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Functional Grammar and Genre Analysis:  
A Description of the Language of  
Learned and Popular Articles

(Volume 1)

by

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A Thesis Submitted in Fulfilment of  
the Degree of Doctor of Philosophy

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## Summary

There has been a growing interest in the form and function of academic English, especially among teachers of English as a Foreign Language. "Academic" English, however, covers a variety of genres, including specialist and non-specialist writings across a range of disciplines. Little is known about the linguistic similarities and differences among these genres.

This thesis aims to add to the study of academic English by investigating learned and popular articles in the fields of biology, computing and history. The descriptive framework is based mainly on Halliday's functional grammar, although reference is made to other linguistic theories, such as Winter's clause relations.

Eighteen articles from the three fields were selected, nine learned articles and nine corresponding popular articles. Extracts from these articles form the small corpus analysed. After an introductory chapter, the second chapter reviews the nature of theme in English, and performs a thematic analysis on the corpus. The third chapter reviews the ideational function of language, and investigates how the language of the corpus articles represents reality. The fourth chapter reviews the interpersonal function of language and investigates this aspect of the corpus. The penultimate chapter comments on discourse patterns in the articles. The conclusion suggests that the similarities and differences between learned and popular articles, and between science and the humanities, are a result of systematic functional variation among genres.

## Acknowledgements

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My family and friends have also offered invaluable support over the years, none more so than Chrys Ray, without whose tolerance and love this thesis would probably never have been completed. Certainly her presence made the job of writing it an easier and happier experience. Needless to say, the faults which remain are all my own.



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## Chapter One:

### Introduction

#### 1.0 Introduction

This research has its origins in a practical problem. For a number of years I have been teaching English as a Foreign Language to overseas students on pre-sessional and in-session courses at the University of Stirling. At first, most of the students were aspiring or practising scientists or social scientists. More recently, I have been involved in designing and teaching academic reading and writing courses for a new BA degree in English as a Foreign Language; the students on these courses tend to lean towards the social sciences and humanities.

When using published materials to teach these students, I found that many (especially those aimed at scientists) often used a high proportion of "popular" academic texts, for example, scientific writing such as is found reported or featured in magazines like New Scientist, or quality newspapers. There seemed to be a disparity, however, between such popular academic articles and those found in the learned journals and books which made up a considerable part of the students' required reading. One of the aims of this research, then, was to compare popular and learned academic English.



A second research question concerned the influence of the students' discipline on the language that they had to comprehend and produce. In some classes one might well find students of biology alongside students of computing. It was possible, though rarer, to find occasional students of business, psychology or history, for example, in the same group, using the same learning materials. The content of their disciplines is obviously different; the question arose as to whether the language of their disciplines (beyond the simple matter of vocabulary) diverged accordingly.

This thesis was, therefore, devised to investigate two features of academic English: the influence on texts of a change of perceived readership (ie a specialist readership for an article in a learned journal, and a non-specialist readership for an article in a newspaper or more popular magazine), and the influence on texts of a change of academic discipline. Learned journals, of course, are not read exclusively by specialists (Nature, for example, has a wide readership, which will include specific sub-groups such as journalists looking for ideas for newspaper features); neither are specialists excluded from the readership of newspapers and magazines. But the actual readership is, I would argue, less important than the perceived readership, and it is, I think, probable that the perceived readership for a learned journal or book is a small group of specialists, while the perceived audience for a quality

newspaper is a wider and more diffuse group of educated general readers.

Over the course of my research it has been evident that a large and growing group of EAP practitioners and theorists have long recognised the same problem that initiated this work, and have responded to it in a variety of ways. Details of these responses will be given in the chapters that follow. I hope that this, necessarily small-scale, contribution to one aspect of the problem will add to the knowledge and understanding of how academic English varies according to discipline and perceived readership.

### 1.1 Functional Grammar

The structure of this thesis is organised very much according to Halliday's model of functional grammar (most fully described in Halliday, 1985): that is, Chapter Two analyses the textual function of the corpus articles, Chapter Three analyses the ideational function and Chapter Four considers the interpersonal function. Only Chapter Five, which looks beyond the level of the clause, departs from the Halliday model and follows a line established by Winter (1982) and Hoey (1983). The initial attraction of Halliday's description of language was its claim to practical application. In an interview, Halliday sets out his stall succinctly:

Take the grammar, which is the central processing unit of language, the core of the whole thing. You begin to see the



grammar as not arbitrary but motivated. In other words you begin to ask questions about why the forms are as they are, why the developments over history have taken place the way they have, why is it, if you like, that when the functions of language expand with social change, this then feeds into the linguistic form? We don't know a great deal about the answers; but at least we're forced to ask these questions, in a functional context.

(Baynham, 1986: 8)

If grammar is not arbitrary but motivated, then any variation in motivation between popular and learned texts across disciplines should be traceable, and functional grammar should be able to describe them.

Halliday's functional grammar, of course, does not exist in a theoretical vacuum, and in the chapters which follow we shall look in turn at the links between Halliday's grammar and some related descriptions. It is not my purpose to give a full account of the development of Halliday's linguistic theories or variations in the "school" of systemic-functional grammarians. Butler (1985; 1989) in his lucid surveys provides a more thorough overview of both than is possible here. Davidse (1987) provides an equally lucid account of the relationship of Halliday's functional grammar with its precursors in the Prague School. I concentrate instead only on those strands of theory which inform the textual analysis attempted in this thesis.

## 1.2 Genre Analysis

If there are several types of functional grammar, then there is even less consensus on what is meant by genre. Within the

Hallidayan tradition the closest concept to "genre", as I understand it, is "register", the term which refers to linguistic variation according to field, tenor and mode (eg Halliday, McIntosh and Stevens, 1964: 87). In this tradition, genre is defined as register consistency: that is, each text will be made up of a number of discourse elements, some of which will be compulsory, and others which may be optional in any given situation (eg Hasan 1984; Halliday and Hasan 1989; and for a slightly different view Ventola 1987 and Martin 1985). Genre in this view is seen as a system of constraints on field, tenor and mode. The Generic Structure Potential of a discourse situation will list the optional and compulsory elements of the potential discourse in the order in which they are expected to occur. For example, an exchange of goods may have the elements Greeting or Sale Initiation followed by Sale Request, Sale Compliance, Purchase and Purchase Closure (among several other possibilities). Of these elements, Greeting and Sales Initiation are optional, the others are compulsory (Halliday and Hasan, 1989: 64ff). The Generic Structure Potential is an attempt to state the conditions under which a text will fulfil the requirements of a typical discourse situation, or genre. Work in this tradition has concentrated mainly on interactive discourses such as service encounters (cf Butler 1989: 15-18).

The definition of genre in this thesis is slightly looser. A problem with register is that, despite its situational



emphasis, it has been seen as something which can be described purely in linguistic terms:

We can speak of registers as varieties in the rather weak sense of sets of linguistic items which all have the same social distribution, ie all occur under the same circumstances.

(Hudson 1980: 50-51)

However, the definition of a situational variety (eg a learned scientific article) requires more than the presence or the consistency of a certain set of linguistic items. Members of the linguistic sets overlap and are too unpredictable to serve alone as criteria for the definition of registers. Swales (1990: 58) recognises this when he gives his "working definition" of genre:

A genre comprises a class of communicative events, the members of which share some set of communicative purposes. These purposes are recognized by the expert members of the parent discourse community, and thereby constitute the rationale for the genre. This rationale shapes the schematic structure of the discourse and influences and constrains choice of content and style. Communicative purpose is both a privileged criterion and one that operates to keep the scope of a genre as here conceived narrowly focused on comparable rhetorical action. In addition to purpose, exemplars of a genre exhibit various patterns of similarity in terms of structure, style, content and intended audience. If all high probability expectations are realized, the exemplar will be viewed as prototypical by the parent discourse community. The genre names inherited and produced by discourse communities and imported by others constitute valuable ethnographic communication but typically need further validation.

The fuzziness of this working definition is both its weakness and its strength. Recognition of communicative purpose by "expert members of the parent discourse community" may be

rather difficult to come by, and there is always the possibility that they might disagree. In such cases the inexperienced linguist may well be tempted to step in either to speak for the experts or to adjudicate between them. However, communicative purpose is an attractive criterion for genre in that it accords with Halliday's claim, reported above, that language is motivated, and that a functional linguistic description should elucidate such motivation. In addition, the motivation of shared communicative purpose should naturally, in Halliday's model, lead to similarities in linguistic structure. However, awkward dissimilarities in structure should not give rise to a call for a different generic classification unless they also accompany a dissimilarity in communicative purpose.

Swales' definition also allows for the existence of texts which may fall between genres: a spoken lecture revised for written publication may contain aspects of at least two genres. There also exists the strong possibility of texts not falling into any genre whatsoever. Swales (1990: 58) includes casual conversation and "ordinary" narrative in this category, largely because of its ubiquity. However, the requirement that there should be expert members of a parent discourse community (at least potentially) to pronounce on a text's being an exemplar of a particular genre would suggest that many texts would fail to be classed as exemplars of any genre.



It is possible to imagine an expert discourse community which generates and may adjudicate upon the status of learned academic articles: the band of scholars who write, edit and read such texts is relatively small and presumably fairly homogeneous. The communicative purposes of such articles -- to state or review knowledge claims about some aspect of nature, science, culture or society -- is relatively clear and uncontentious. Arguably, however, popular articles, even on similar subjects, are more difficult to label generically. The discourse community is more heterogeneous, presumably ranging from older schoolchildren, through interested non-specialist adults, to specialists in different, related or the same discipline. The communicative purpose of such texts is also less easy to define: perhaps to inform the public about current developments in a particular field, perhaps to entertain or amuse with some offbeat information, or perhaps to publicise and promote a certain line of inquiry. The texts consequently would be less constrained by the strict demands of a conservative expert discourse community. Texts labelled "popular science", for example, would not necessarily be members of one clearly-defined genre.

