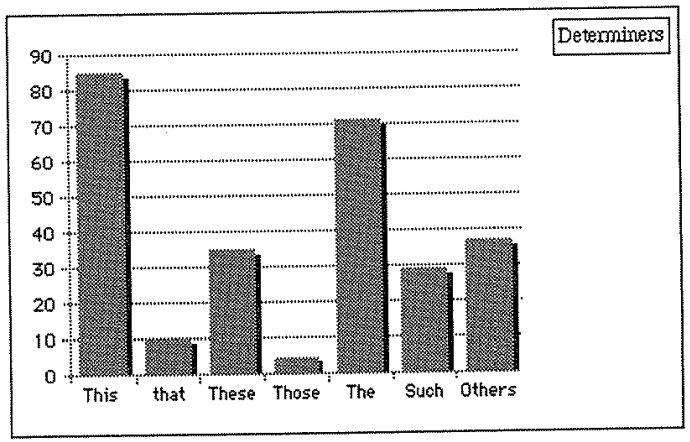

Figure 2

Before attempting to explain these results, we will first try to differentiate between the functions of the definite article and the demonstratives *this/these* and *that/those*. We will do this by comparing them with the pronouns *it, this* and *that* analyzed by McCarthy (1994). McCarthy tentatively claims that *it* is used for unmarked reference while *this* "signals a shift of entity or focus of attention to a new focus". The pronoun *that* is used to refer "across from the current focus to entities or foci that are non-current, non-central, marginalizable or other-attributed" (1994: 275). Our hypothesis is that *the* + A-noun has the same unmarked role as *it*. The function of the demonstratives

this/these and *that/those* + A-nouns being parallel to that of the pronoun *this* and *that* respectively. Now, if we take into account one of the main role of A-nouns, which is referential continuity, the numerous presence of the unmarked form *the* is logical as it simply marks an entity as already being in focus. The large number of occurrences of *'this/these* is to shift focus on to a new entity. If the main functions of A-nouns are referential continuity and bringing entities into focus so that they can be discussed in more detail, then it is quite logical that *that/those* should be far less numerous when used with A-nouns. The function of *that/those* is to signal an entity or idea in order to marginalize it. By definition if something is "marginal" it is not central to the discourse. Moreover, in various examples from our corpus we can observe how *that/those* are accompanied by contrastive conjunctions which attenuate the importance of the entity signalled even more. In example 8, for instance, *but,* together with *that,* is used to downplay the information in the first sentence:

8 So far no data from animal trials have been reported and no human trials are under way. But *that picture* is likely to change in the next few years.
("The New Genetic Medicines", 55)

9 It therefore initially seemed likely that the features giving each protein its functional specificity would be found outside its homeodomain ... Yet as often happens when simple deductive reasoning is applied to biological problems, *that* expectation was wrong.
("The Molecular Architects of Body Design", 39)

10 Antennapedia adults are rare exceptions, because most mutations in homeotic genes cause fatal birth defects. Nevertheless, even *those dying embryos* can be quite instructive.
("The Molecular Architects of Body Design", 36)

We were surprised to find a high number of instances of the comparative reference item *such* (Halliday & Hasan 1976). The high proportion of A-nouns with this determiner suggests to us that it has a similar function to *this/these.* In many cases *such* seems to be interchangeable with either without any noticeable change of meaning. To our knowledge, students are rarely taught how to use this word or the use of the other re-entry devices. This in itself is important as it pinpoints the need to teach, or at least, to bring to the attention of the students, these useful words. We believe that our findings with regards to determiners in this genre can be applied to other genres in the sense that the function of the definite article, and the determiners *this/these* and *that/those* are so basic to the structure of our language that it would be difficult to see how said functions could change.