Perhaps it would be more accurate to view the relationship between learned and popular science and academic articles as the "de-genrefication" of texts: texts designed for a distinct discourse community and purpose are redesigned for a broader readership and a wider range of purposes. Even so, this thesis

will assume that a general intended readership does form a coherent "expert" discourse community, and so satisfies one criterion for a genre. Content (corresponding roughly to Halliday's field) is taken as another criterion. Therefore, for the purposes of this research, popular and learned articles in biology, computing and history are considered to be exemplars of six possible genres (popular biology, learned biology, popular computing, learned computing, and so on).

The classification is inevitably rather loose. Learned science, for example, may be further categorised into sub-genres: for example, reviews, book chapters and journal articles. Of these, journal articles are likely to be the most highly constrained, because journals do prescribe an often rigid set of guidelines for authors to follow (see Bazerman 1988, for an extended discussion of the influence of the APA publication manual on the development of that journal). In comparison, book articles may be more discursive, and perhaps controversial. Knowledge claims in reviews may reside in the synthesis of several given points of view; such texts are often associated with relative novices in a particular discipline, or established specialists transferring disciplines (Tytler, personal communication). However, despite variations within the broader category, the umbrella labels of "popular" and "learned" will serve us here, since I shall assume that the variations within genres are small compared to the differences across genres.



Having discussed the broad principles underlying the classification of genres in this thesis, we shall now turn to the selection of articles for the corpus.

### 1.3 The Corpus

It is a perennial problem -- even given the advances in computerised corpuses and computer parsing -- that in detailed linguistic research a small quantity of text can yield acres of analysis. Close analysis requires a manageable amount of text, and so the present study is restricted to eighteen articles in all: three sets of three matched pairs from the fields of biology, computing and history. Most of the analysis is in fact based on extracts from these texts, selected on a basis described shortly.

Practical considerations governed the initial choice of sample articles. A random group of articles were selected from popular publications (mainly New Scientist, History Today, and, in one case, a report in a quality newspaper), and a search was made for a corresponding learned article. In some cases a popular article explicitly referred to a learned article on which it was based: this is true of "No domestic bliss", a newspaper report which is based on a learned article on the identification of wildcat hybrids by skull morphometrics. The author of "All About Eve" personally identified the source of her New Scientist article as a Nature article on "Mitochondrial

DNA and Human Evolution" (Poulton, personal communication). In these two cases the popular article was someone else's report of a learned article. In the other cases, however, the author remained "relatively" constant (by "relatively" I mean simply that popular articles are typically by one author, whereas learned articles, particularly learned science articles, may be credited to several. The popular article would then be by one of the team responsible for the learned version). Some authors of the popular article were also kind enough to send reprints of the corresponding learned article; other matches were made using published abstracts in university libraries. Although the popular versions typically were written after the learned articles, I have resisted the term "popularisation", preferring to view the articles as independent texts, each fulfilling different communicative purposes. I do not, in other words, view the popular articles as parasitic or secondary texts to the learned articles. I believe the findings of this study bear this view out. The articles in the corpus are as follows (each article is followed by its code in this study; a full reference is given in the appendices):

<u>Popular</u>	<u>Learned</u>
<u>Biology</u>	
"A murder mystery from the Mesozoic" (BP1: magazine article)	"The Paleoecological Significance of an Anachronistic Ophiuroid Community" (BL1: book article)



"All about Eve" (BP2:  
magazine article)

"Mitochondrial DNA and Human  
Evolution" (BL2: journal  
article)

"No domestic bliss" (BP3:  
newspaper article)

"Morphological discriminants  
of Scottish wildcats (*Felis  
silvestris*), domestic cats  
(*F. catus*) and their hybrids"  
(BL3: journal article)

### Computing

"Cognitive science meets  
the biological mind"  
(CP1: magazine article)

"PDP or not PDP: Is that the  
question?" (CL1: unpublished  
manuscript)

"Vision leads robots from  
the factory" (CP2:  
magazine article)

"The Viewpoint Consistency  
(CL2: journal article)

"Computing in parallel"  
(CP3: magazine article)

"Implementing neural network  
models on parallel computers"  
(CL3: journal article)

### History

"The Seaside Resort and  
its Rise in Victorian and  
Edwardian England" (HP1:  
magazine article)

"The Demand for Working-Class  
Seaside Holidays in Victorian  
England" (HL1: journal  
article)

"The Bishops' Wars"  
(HP2: newspaper  
colour supplement)

"Scottish Covenanters and  
Irish Confederates" (HL2:  
journal article)

"Crime in the 20th Century"  
(HP3: magazine article)

"Crime, Criminal Justice and  
Authority in England" (HL3:  
bibliographical essay in a  
learned journal)

As intimated earlier, the comparability of the texts is not entirely strict: as we shall see, particularly in Chapter Five, the reports of others are typically different in discourse structure from different versions of one's own work. As I have suggested, a bibliographical essay may differ from an unpublished manuscript, and a newspaper report may differ from

a magazine article. However, I shall restrict the genre distinctions to those corresponding to field (biology, computing and history) and tenor (authorial relationships with different intended readerships, specialist and non-specialist).

The degree to which popular and learned articles are close "matches" also varies: BP1 and BL1, for example, both address an almost identical problem (namely reasons for the near extinction of a form of starfish). Here the main difference in the content of the popular and learned article is a slight bias in the British magazine article towards evidence from British coastal waters, while, in the learned article published in an American book, the main evidence comes from a Bahamanian lake. However, each location does feature in both articles. There is a greater divergence in other articles: two pairs of history articles in particular show significant differences. HP2 is a general article about the Bishops' Wars, whereas the learned article focuses on one aspect of this conflict: the Scottish-Irish dimension. In contrast the learned HL3 is a bibliographical survey of research into crime in various centuries, while HP3 focuses only on the twentieth century.

Faced with a variation in the degree of "fit" between popular and learned articles, there are several potential procedures to facilitate comparison of like with like. Young (1990) illustrates one possible response from the Hallidayan tradition. In a study which has striking similarities to this



one, she analyses a small corpus of academic English: three freshman lectures in Engineering, Sociology and Economics were compared with extracts from introductory student textbooks in the same field. The core of her analysis is a "phasal" analysis of the texts, phase being defined as a "very delicate statement of register realization" identified on the basis of consistency in ideational, modal and textual selections, as well as a consistent pattern of morphosyntactic choices (Young 1990: 42-3). Phases are "strands" of functionally similar language, woven through the discourses and texts, and apparently offering a basis for linguistic comparison and contrast. Young labels typical phases as "Discourse/Text structuring" (explicit references to the construction of the lecture or textbook), "Interaction" (explicit instances of two-way communication, or pseudo-communication, between lecturer/writer and student), and so on.

Young's research results in some interesting findings which will be discussed where appropriate in the present study (see the Conclusion in particular); here, however, the concept of phase demands further consideration. Some phase labels (eg Content) are much more general and more difficult to grasp than others. More serious is the reliance on this "more delicate" version of register as the basis for comparison: if phases are identified by codal selections, the subsequent description of codal selections in terms of phase seems like a dangerously circular argument. As argued in the preceding section, recent

work on genre offers a possible way out of this categorisation of language variation based only on codal selections.

The present research has an advantage over Young's in that the pairs of extracts here are much closer in purpose than those in her corpus -- communicative purpose being a principal factor in Swales' definition of genre. To a greater or lesser extent the articles in the present corpus are communicating the same content; and, as mentioned above, many learned and popular pairs are also written by the same author(s). However, the learned articles, learned science in particular, are often more technically elaborate than their popular counterparts: long stretches of arcane detail have no equivalent in the popular articles.

The response to this problem has been to extract for close analysis those passages where the popular article and the learned article do communicate very similar content, or, alternatively, are similar in function. The introductory and concluding paragraphs of each article are always analysed, along with sections which overlap in information or function. For example, extracts from the body of BL1 and BP1 deal with constraints on the formation of brittlestar beds, experimental procedure, and the role of predators. Overlapping extracts from the body of CL1 and CP1 deal with the nature of intelligence (human and artificial), descriptions of parallel distributed processing, and the advantages and weaknesses of a



PDP model of human intelligence. And overlapping extracts from HL1 and HP1 deal with the universality of seaside holidays, class conflict at the seaside, and changing holiday patterns. A full analysis of the extracts is given in the appendices, with a parenthetical heading indicating the nature of the overlap.

Since the content and function of the extracts are taken as the basis of comparison, the analysis of the codal selections becomes less circular. Popular and learned extracts are intended to communicate similar information, or to introduce or conclude the article. Therefore any systematic linguistic variations should be a reflection of the differences in intended audience: general or specialist.

#### 1.4 Qualitative and Quantitative Analysis

There is an inherent weakness in all research of this type: from a small corpus of eighteen articles I shall attempt to make generalisations about the language of all popular and learned scholarship. Statistically, the corpus is simply far too small to act as a representative sample. This is also true of Young (1990), and I can only echo her words here:

A final point that I wish to emphasize is that the focus of the analysis is not on numerical counts or statistical findings; the corpus is too small for that. Rather, the intention is to report on tendencies, to suggest what may in fact be patterns, both semological and morphosyntactic, of academic English. At this stage, it seems more important to reveal what may be markers of this variety of English. Thus when I use terms such as "significant" or "numerous", I use them in the broadest



sense and not as mathematical calculations. In future studies, with a larger corpus, this quantitative aspect will be an important component of the findings; at this stage, though, I am concerned with possible or likely tendencies only.

(Young 1990: 85)

Practically speaking, it is impossible for a single person to undertake a full-scale analysis of a corpus which would be statistically significant. Therefore the most that one can hope for is that a careful analysis of a small corpus will reveal tendencies which may be widespread patterns. Some rough and ready statistics are given (especially in the first two chapters), but these should not be taken as proof of any general pattern but rather as circumstantial evidence supporting tendencies within the given corpus, tendencies which may be repeated in the wider field of academic English.

Under scrutiny at all times will be the quality of the analysis: to what extent are the analytical tools of functional grammar adequate to the description of patterns across genres? If the classifications of language afforded by functional grammar do appear to offer insights into patterns, then at least the mechanism for a broader-based analysis will be available for further use. Hoey (1991) offers a baldly robust defence of qualitative analysis, which is typical of present research in the field, in its consciousness of bases for knowledge claims. He asks the reader to endorse the coherence of a particular summary, arguing:

It may seem strange, or even unscientific, to appeal to the reader's judgement in this way. There is, in fact, no other form of proof possible... It would in principle be possible to present statistical support for judgements made here, based on acceptability tests, but if the reader does not find the examples I offer coherent, it is doubtful whether he or she will be convinced by evidence that others did.

(Hoey 1991: 106-7)

This thesis will not ask readers to adjudicate on matters of coherence, although Chapter Five demands the reader's endorsement of some necessarily subjective interpretations of text structure. However, the thesis will highlight patterns in a small corpus and make tentative generalisations from them. The reader must decide if these generalisations are plausible, given the evidence from the corpus, the rigour of the analysis, and his or her knowledge of scholarly language and procedures. If the readers do not find the qualitative analysis plausible, then it is certainly unlikely that statistical analyses would sway them.

Having introduced the concepts of functional grammar and genre, and having explained the selection of the corpus and the general principles of analysis, I shall now turn to the detailed study of the texts. Chapter Two deals with the textual function of the clauses, focusing on the realisation of theme. Chapter Three investigates the ideational function, focusing on the realisation of participants and processes. Chapter Four turns to the interpersonal function, and the question of modality across genres. And Chapter Five looks beyond the clause to larger discourse structures and

their realisation across genres. The Conclusion links the findings of the four main chapters to research into academic English to date.



Chapter Two:  
Theme and Genre

2.0 Introduction

In this chapter I shall first briefly trace the development of the concept of theme, through Prague School linguistics to Halliday and later functional-systemic linguists. The purpose of this section will be to make clear which definition of theme I am using, and to illustrate alternative interpretations of the study of information flow through the clause. Then I shall offer a comparison, with examples, of the function and realisation of the theme in the popular and learned articles under analysis.

2.1 A brief history of thematic analysis

2.1.1 Early approaches

A scholarly concern for the significance of word order in the clause is far from new. Weil devoted an influential monograph to the subject of word order in the ancient languages, and Super's introduction to his translation of this work (1887; 1978) traces Weil's forbears back to Dionysius of Halicarnassus in the 1st Century BC, as well as to more modern writers such as Condillac and Batteux in the 18th Century (Super, 1978: ix). Weil provides a useful starting point, however, because he makes a clear identification of word order with "the march of ideas" and because this notion had a direct influence upon later Prague School linguists. Weil sought to answer what seemed to him an apparently simple question:

Let us forget for a moment the constructions peculiar to the French, German, English, Greek; let us rid ourselves of all that we know of the variations in the usage of one language as compared with another, and let us ask ourselves, what principle, judging by simple common sense, ought to regulate the order of words. We answer, because we try to trace in words the faithful image of thought, the order of words ought to reproduce the order of ideas; these two orders ought to be identical.

(Super, trans., 1978: 21)

Two points -- the appeal to common sense, or as we might now say, intuition, as a criterion for describing sentence constituents, and the idea that not just words but ideas, or, again as we would now say, information units, have a certain order of development -- these two points effectively remain constant in most later writings on theme, as we shall see.

Weil further speculated that the correspondence between word-order and ideas held true for all languages, ancient and modern (eg Super, trans., 1978: 21ff). While subscribing largely to his assertion that a relationship between word-order and information development is unavoidable, I would hesitate to argue that the mechanism is identical in all languages, and in this chapter all claims will be confined to the English language.

In a later passage Weil writes specifically of a "division" in the statement, a division which will later be formulated by the Prague School as theme and rheme:

It was in the first place necessary that this other personage, with whom it was desired to communicate, should be placed at the same point of view with the speaker; it was necessary that a word of introduction should precede the remark which it was



intended to utter; it was necessary to lean on something present and known, in order to reach out to something less present, nearer or unknown. There is then a point of departure, an initial notion which is equally present to him who speaks and to him who hears, which forms, as it were, the ground upon which the two intelligences meet; and another part of the statement (l'énonciation), properly so called. This division is found in almost all we say.

(Super, trans., 1978: 29)

This passage is worth quoting at length because in it lie the seeds of almost everything that I am about to say about theme-rheme: the necessity of putting the receiver of the message in a particular point of view, the possibility of doing so by reference to something "present and known", and, it must be said, the vagueness about "another part of the statement", which will become known as the rheme.

Weil's work, published in 1845, influenced Mathesius, one of the founders of the Prague School, and it is his codification of theme and rheme which led to the widespread exploration of "functional sentence perspective" (FSP), which also evolved into "communicative dynamism" (CD), and influenced the grammars of Halliday and even, in the concepts of "presupposition" and "focus" found in his later writings, Chomsky (cf, for example, Danes, 1987: 25ff). Mathesius (1939) offers a characterization of the two elements of the division which Weil discusses above: the first element, or theme, he describes as expressing "that which is known or at least obvious in the given situation and from which the speaker proceeds" (Firbas, trans., 1964: 268; see also Fries, 1978; Davidse, 1987). As in Weil's description



above, two aspects of the theme are conjoined: first, the theme establishes a "point of departure" "from which the speaker proceeds", and, secondly, there is the possibility of making this point of departure an area of "known" common ground. Later linguists, like Firbas, either regard these two aspects as inseparable; or, like Halliday, they see them as two separate systems which operate simultaneously and may be overlaid upon each other (cf Davidse 1987: 64ff).

### 2.1.2 Theme in Prague School Linguistics

We shall concentrate on Firbas's work, since he is a leading representative of the developments in the Prague School, in order to illustrate one influential modification of the notion of theme-rheme: communicative dynamism (CD). Using Mathesius as a starting-point, Firbas argues that each element of the sentence is "known" to a different degree, or more precisely, each element of the sentence is context-dependent to a different degree, this being its degree of communicative dynamism. With this revised definition it follows that:

...the theme is not invariably linked with the beginning of the sentence. Known (context-dependent) information is always thematic, but the theme does not exclusively convey such information. It may also express new (context-independent) information. But no matter whether context-dependent or context-independent, the information conveyed by the theme will always carry the lowest degree(s) of communicative dynamism (CD) within the sentence. This means that the information conveyed by the theme contributes least to the further development of the communication within the sentence.

(Firbas, 1987: 138)

In Firbas's view, then, the "march of ideas" is tied to contextual common ground: the two intelligences, of receiver and sender, must proceed from shared knowledge, which is recoverable from the context, either of situation or preceding discourse. Such information has a "low degree of CD" and is therefore thematic. Other elements in the sentence will have higher degrees of CD, being less context-dependent, and the highest degree of CD will be carried by the rheme. As noted above, sentence-initial position is not a necessary or sufficient signal of thematicity; context dependence is the defining factor. Functional sentence perspective is a vehicle not for defining but for signalling theme and rheme (plus any transitional element), and word-order is only one way of doing this:

FSP is regarded as an outcome of the distribution of degrees of CD over the sentence elements, this distribution being at the level of written language brought about by an interplay of context, semantics, and linear modification, and at the level of spoken language by an interplay of context, semantics, linear modification and intonation.

(Firbas, 1987: 138)

In Firbas's model, then, context and semantics define the degree of CD that a sentence element carries; this element is accordingly allocated a position in the sentence and given a certain prosodic weight. In an unmarked sentence, the theme, carrying the lowest degree of CD, will be sentence-initial, and will not contain a sharp tonal movement; the rheme, carrying



the highest degree of CD, will be sentence-final, and will contain the main movement in tone.

The conception of Theme and Rheme found in Firbas's work has been further developed by writers of the Brno School, such as Svoboda (1983) and Golkova (1987). Svoboda in particular has classified the theme into a number of separate elements, worth summarising here.

Svoboda (1983: 50ff) distinguishes five types of thematic element. The principal two are "themes proper" and "diathemes", which are defined as follows: "The least dynamic element of the thematic sphere is theme proper (denoted by Tp); the most dynamic element of the thematic sphere is diatheme (denoted by Td)" (Svoboda, 1983: 50). Themes proper may be "ellipted", giving the third category; and the final two categories denote themes which are "oriented" towards either themes proper or diathemes. Again, degree of "dynamism" or, in other words, the degree of "newness" is the distinguishing criterion for classifying thematic types.