10. Conclusions

It is clear from what we have seen that A-nouns are worth looking at by both researchers and teachers. In her article, Francis (1986) invited researchers to compare the use of A-nouns in editorials with other genres. We have followed her advice and have found that there are apparently significant differences between the editorial genre and the popular science genre in the distribution of A-nouns. The clearest difference is that there are far more non-metadiscursive A-nouns in science texts than the metadiscursive kind which she claims are abundant in newspaper editorials. With regard to determiners, the overwhelming use of the definite article and the determiner "this" preceding A-nouns is the most outstanding result. Another interesting discovery is that there are rare occurrences of A-nouns without determiners or preceded by the indefinite article. Unfortunately, Francis (1986, 1995) does not mention the numerical distribution of determiners in her editorial corpus and so a comparison of editorials and scientific texts is not possible at this stage. It would seem however, that predominance of "the" and "this" is a natural consequence of the main function of A-nouns, which is to maintain an entity in focus in the discourse and develop on it. Our hypothesis, therefore is that "the" and "these" are the default determiners in A-nouns.

From a pedagogical point of view we have shown that A-nouns are important linking devices in the scientific text genre and therefore of interest to both teachers and students of scientific English. In the light of the genre-analysis approach, our teaching will be more effective if we make students aware that language is always bound to specific contexts, specific communicative goals, and specific intended audiences. If we look at the teaching of scientific lexis, which has traditionally been an important activity in ESP, it is clear that learning language out of context has its drawbacks. We certainly need scientific lexis if our goal is to produce or comprehend scientific texts. However a problem associated with the learning of vocabulary of this kind is that there are many kinds of such texts, depending on the subject matter. Different scientific sub-genres often share little specialist vocabulary. It would come as no surprise, for instance, to find that a text on microbiology contains words that are not found in a text on black holes in space or an article on how to preserve electronic data. Therefore, as students study vastly different subjects, teaching general scientific vocabulary might not be an effective way of spending class time. Another reason for spending less time on genre-specific lexis is that students often pick up quite a lot of the L_2 vocabulary associated with their degree course by simply reading scientific

articles or working with a dictionary. Moreover, if they speak one of the major European languages, there will probably be a large number of words in their language which are similar to words in English, especially in the field of science. We are not suggesting that the teaching of decontextualized vocabulary and isolated grammatical structures should be excluded altogether but we do suggest that learning language in context is a good alternative and/or complementary activity.

There are other, more specific reasons for studying A-nouns. The linking relationships between A-nouns and their antecedents are by no means straightforward and often include opaque semantic relationships. Therefore time spent helping students to understand them is time well spent. A-nouns should be taught alongside linking words, topic development, repetition and other insights into the structure of written texts to improve students' comprehension of scientific discourse, and perhaps even enable them to produce research articles. Another reason for focusing on A-nouns lies in the fact that they are local coherence markers and are quite easy to identify and not too numerous, which makes activities connected with them less time-consuming than learning long lists of vocabulary items. Finally, as teachers, we must not forget that making a class enjoyable is one of the most efficient ways of teaching. In this respect, we feel that analyzing the relations between A-nouns and their antecedents is an interesting and challenging task for students and that their attitude to learning English will thus be improved.

Unfortunately, at the present time, A-nouns share the fate of most supra-sentential relations in that they are still generally ignored in the teaching of English. Teachers find it easier either to stick to the study of decontextualized vocabulary and structures or, at the other extreme, to simply give students comprehension questions on complete texts or excerpts from texts. The structure of discourse, in either case, is ignored. This is easy to understand given the dearth of materials to help teachers and students to become aware of the rhetorical structure of texts and how texts hang together. It is precisely this lack of meaningful, challenging, non time-consuming activities that should be addressed. It is up to teachers and researchers to do just that.

REFERENCES

Barber, C.L. 1964. Some remarkable characteristics of modern scientific prose. In Swales, J. (ed) 1988: 3-14.

Borra, E.F. 1994. The molecular architects of body design. *Scientific American* 270(2): 50-55.

Cohen, J.S. & M.E. Hogan. 1994. The new Ggnetic medicines. *Scientific American* 271(6): 50-55.