Svoboda's examples of each type of theme are given as an illustration below ("..." marks "ellipted" themes):

- |                  |  |
|------------------|--|
| 1. (Tp)          | But <u>she</u> was a passing good woman,                               |
| 2. (Tp ellipted) | and ... would not assent unto the king.                                |
| 3. (Tp oriented) | Then he called <u>to him</u> his privy council.                        |
| 4. (Td)          | <u>And when the child is born</u> let it be delivered to me.           |
| 5. (Td oriented) | <u>Then within two years</u> , King Uther fell sick of a great malady. |



Context, semantics and linearity are the means towards assigning a degree of "dynamism" to a thematic element. Themes proper either recover items previously mentioned in the text (as in example 1. above), or they express "eternal themes", that is, "elements that frequently appear as thematic in any kind of text" (Svoboda, 1983: 55). Often they are "hyperthemes", which Svoboda defines as themes which share identical referents, for example, "The king's daughter was very beautiful...This princess, however, was also proud...". Hyperthemes may be omitted, resulting in an "ellipted theme proper". Theme-proper oriented themes share certain features with themes proper -- they may be contextually tied to preceding discourse or share a referent with a hypertheme -- but they are not usually in sentence-initial position (see example 2 above). Diathemes perform three principal functions:

- (i) they link the (preceding) non-thematic spheres and the (following) thematic spheres by constituting ties between non-thematic and thematic elements;
- (ii) they link the successive thematic spheres together by keeping a certain element in the foreground or foregrounding some of the background elements;
- (iii) they introduce new information into the thematic sphere of the clause; in other words, they introduce new elements in such a way that they have to be regarded as thematic and are distinct from other new elements that are to function as non-thematic (transitional or rhematic).

(Svoboda, 1983: 60)

Svoboda here recognises the clear distinction between themes which refer, that is, which have some semantic content, and those which link passages of text together, that is, those which have a cohesive function. This is the main distinction

between themes proper and diathemes. In the category "diatheme", Svoboda also includes, rather tenuously, themes which are present in the preceding context, but not recently: therefore, if the themes of two succeeding clauses are contextually tied and share a single referent, they are themes proper and hyperthemes; if the themes of two clauses some distance apart are also contextually tied and share the same referent, then the first is a theme proper but the second is a diatheme: presumably the information it conveys is marginally "newer", since the receiver will have to work a little harder to recover it.

The final type of diatheme paradoxically introduces new information into the theme, often by means of a nominal or adverbial clause, or a prepositional phrase. The information given in such subclauses and phrases is communicatively "less dynamic" than the rest of the main clause, and therefore the paradox of newness and thematicity can arguably be reconciled (see example 4 above). Diatheme-oriented themes display the characteristics of (i) and (iii), the cohesive function and the giving of new information, but they cannot assume full thematic status because in the clause there is another diathematic element with a greater degree of communicative dynamism (as in example 5, where "King Uther" is the "more dynamic" diatheme).

While we shall not be using the concept of theme expounded by Svoboda, her theory has marked parallels with that of Halliday



in that a distinction is made between themes which have semantic content (topical themes, in Halliday's terms), and those which serve to tie the proposition to the co-text (textual themes).

Golkova (1987) extends the work of Firbas and Svoboda, using their descriptive apparatus to analyse initial themes in 5,000 sentences/clauses from English fictional and factual prose. Her conclusion is worth noting here for comparison later with the findings of this study:

While in English fictional prose the most typical sentence beginning is theme proper, expressed by a personal pronoun, English informative and concise non-fictional style prefers diathematic sentence beginnings, the diathemes being implemented mostly by grammatical subjects expressed by expanded noun phrases.

(Golkova, 1987: 94)

We shall return later to a discussion of the merits of Svoboda's thematic elements; suffice it to say for now that the Prague School has developed a descriptive apparatus to account for a range of thematic elements performing certain functions at different places in the clause, not just at the sentence-initial position. This approach has inspired some fruitful research, such as Golkova's (quoted above) and also Nwogu and Bloor (1989), which we shall discuss in a later section.

Degrees of newness, then, is at the core of the Prague School conception of the Theme. As we have seen, however, there is another point of view, and adherents to it separate thematicity



and newness into two separate systems: theme and information. The most influential exponent of this view is Michael Halliday.

### 2.1.3 Halliday's Approach to Theme

In a phrase strongly echoic of Super's translation of Weil (1887; 1978: 29; quoted above), Halliday (1985: 36) describes the theme as "the point of departure for what the speaker is going to say". As noted above, in various writings (eg Halliday, 1967; 1968; 1985) Halliday separates various elements which the proponents of communicative dynamism prefer to leave combined, namely given-new and theme-rheme, as identified by intonation and word-order:

Information choices, those concerned with given-new, are realized phonologically, by intonation features. Thematization, yielding a theme-rheme structure, is realized by the sequence of elements in the clause.  
(Halliday, 1967; Kress, ed., 1976: 175)

Halliday therefore argues that given and new information are signalled by phonological features rather than linearity, although it is true that in unmarked clauses theme will be found among given information and somewhere in the rheme will be "the climax of the New" (Halliday, 1985: 278). This identification of given-new with intonation has proved useful in spheres such as language teaching (see, for example, Brazil et al., 1980) and is gaining widespread recognition. If, however, given-new is signalled mainly by intonation, then written language falls outside the scope of the clause as information in this sense, notwithstanding theories about an

"inner ear" used when reading silently (cf Davies, M. in Couture, ed., 1986). We shall concern ourselves here, then, with Halliday's notion of theme and rheme.

The untangling of given-new and theme-rheme has had the unfortunate consequence of leaving the latter dichotomy rather vague. The theme can easily be identified -- it is the first element in the clause (although Halliday, like Svoboda, goes on to subclassify thematic elements) -- but its function is harder to grasp. No longer neatly categorised as given information, the theme is "what the clause is going to be about" (Halliday, 1985: 39). Various linguists have expressed dissatisfaction with the insubstantiality of this definition (eg Brown and Yule, 1983; Taglicht, 1984; Fries, 1987). Where Brown and Yule simply express their reservations about the concept, Taglicht offers an alternative and Fries elaborates on Halliday's concise description. Before attempting a workable definition of theme for the purposes of this study, let us examine each in turn.

Brown and Yule generally accept Halliday's view of theme and rheme, but they nevertheless admit unease when considering the placement of adverbials in isolated sentences:

It is hard to make judgements on the effect of different placings of adverbials in sentences in isolation. Some hearers feel these variations produce no difference in meaning, others perceive subtle nuances of difference. Like many issues concerning thematisation/linearisation/selection of syntactic structure, this issue is little understood. We shall assume in



the rest of our discussion that theme is a formal category in the analysis of a sentence (or clauses in a complex or compound sentence) and, following Danes (1974), we shall assume that it has two main functions:

- (i) connecting back and linking in to the previous discourse, maintaining a coherent point of view
- (ii) serving as a point of departure for the further development of the discourse.

(Brown and Yule, 1983: 133)

Danes' formulation, summarised here, is identical to Halliday's classification of textual and topical theme, whose validity we shall discuss in the next section. Firbas and Svoboda also recognised a dual concern of the theme: to indicate the status of an utterance in the text and to anchor it to a referent of some kind in the discourse. Given that both functions are discourse-dependent, it is hardly surprising that it is difficult to determine the purpose of a theme when a sentence is analysed in isolation. However, I would grant Brown and Yule's general point that often the nuances of difference are subtle; in the analysis of texts later in the chapter I hope to shed some more light on them.

The central problem of accounting for theme and rheme is the vagueness of the second function quoted above: "serving as a point of departure for the further utterance of the discourse." An analysis of a short extract from a popular biology article will serve as an example of Halliday's approach to theme. He claims that in any clause the leftmost constituent alone can function as theme. Therefore, in the following extract, the underlined constituents are thematic:



The sight was astonishing. Normally, we encounter only the occasional brittlestar hiding under a stone along the shore. Here, there were brittlestars as far as the eye could see. It was as if we had dropped onto some primeval marine community.

(BP1:1)

Following Halliday's definition, the theme of the first clause would also be the subject, and the point of departure would be "the sight". The theme of the second clause would be a common marked theme, an adjunct, and the point of departure could be glossed as "in normal conditions". The theme of the third sentence would also be an adjunct, and the point of departure may be glossed as "the conditions here". These two consecutive clauses therefore fall into a matching relationship (see Chapter 5) of implied contrast: "what is here is not what is normal".

The final clause complex of the extract causes a few more problems: the "empty" or "dummy" subject signals a predicated theme (cf Halliday, 1985: 59ff for a discussion of theme in cleft sentences, ie those with the structure "it + be + ..."), and so we have two simultaneous configurations of theme and rheme:

It	was	as if	we	had dropped onto some primeval...
Theme	Rheme	Textual Theme	Topical Theme	Rheme
Theme	Rheme			

The first interpretation is the local interpretation: "It" is the sentence theme, but as it is empty, attention is switched to the clause that it anticipates, here the hypothetical clause

beginning "as if". The complex subordinating conjunction functions as textual theme, signalling that what follows is hypothetical comparison (cf Quirk and Greenbaum, 1973: 328, 340), and the pronoun "we" functions as topical theme, signalling that the hypothesis is "about" the actors in the narrative.

The second interpretation is the overall interpretation: taking the clause complex as a whole, the primary theme is the pronoun "it" which is predicated and therefore empty. What then is the point of departure here? Halliday's discussion of predicated themes is unsatisfactory on this point: he offers a convincing explanation of why the theme is predicated in cleft sentences (namely, to redistribute given-new information to appropriate slots in the clause complex), but fails to elaborate on the weakened thematic force of the dummy subject. Again, we shall return to this point in the next section; for the moment I wish to focus on a more general criticism of Halliday's approach.

Taglicht (1984) brands Halliday's discussion of theme as "pretheoretical" and goes on thus to elaborate on its shortcomings:

The unwillingness to part company with the idea of the theme as "what is being talked about" has this drawback: it leads easily to the conclusion that if x is the theme of a sentence, all that remains must be "what is being said about it", the rheme...

...



The statement that the subject is theme and the predicate is rheme in textually unmarked declarative sentences, which is the point of departure for the rules of textual sequence in English, illustrates the organic connexion between sequential order and syntactic dependency. Textual order is not merely linear order, related only to preceding and following sentences (if any) in the text; textual order is linear order in relation to syntactic dependency structure.