Coulthard, M. (ed) *Advances in Written Discourse Analysis.* London & New York: Routledge.

Dillon, G. L. 1991. *Contending Rhetorics: Writing in Academic Disciplines.* Bloomington: Indiana University Press.

Downing, A. 1996. Register and/or genre?. In Vázquez, I. & Hornero, A. (eds) 1996: 11-27.

Dudley-Evans, T. 1986. Genre analysis: an investigation of the introduction and discussion of M.Sc. dissertations. In Coulthard, M. (ed) *Talking about Text.* Birmingham: English Language Research, University of Birmingham.

Eggins, S. 1994. *An Introduction to Systemic Functional Linguistics.* London: Pinter Publishers.

Fairclough, N. 1995. *Media Discourse.* London & New York: Arnold.

Fowler, R. 1993. *Language in the News: Discourse and Ideology in the Press.* London: Routledge.

Francis, G. 1986. *Anaphoric Nouns.* Birmingham: ELR.

Francis, G. 1995. Labelling discourse: an aspect of nominal-group cohesion. In Coulthard, M. (ed) 1995: 83-101.

Goatley, A. 1994. Register and the redemption of relevance theory. *Pragmatics* 4(2): 139-182.

Halliday, M.A.K. 1978. *Language as a Social Semiotic.* London: Arnold.

Halliday, M.A.K. & R. Hasan. 1976. *Cohesion in English.* Harlow: Longman.

Halliday, M.A.K. & R. Hasan. 1985. *Language Context and Text: Aspects of Languages in a Social Semiotic Perspective.* Victoria: Deakin University.

Hatakeyama, K., J.S. Petöfi & E. Sözer. 1985. Text, connexity, cohesion, coherence. In Sözer, E. (ed) 1985: 36-105.

Jordan, M.P. 1984. Complex lexical cohesion in the English clause and sentence: An extension of the system of nominal group continuity in everyday English use. In Manning, A., Martin, P. & McCalla, K. (eds) *The 10th LACUS Forum.* Columbia S.C.: Hornbeam Press.

Kress, G. 1985. *The Linguistic Expression of Social Meaning: Discourse, Genre, Text.* Geelong, Vic.: Deakin University Press.

Martin, J. 1992. *English Text. System and Structure.* Amsterdam: John Benjamins.

Martin, J.R. 1985. *Factual Writing.* Geelong, Vic.: Deakin University Press (reprinted 1989. Oxford: Oxford University Press).

McCarthy, M. 1991. *Discourse Analysis for Language Teachers.* Cambridge: CUP.

McCarthy, M. 1994. *It ,this* and *that.* In Coulthard, M. (ed) 1994: 267-275.

McGinnis, W. & M. Zuziora. 1994. Liquid mirrors. *Scientific American* 270(2): 36-42.

Pennock, B. 1994. The rhetoric of coherence: Reformulation, repetition and augmentation of given information in newspaper texts. *Actas del Primer Encuentro Interdisciplinar Sobre Retórica, Texto y Comunicación* (9, 10 y 11 of December 1993). 227-230. Cádiz.

Sözer, E. (ed) *Text Connexity, Text Coherence: Aspects, Methods, Results.* Hamburg: Helmut Buske Verlag.

Swales, J. (ed) (1988) *Episodes in ESP.* New York: Prentice Hall,

Swales, J. M. 1990. *Genre Analysis.* Cambridge: CUP.

Trudgill, P. 1974. *Sociolinguistics: An Introduction.* New York: Penguin.

Vázquez Orta, I. 1996. Register, genre and linguistic choice". In Vázquez, I. & Hornero, A. (eds) 1996: 29-50.

Vázquez, I. & Hornero, A. (eds). 1996. *Current issues in Genre Theory.* Zaragoza: Mira Editores.

Ventola, E. 1984. The dynamics of genre. *Nottingham Linguistic Circular* 13: 103-123.

Wardaugh, R. 1986. *An Introduction to Sociolinguistics.* Oxford: Blackwell.