(Taglicht, 1985: 14)

In Taglicht's view, the subject of a sentence always has some kind of thematic status, although it may be preceded by another constituent, for example an adjunct, as a marked theme. He also gives a special label, "operator", to the independent verbal item performing the function of finite. His analysis of the biology passage above would be as follows:

The sight	was	astonishing.
Theme	Operator	Rheme

Normally,	we	encounter only the occasional brittlestar...
Marked Theme	Theme	Rheme

Here,	there	were	brittlestars as far as the eye...
Marked Theme	Theme	Operator	Rheme

It	was as if we had dropped onto some primeval...
Theme	Rheme

The declared advantage of this description is that it accommodates a view of textual order and syntactic dependency. Why these two components should be combined is unclear: in Halliday's functional grammar, the subject-finite relationship is dealt with separately, as part of the interpersonal metafunction. Together, subject and finite form the mood of the clause, which "carries the burden of the clause as



interactive event" (Halliday, 1985: 77; cf Chapter 3 of this study). In brief, the subject specifies "something by reference to which the proposition can be affirmed or denied" and the finite anchors the proposition either to time or the speaker's judgement (Halliday, 1985: 75ff).

Taglicht, then, by retaining thematic status for the subject, no matter what, and by creating the category "operator" to label the finite element, is conflating two of Halliday's metafunctions, the interpersonal and the textual. Even allowing that we might debate the extent to which these metafunctions are truly distinct, it is at least convenient to treat them so. The basic argument, that linearity is not a sufficient criterion for thematicity, will be considered more fully in the following section.

We shall conclude this brief summary of approaches to the theme with an attempt to give flesh to the bare bones of Halliday's description. Fries (1987) draws attention to the inadequacy of Halliday's formulation, and then outlines his own method for giving added substance to it:

Authors and speakers -- some of my data were taken from spoken language -- use initial position in clause complexes to communicate something which Halliday has called 'the peg on which the message is hung'. Thematic content correlates with something which I have called 'the method of development' of a passage.

(Fries, 1987: 7)

Fries argues that Halliday's insights are useful in that they identify an important discourse procedure; however, the description of this procedure relies on metaphor. Fries accepts Halliday's identification of theme, but, crucially for the precise definition of its function, he goes to authentic data to "explore the reasons why one chooses certain items of information as peg and does not choose others" (Fries, 1987: 7). From the analysis of his data, Fries formulates one general and four specific principles which offer a more detailed account of the function of theme. These principles are as follows:

General principle: The theme of a clause complex provides a framework within which the rheme of the clause complex can be interpreted.

Principle 1: Provide information which is required to interpret the main message.

Principle 2: Cancel an assumption which has been established in the previous context.

Principle 3: Prevent temporal or local misinterpretation.

Principle 4: Highlight the point of elaboration.

(Fries, 1987: 9-12)

Applying these principles to the popular biology extract quoted above, the first theme ("The sight") is required to interpret the main message (ie What was astonishing?); the second and third themes ("Normally" and "Here") are required first to avoid locational misinterpretation and then to cancel the locational assumption previously established. The final theme ("It") poses a problem which we have already touched upon and shall return to again.



However, ignoring for the moment the problems posed by predicated themes, Fries' principles are a useful starting point for a clearer and more useful description of the thematic function. In his closing paragraphs, Fries speculates upon a point which has direct application to the present study:

Of course, if the function of theme is one of orienting readers and listeners to what is to come, the effective use of thematic content necessarily involves considering and manipulating readers' and listeners' expectations. That is, writers and speakers must consider what their readers and listeners are likely to expect at any given point and then use the thematic content of their messages to influence these expectancies.

(Fries, 1987: 15)

To the textual analyst, one of the most attractive aspects of Halliday's approach to language description, as opposed to, say, the Prague School proper, is this very sensitivity to the fact that language is used manipulatively, or rhetorically. Theme-rheme and given-new are in the hands of the language users, part of the system which they can exploit; such elements are not merely necessary baggage, bound securely to each clause. Moreover, if Myers (1985b) is correct in his assumption that the manipulation of readers' expectations is one of the crucial methods of distinguishing the "narrative of science" from "the narrative of nature", then a thematic analysis of related scientific texts, learned and popular, should (a) throw further light on the function of theme, and (b) offer specific linguistic evidence for the social construction of learned and popular science.



## 2.2 Previous thematic analyses of learned and popular articles

Two recent studies which attempt a thematic analysis of texts from different but related genres are Nwogu and Bloor (1989) and Francis (1989).

Nwogu and Bloor do not follow Halliday's approach to theme, but maintain the views of the Prague School, particularly Danes (1970, 1974). Danes' notion of thematic progression is at the heart of Nwogu and Bloor's study of professional and popular medical texts. In particular, they look for:

1. Simple linear thematic progression: ie the Rheme of one clause becomes the Theme of the following clause.
2. Thematic progression with constant Theme: ie the Theme of one clause is repeated as the Theme of the next.
3. Thematic progression with derived Themes: ie the Themes of successive clauses refer to a "hypertheme", or a general topic which allows the selection of related subject matter as Themes.

(Nwogu and Bloor, 1989: 3-4)

Nwogu and Bloor tentatively conclude that simple linear progression is suited to explanation and exposition, and is therefore found more frequently in popular texts than in professional texts, a higher degree of information being taken as given in the latter. Information presented by linear progression may also be easier to process. Constant thematic progression was found in all genres, mainly in descriptions of state, process, event or procedure: professional texts used it frequently to describe methods; popular texts, apparently less concerned with methodology, used it less frequently. Thematic progression with derived themes was found only once in Nwogu

and Bloor's corpus, in a professional text where the itemization and serialization of events are detailed (Nwogu and Bloor, 1989: 7-9).

It will be evident that this thematic analysis is only indirectly related to the present study. First of all, the definition of the theme (elaborated upon in the next section) is subtly but crucially different; and secondly, I am more concerned with the realisation of specific themes than with their general classification. That is, rather than classifying types of theme and then counting instances of these types in professional and popular texts, I attempt a more particular study of the themes of closely related texts, in order to find patterns of similarity or difference. This approach is closer to that of Francis (1989).

Francis uses a concept of theme influenced by Fries (1983) to analyse randomly-selected texts from two newspapers, the Times and the Guardian, published on the same day. She classifies these texts into three groups: news report (report), editorial (analytical exposition) and letter of complaint (hortatory exposition). Both a quantitative and a qualitative analysis are attempted, and the relationship between theme and cohesive harmony is discussed (Francis, 1989: 201).

Francis (1989: 204) admits that the results of the quantitative analysis are inconclusive -- 7500 words is a small foundation



on which to build a statistical argument -- but the qualitative analysis throws up a number of interesting suggestions.

Francis focuses on two aspects of theme: transitivity, that is, which participants and process are selected as theme; and lexical selection; that is, "whether the themes are typically people, institutions, concrete objects, abstractions, etc." (1989: 202).

Her results suggest that editorials and letters, the persuasive texts, thematise comparatively few material and verbal processes; instead they prefer nominalised themes. This makes sense if we accept that editorials are concerned with the significance of events rather than events as narratives:

"Nominalization is a synoptic interpretation of reality: it freezes the processes and makes them static, so they can be talked about and evaluated" (Francis, 1989: 203). A high proportion of different lexemes in thematic position is associated with nominalisation. Francis (1989: 205) reasons that this is because of the potential for modification allowed by nominalised expressions. Francis, then, is building a case for arguments and narratives typically having a different proportion of certain thematic realisations, a distinction which may well hold true for learned and popular articles.

Francis, like Nwogu and Bloor (1989), also considers thematic progression from Danes' viewpoint (implying a conflation of points of view about the nature of theme). She expects to find



that arguments follow a linear pattern of theme, while narratives should thematise "one of the characters, sequence in time, or (when a change occurs), setting in time or place" (Francis, 1989: 213; Fries, 1983: 124). However, perhaps again because of the size of her corpus, no pattern of thematic development is discernable (Francis, 1989: 215). The final claim about thematic development is explicitly modest:

...it is simply that the number of lexical ties is crucial in the case of thematic participants because it is Lexis, and not merely transitivity, that encodes method of development and the particular kind of coherence it provides.  
(Francis, 1989: 219)

Although Francis' study is not about learned and popular articles, it is more relevant to the present study than Nwogu and Bloor's. First of all, the conception of theme is similar to that of the present study; and secondly, the insights into typical themes of argumentative and narrative texts may prove generally applicable across a variety of genres. Part of the purpose of the present study will be to extend Francis' analysis to popular and learned articles.

### 2.3 The concept of theme in the present study

It is evident from the previous sections that various views of theme still abound. These controversies may be reduced to two fundamental questions which have to be answered before any thematic analysis can proceed: (a) what is the function of the theme, and, specifically, is it to be identified with given information; and (b) if the theme is not identified with given information, how is it to be identified?

I find Halliday's identification of given and new information with the intonation system of English to be persuasive. Such practical applications as Brazil and Johns (1980), which adapt what is essentially Halliday's model, provide some evidence of the validity of the identification. That the given-new configurations of a single sentence may be altered by changing the tone of the information units also gives ample support to the view that intonation, not word-order, is the determining factor here:

- a) The sight was asTONishing.  
Given                      New
- b) The SIGHT was astonishing.  
New                      Given

Given that in the above examples the tonic syllable is capitalised and underlined, (a) realises an unmarked utterance which answers the question, "What was the sight like?" The new information characterises the sight. Utterance (b) is marked,

and would presumably offer some kind of emphatic response to a question like, "Sorry, what did you say was astonishing?" In the Prague School model, the degrees of CD would shift in these two sentences: in (a) CD would rise as the sentence progresses; in (b) CD would fall as the sentence progresses. Communicative dynamism, if identified with given and new, would be determined by intonation alone.

If we grant that theme is not to be identified with given and new, then, how is it to be characterised? As suggested above, Fries (1987) offers a plausible reformulation in terms of orientation: the theme provides a framework within which a statement is to be interpreted. This reformulation may easily be confused with given and new -- indeed some Prague School linguists conflate the two notions in their definition of theme. Firbas (1987: 147) draws attention to what he calls "less dynamic context-independent information":

Not all context-independent elements are of equal communicative value. Some of them merely prepare the way for the attainment of the communicative purpose. Under this heading come the adverbial elements that evidently serve as settings.

Firbas here is attempting to reconcile the fact that thematic information can, in a sense, be new, even in unmarked sentences. This paradox is also evident in Mathesius (1975: 81-2): he attempts to explain the fact that the beginnings of narrations (eg "Once upon a time...") cannot be given:



When we start to speak about something which cannot yet be referred to as a known fact, then from the complex of notions included in the statement we anticipate one as given, ie as a notion that naturally presents itself and we make it the starting point.

(Mathesius, 1975: 82)

Mathesius argues that the beginnings of narrations draw upon "something given that readily presents itself" as themes, and apparently regards these newish givens as exceptional.

However, any text which does not proceed by mechanically converting rhemes into themes will have such context-independent elements in thematic position. Even in the above example, from a popular biology text, "The sight was astonishing", the thematic element ("The sight") is only recoverable from the surrounding discourse if you argue that when you are swimming around at the bottom of the sea, you are bound to see something. Here the theme is possibly better not treated as given at all, but as a setting, something that readily presents itself, and provides a context in which to interpret the rest of the message. In emphatic sentences, as we have seen, the initial element of a clause can express new, communicatively dynamic, information. Firbas' notion of "setting", then, is close to Fries' "orientation", and is what I take to be the core function of the theme.

The theme, then, in this study, should be understood as having the function of providing a "setting" or "orientation" for the interpretation of the clause. Like Halliday, I shall assume that this setting is provided by the initial element in the

clause. This feature may well be unique to languages like English which depend heavily on word-order (cf Mathesius, 1975: 153ff); again, I make no claims about the universality of clause-initial identification with the theme. However, in English, the initial information provided by the clause will act as a context for the interpretation of the rest.

This definition of theme also accords with Halliday's description of textual and topical themes (1985: 53ff). If it is initial information which is important -- as he says it is - - then clause-initial elements which do not inform have a different function from those elements which do inform. The former type of theme will be textual themes, and the latter will be topical themes. The paragraph quoted earlier will then be analysed as follows:

The sight	was astonishing.
Topical Theme	Rheme

Normally	we encounter only the occasional brittlestars...
Topical Theme	Rheme

Here	there were brittlestars as far as the eye...
Topical Theme	Rheme

The scheme I have suggested still has some difficulty dealing with predicated or "empty" subjects, insofar as it is debatable how far a lexically empty item can act as a setting. Obviously such elements cannot function as topical themes. I shall therefore treat them as "directive" textual themes, arguing that, like conjunctive adjuncts, their function is to direct





Unlike some other analysts (eg Francis, 1989) I shall not attempt to "recover" such deleted themes in order to include them in the analysis.

The description of theme outlined in this section, then, is that which will operate in the rest of the chapter, which in turn will attempt a thematic analysis of a variety of learned and popular articles.

## 2.4 A Thematic Analysis of the Texts

The definition of theme formulated in the preceding section was applied to the various matched extracts taken from the corpus of popular and learned articles. Following Francis (1989) to some extent, I classify the themes according to their ideational function (topical themes, that is, those whose realisations "represent" reality in a way discussed in greater length in Chapter Three) or textual function (textual themes, that is, those whose primary function is to organise the discourse). A third category, so far little discussed, is that of "modal themes" (Halliday, 1985: 49-54). These themes comment directly on the proposition expressed. Halliday seems to class them as topical themes; however, I would dispute that they provide a setting for the message in themselves, and would group them as analogous to textual themes. There are other reasons for this classification. Consider the following example:

<u>Modal theme</u>	<u>Topical theme</u>
In fact	fluctuations in the occurrence of dense beds of <u>Ophiothrix fragilis</u> in the English Channel over a period of several decades

BP1:7

Here "in fact" signals that the writer believes the proposition to be the (surprising) truth: Halliday would label it "verifactive" (1985: 50). However, this adjunct also functions as a conjunctive adjunct or sentence connective (cf Quirk and Greenbaum, 1973: 293-4) and might conceivably be classed with

cohesive devices, which are essentially textual. Even so, given that explicit expressions of attitude are widely taken to be indicators of popular articles rather than learned articles, I have allowed them a separate category. The classification of modal themes into attitudinal and style markers follows Quirk and Greenbaum (1973: 242ff): the former comment on the "content of the information" (eg "Obviously I have to go"), the latter comment on the conditions under which the speaker gives the message (eg "Frankly, my dear, I don't give a damn"). Both would normally be followed by topical themes.

Topical themes are classed according to whatever ideational components they realise. The ideational function of language is its representational function (discussed in detail in Chapter Three). Briefly, clause constituents are classified into processes (actions, states, etc), participants (which are associated with particular types of process) and circumstances (usually adjuncts, giving additional information about the process). The main process types are material, which represent actions and states in the physical world;; relational, which represent processes of being; and verbal, which represent processes of saying. Other types of process include mental, existential and behavioural.

I have labelled the topical themes here according to process type and circumstance type only -- largely because participant-type is closely linked to process type. For example, Actors



and Goals are associated only with material processes, and Sayers, Verbiage\*, Targets and Recipients are associated only with verbal processes. An Actor would be responsible for performing a material process, whereas a Sayer would be responsible for performing a verbal process. And so, the thematic development of a short extract from CP1: 2 would be fully analysed thus:

Topical theme: relational  
One alternative

Rheme  
is to adopt an approach that concentrates on more primitive biological achievements.

Topical theme: material  
American high-school yearbooks

Rheme  
single out a few individuals as possessing the kinds of traits required for future success ("The person most likely to...")

Topical theme: location  
In the biological yearbook

Rheme  
the list of star qualities is revealing.

The criteria for categorizing participants, processes and circumstances will be examined thoroughly in Chapter Three, which deals principally with this issue. It is worth noting here, however, that the assignation of a role to a theme is not always straightforward. One of various problems is the classification of metaphorical processes, for example:

Topical theme: "verbal"  
Many of the programs

Rheme  
echo our common-sense understanding of mental states.

Here the apparent reading of the sentence is as participants involved in a verbal process ("Many of the programs" = Sayer,

\*The use of the term "Verbiage" here departs from Halliday in including quoted and reported speech (cf Halliday 1985:129). I use the term to refer to all expressions of verbalisation.

and "echo" = verbal process). However, such a representation of reality conflicts with our literal, common-sense knowledge of reality: computer programs cannot participate in verbal processes. Therefore an alternative, or "congruent" interpretation would possibly be as a relational process (ie a process of being), which might be paraphrased as "Many of the programs are similar to our common-sense understanding of mental states". "Echo", then, would not express a verbal process, but a relational process expressed metaphorically. The question then arises: which classification is primary, the literal or the metaphorical?

Halliday (1983: 320-345) argues for dual interpretations of such clauses, that is, both metaphorical and literal interpretations. Unfortunately, such a thorough analysis, though laudable, is beyond the descriptive means of the present study. A full analysis of the extracts is given in Appendix B: metaphorical processes are signalled by inverted commas, as in the example given above. No literal analysis is offered.

Topical themes which express circumstance types offer fewer problems; the principal circumstance types (eg place, time, means, and manner,) are all represented in the extracts.

Textual themes are also subclassified: into existential, directive, cohesive and question types. Most of these categories have been discussed piecemeal above. To review the



subject briefly, the function of textual themes is essentially to signal the status of the message as part of the text. I have classed cohesive adjuncts and conjunctions together under cohesive textual themes, because they perform similar functions ("and" being similar to "in addition to"; "but" being similar to "however"; "because" being similar to "for the reason" and so on). However, even here there is a grey area between some cohesive textual themes and some topical themes of circumstance. Sometimes the extension of a cohesive theme can lead to classification as a topical theme. Compare the following:

<u>Textual theme</u>	<u>Topical theme</u>	<u>Rheme</u>
In stark contrast	they	all survived in Sweetings Pond

<u>Topical theme</u>	<u>Rheme</u>
In stark contrast to coastal conspecifics	Sweetings Pond brittlestars expose themselves day and night.

(BP1: 5; BL1: 5)

In the first, popular, example the adjunct is purely conjunctive, providing a textual signal. The setting is provided by the topical theme "they". In the second example, from the corresponding learned article, the same phrase "in stark contrast" is extended to become a circumstantial theme (contrastive). I assume that the postmodifying prepositional group "to coastal specifics" provides the setting necessary for the theme to qualify as topical.



Another grey area of classification concerns items such as "then" and "first", which Halliday (1985: 50) regards as "temporal" conjunctive adjuncts, and which therefore would, in my scheme, be cohesive textual themes. There is some difference, however, in the use of "first" in the following examples:

<u>Textual theme</u>	<u>Topical theme</u>	<u>Rheme</u>
First	Charles	was overconfident....

<u>Textual theme</u>	<u>Topical theme</u>	<u>Rheme</u>
Second	he	failed to take account of...

(HP2: 2)

<u>Textual theme</u>	<u>Topical theme</u>	<u>Rheme</u>
First,	in 1641	the oppressed Irish Catholics...

<u>Textual theme</u>	<u>Topical theme</u>	<u>Rheme</u>
Then	in the same year	England collapsed into civil war...

(HP2: 5)

In the examples from HP2: 2 above, "first" is obviously an ordinal; its function is primarily textual, that is, it signals the status of the message as first in a sequence. As such, it is naturally followed by "second". In the examples from HP2: 5, "first" is a temporal conjunctive adjunct, naturally followed by "then". A case might be made that such adjuncts provide a setting in a similar way to circumstances of temporal location acting as topical themes. I have resisted such an interpretation on the admittedly debatable grounds that such adjuncts are often followed, as above, by indicators of

temporal location, which may function as more specific settings. However, I wish here simply to note that even for textual themes the categories are seldom clearly defined or absolute. For a full account of the thematic value assigned to each individual clause, again see Appendix B.

I group with cohesive textual themes, existential and directive themes (see above, Section 2,3). These themes consist of the "dummy subjects" in existential and cleft sentences. Such textual devices are different in function from the cohesive devices: rather than signalling the textual status of the message, they direct the reader's attention towards a particular part of the message, simultaneously signalling its salient status.

Finally, I also group with textual themes the interrogative markers for polar and wh- questions. This seems to correspond to Halliday's argument (1985: 48) that in polar interrogatives, theme extends beyond the finite verb to incorporate the subject, which would give, for example:

<u>Textual theme</u>	<u>Topical theme</u>	<u>Rheme</u>
Did	Charles I	really expect to get...

(HL2: 5)

Moreover, it is difficult to see how a wh- item provides a setting as we have conceived it; rather, like an existential or directive theme, it functions as a signal as to the nature of

the message that follows, this time as a request for information of a particular kind:

Textual theme: <u>cohesive</u> ...and	Textual theme: <u>wh- interrogative</u> what	<u>Rheme</u> can they contribute to our understanding of Victorian and Edwardian society?  (HP1: 1)
---	--	--

The table of classifications, then, attempts to show how a range of topical, textual and modal themes are distributed in matching extracts from popular and learned texts. Let us now turn to the tables themselves, and a discussion of the results presented therein.

#### 2.4. 1 Results and discussion

The tables in Appendix C (thematic profiles) give details of the number and (rough) proportion of thematic types found in matching extracts taken from the corpus of eighteen articles, popular and learned. It must be stressed that the tables give only a rough indication of the proportions of thematic types in each matched extract: in any case, no valid argument could be made on fine statistical discriminations in a corpus of this size. The value of the tables is purely that they provide a sketch of the thematic make-up of each set of matching extracts. An example is given on the next page.



The thematic profile may be read as follows. Codes such as BP2 or BL2 relate to the second (2) set of popular (P) and learned (L) biology (B) articles. The top row of figures gives the raw number of themes in each of the matched extracts. Thus the fourth set of extracts contains eleven themes in the popular article and thirty in the learned article. To make comparison between matched extracts easier, I have then converted the proportion of thematic types into rough percentages, rounding off to the nearest whole figure. Again, given the size of the corpus no significant claim could be made on the grounds of a fractional difference in percentages. The purpose of conversion into percentages is simply to make a broad comparison more attainable:

Thematic profile: Extracts BP2/BL2

Theme type	1	2	3	4	5	Total
Number of themes in extracts:	43/23	27/3	14/14	11/30	44/6	139/76
% Topical themes (ideational						
Participant types:						
material:	32/39	48/33	43/57	36/40	25/17	34/41
relational:	14/17	4/0	21/21	0/13	16/17	12/14

(cf Appendix C)

In the above table, then, we can see that of the 11 themes in extract 4 of the second popular biology article, 36% are participants in material processes, that is, are actors, goals or beneficiaries, while none are participants in relational

processes, that is, "carriers" which are characterised by "attributes" or, "identifieds" which are specified by "identifiers". In the thirty themes of the extract from the corresponding learned article, 40% partake in material processes, while 13% participate in relational processes. A glance across the five pairs of matching extracts and the total percentage, confirms that in this article the broad tendency is -- without doubt -- to establish settings which create a sense of action or happening (expressed through material processes) rather than simply being (expressed through relational processes). The tables can also turn a spotlight on possible contrastive features of some texts. For example, the full table for BP2/BL2 shows that the popular text contains 7% interrogative themes as opposed to a lowly 1% in the learned text. If this kind of broad difference is discernible in the other articles, then some support will be provided for those who believe that question-answer sequences are more prevalent in popular than in learned articles.

Let us now, then, consider the broad regularities which emerge from our analysis, before discussing in some greater detail examples from the texts. In the analyses which follow, I compare labelled extracts from the texts which give similar information or have a similar function. Therefore, for example, BP1:1 and BL1:1 are "near correspondences" in that they both introduce their respective texts, while BP1:4 and BL1:4 are "near correspondences" in that these extracts from

the first set of popular and learned biology articles both describe the circumstances necessary for the survival of a particular kind of starfish, the brittlestar.

#### 2.4.1.1 Topical themes

It is evident from the texts that throughout most of the articles, learned and popular, in whatever field, the highest proportion of themes provide the setting of a participant in a material or relational process. A summary of the total percentage of topical themes as participants in processes is given below:

Fig 1: Popular/Learned articles: summary of participant themes  
(all figures %ages of total number of themes)

Articles	Material	Relational	Verbal	Mental	Behavioural
BP1/BL1	24/27	22/26	3/10	5/5	0/0
BP2/BL2	34/41	12/14	5/3	6/4	0/1
BP3/BL3	19/28	21/18	2/3	7/4	0/0
CP1/CL1	34/22	16/19	6/10	2/6	0/0
CP2/CL2	25/29	18/15	0/4	10/8	0/0
CP3/CL3	21/25	23/18	0/2	2/2	0/0
HP1/HL1	30/29	18/12	1/0	7/3	0/0
HP2/HL2	23/24	6/5	0/4	8/6	0/0
HP3/HL3	35/37	18/15	7/4	3/3	0/0

There is a general consistency here which is not surprising: we would expect articles in biology, computing and history to provide a high proportion of settings for processes of action, event and being. All genres show a slight tendency for processes of action/event over being; however, both process



types together usually provide 40-50% of the themes in each article. It is interesting to note that there is little variation between the learned and popular articles in each field: although there may be a difference in percentage points of up to 10%, generally a relatively high proportion of one participant type in the learned article corresponds to a high proportion in the popular article.

This correspondence may be illustrated by the one obvious exception in the table: the uncharacteristically low proportion of participants in relational processes found in HP2 and HL2. It is difficult to identify the reason for this apparent anomaly; however, unlike the other two sets of history articles, which deal with historical processes (the rise of seaside tourism and the rise of crime respectively), HP2 and HL2 deal with personalities and groups, namely Charles I, the Scottish Covenanters and their Irish confederates. It is possible that articles which deal with people may place less emphasis on processes of being. However, there seems to be no substantial increase in the number of themes expressing material processes, an increase which would support such a view. A more marked rise seems to be in circumstances of location in time (see below). Possibly the low proportion of relational themes shows the writer's predilection for providing a thematic setting in time, thus pushing potentially thematic relational participants into the rheme. Whatever the reason,

it is beyond dispute that relational and especially material processes still dominate the participant types found as theme.

Figure 1 also shows a fair sprinkling of participants in verbal processes as theme: no consistent pattern is discernible either between learned and popular article or field. All text-types have a small but significant proportion of verbal themes.

The distribution of thematic participants in mental processes is perhaps more interesting. Like verbal themes, there is a small but consistent presence of mental themes; however there is a marginally higher proportion in CP2/CL2, and again in HP2/HL2. The former figure may be explained by the subject matter of this particular computing article, namely computer vision. A higher proportion of Sensors and Phenomena is to be expected in an article devoted even to machine vision. As for the history articles, the argument used above to explain the low proportion of relational themes may again be called on to explain the slightly higher number of mental themes: one would expect a higher number of mental themes in an article tracing the actions of individuals and groups.

In all the texts, the proportion of behavioural themes is negligible; in fact I have classified only one theme as behavioural in the whole series of extracts (BL2: 1):

Theme: Behaver  
Typical mammalian females

Rheme  
consequently behave as haploids...

Given that biology and history articles both deal at times with the behaviour of animals and people, it is perhaps strange that the number of behavioural themes is not higher; however, in the extracts under consideration, behavioural themes are consistently avoided as thematic settings.

Of the other topical themes, circumstances of location in time and space predominate, as the summary in Figure 2 shows (the figures are percentages of the total number of themes):

Figure 2: Popular/Learned articles: summary of circumstances

Articles	Extent:		Location:	
	Space	Time	Space	Time
BP1/BL1	0/0	1/2	6/7	7/2
BP2/BL2	0/0	0/0	1/3	2/1
BP3/BL3	0/0	0/0	0/4	14/5
CP1/CL1	0/1	3/3	5/3	2/1
CP2/CL2	0/0	0/0	0/2	9/2
CP3/CL3	0/2	3/4	0/2	0/2
HP1/HL1	1/1	0/0	5/12	5/9
HP2/HL2	0/0	0/0	2/4	16/15
HP3/HL3	4/3	0/1	0/2	8/4

The above table indicates that location in time is the most common circumstantial theme: evident in all fields, it is perhaps most consistently used in the history articles, for obvious reasons. There is also a relatively high proportion of such themes in BP3: more so than the corresponding learned article, the popular article deals with the time-scale of the near-extinction of Scottish wildcats.



Themes expressing location in space are also relatively high in HP1/HL1, possibly because that article deals with the rise of seaside resorts. Place is naturally an essential part of the subject matter of this article.

As the tables in Appendix C show, other circumstantial themes are represented, scattered throughout the learned and popular articles in all three fields. None, however, approach the frequency of locational themes. Two only will be taken as representative examples: concessional and the slightly more frequent conditional themes (the figures are percentages of the total number of themes):

Figure 3: Popular/Learned articles: summary of circumstances

Articles	Concession	Condition
BP1/BL1	1/2	1/0
BP2/BL2	3/0	4/1
BP3/BL3	2/2	2/2
CP1/CL1	1/0	2/1
CP2/CL2	2/1	4/0
CP3/CL3	0/1	7/1
HP1/HL1	0/1	0/0
HP2/HL2	1/2	0/1
HP3/HL3	0/1	3/1

As can be seen, no clear pattern is discernible here. One might argue that learned articles are marginally more likely than popular articles to set conditions as themes, but the differences are too slight to make any strong claim. As with other circumstances as theme, the broad picture shows a small proportion distributed throughout the extracts analysed. Here

the main value of the tables in Appendix C is to identify differences between individual extracts: for example, the 27 themes of CP2:5 contain 11% conditional themes, while the 41 themes of CL2:5 contain no conditional themes. A close study of the corresponding pair may indicate why the popular article selects conditions as settings while the learned article avoids them. As noted, a number of close studies will be given in a later section.

#### 2.4.1.2 Textual Themes

A summary of textual themes is given below (the figures are percentages of the total number of themes):

Figure 4: Popular/Learned articles: summary of textual themes

Articles	Existential	Directive	Cohesive	Questions: Polar	Wh-
BP1/BL1	1/0	3/2	15/9	0/0	1/0
BP2/BL2	1/1	0/4	17/12	0/0	7/1
BP3/BL3	2/3	10/2	17/20	0/0	2/1
CP1/CL1	0/0	2/3	17/20	0/0	2/0
CP2/CL2	2/0	3/5	15/25	0/0	0/0
CP3/CL3	3/3	1/2	11/7	0/0	0/0
HP1/HL1	1/1	1/2	26/27	0/0	2/0
HP2/HL2	1/0	1/5	31/25	0/1	1/0
HP3/HL3	1/2	3/4	16/13	0/0	1/0

Again, a remarkable consistency is evident across genres, with the possible exception of history, which, on the evidence above, seems to have a slightly higher proportion of cohesive themes, suggesting a greater tendency to signal the discourse status of the following messages. This signalling may of

course take a variety of forms: the use of conjunctions or adverbials such as "however", "next" and so on. If this suggestion about the greater explicitness of historical articles is correct, it may have implications for the comparative sentence structures of arts and science articles. Obviously, only a much wider study of a greater corpus could confirm this kind of hypothesis. However, the present study indicates that the degree of thematic cohesion in the biological and computing articles is similar, while in the history articles it is slightly higher. This finding holds for both popular and learned articles, suggesting that thematic choice in this respect is less dependent on perceived readership (tenor) than on subject matter (field). Indeed, no clear pattern emerges from Figure 4 as to whether learned or popular articles have a greater degree of thematic cohesion.

There is, however, some evidence in Figure 4 that popular articles are more inclined than learned articles to use question forms, certainly as theme. The tendency is to use wh-questions rather than polar interrogatives, that is, to thematise "blanks" to be filled in: questions of who, what, where, when and how. As we have noted, writers such as Myers (1985b) have argued that popular science, the "narrative of nature", tends to use a straightforward development of discourse based upon question and answer; the figures given above do indeed support this hypothesis, and we shall return to this subject later.



Less of a pattern can be seen in the use of existential and directive themes. All articles use them, and there is little evidence that they are more abundant in any particular field, or in learned or popular articles. The fuller tables in Appendix C do however suggest that directive themes especially are clustered more towards the end of each article, in the concluding stages. Consider for a moment the percentages of directive themes in the concluding extract of each article compared to the overall percentage:

Figure 5: Popular/Learned articles: summary of directive themes

Articles	Directive themes: Concluding extract (%)	Directive themes Overall total (%)
BP1/BL1	25/0	3/2
BP2/BL2	0/12	0/4
BP3/BL3	23/0	10/2
CP1/CL1	0/0	2/3
CP2/CL2	14/6	3/5
CP3/CL3	14/12	1/2
HP1/HL1	0/0	1/2
HP2/HL2	4/5	1/5
HP3/HL3	0/15	3/4

Figure 5 suggests that while directive themes are by no means restricted to the closing passages of articles, there is a marked tendency for them to be found there. The reasons for this are quite obvious: the closing passages of articles are where new information is likely to be foregrounded, perhaps particularly in popular science texts, where the answer to a question may be likened to the denouement of a mystery.

Certainly directives figure highly in four of the six conclusions of the popular science extracts studied. It is interesting that this pattern is not repeated in the history articles. Again, the corpus is too small to draw any firm general conclusions (and exceptional cases like BP2/BL2 above fall into the history pattern rather than the science pattern) but arguably the smaller proportion of directive themes in the conclusions to popular history articles reflects this genre's lesser concern with coming up with new information at the climax.

#### 2.4.1.3 Modal Themes

The final category of theme to be considered is modal theme (again figures are percentages of the total number of themes):

Figure 6: Popular and learned articles: summary of modal themes

Articles	Attitudinal (%)	Style (%)
BP1/BL1	1/2	0/1
BP2/BL2	0/0	0/0
BP3/BL3	3/1	0/0
CP1/CL1	1/1	1/1
CP2/CL2	7/1	0/0
CP3/CL3	0/2	0/0
HP1/HL1	1/0	0/0
HP2/HL2	0/4	0/0
HP3/HL3	1/2	0/0

It is evident from Figure 6 that the thematisation of a style adjunct is extremely rare; and that modal adjuncts are also quite rare. The avoidance of direct expressions of attitude is

a cliché about scientific and learned writing; Figure 6 suggests that a generally low level of modal theme is a feature of the genre. However, it should also be noted that the difference between learned and popular writing is not substantial. It is true that a popular text (CP2) has the highest proportion of modal themes, but a learned text (HL2) has next highest. Furthermore, given the rough-and-readiness of the statistics, the slight difference between learned and popular articles should not be seen as significant in this respect.

The purpose of the foregoing section has been to give a general profile, painted with a broad brush, of the thematic values of the various articles under consideration. The profile suggests that the articles share a number of general features: they tend to thematise participants in material and relational processes, and circumstantial settings are very largely those of location in space and, especially, time. There is a low but persistent proportion of modal themes (specifically, attitudinal themes) in all the articles, and again there is little difference in distribution between learned and popular texts. What differences there are emerge at the textual level: wh- question themes are more likely to be found in popular articles in whatever field, and history articles are possibly more explicit about textual structure in that they have a slightly higher proportion of cohesive themes. Directive themes, indicating that new information is found later in the clause, tend to



cluster in the concluding passages of the articles, especially the popular science ones.

The results found here are useful but perhaps unsurprising. Moreover, their generality is such that more specific insights into the nature of the texts may be overlooked: for example, we may see from Figure 6 above that modal themes are fairly evenly distributed between learned and popular texts. But only a detailed analysis of the texts will show how the modal themes are in fact realised in the articles: one would expect, for example, that (purely modal) desiderative adjuncts such as "unfortunately" would be confined largely to popular texts, where they appear at all, while adjuncts with both a modal and a textual function, such as the verifactive "in fact" would predominate. At this level of analysis a statistical profile is less useful; and I now wish to turn to a consideration of some aspects of the qualitative nature of the themes found in the articles.

### 2.4.2 The Realisation of Theme

In this section we shall select some features of the extracts for more detailed analysis, following to some extent Francis' (1989) "qualitative" study of themes in editorials and letters. In particular, we shall focus on three aspects of theme in learned and popular articles: types of participants in material and relational processes; types of setting in time and place; and types of modal theme. The rationale for selecting the first two features is that, as the preceding section confirmed, material and relational processes, and circumstances of location in time and place are the predominant choices of theme in both learned and popular articles. Modal themes, while being much less significant statistically, should be interesting for the light they cast on direct expression of attitude in such apparently "objective" texts.

#### 2.4.2.1 Participants in thematic material & relational processes

In the following subsections, we shall consider three aspects of themes which are realised by participants in material and relational processes: (a) the degree to which these participants are themselves nominalised processes ("nominalised" themes), (b) themes which direct the reader towards a research setting, and (c) the specificity of the information expressed in the themes.

#### 2.4.2.1.1 Nominalisations

Francis (1989: 202) identifies degree of nominalisation as a genre-marker between News and Editorials/Letters in newspapers:

The typical and most predominant themes in News are material and verbal, while far fewer relational participants and processes are selected as point of departure for the message. This reflects the fact that in News there is less nominalisation, which as Halliday (1987) points out, means there is more ideation and more information.

As we have seen in the previous section of this study, relational and material processes far exceed the number of verbal processes in both our popular and learned articles. We should therefore expect a certain degree of nominalisation in both sets of extracts. And a high degree of nominalisation is indeed what we find in all the articles. To give one example only: both popular and learned biology article give nominalised processes as theme when explaining the increase in wildcat population in recent years:

<u>Theme</u>	<u>Rheme</u>
Only a relaxation in the zeal of gamekeepers and the rapid spread of coniferous plantation after the First World War	have allowed the wild cat to recolonise many of its former haunts in Scotland. (BP2: 2)
This increase	may be have been partly due to changes in availability of habitat and food,
but	may also have been partly because of crossbreeding between wild and domestic cats ... (BL2: 2)



Here the popular and the learned article organise their information in different ways, largely because of the function of the clauses in the different contexts. The popular extract is taken from the beginning of the article: the behaviour of gamekeepers and the spread of forests is given as a setting for information about the increase in wildcat population. The learned extract uses the increase as a setting for information about the habitat (the coniferous plantations), and also the crucial subject of cross-breeding. The main point here, however, is that the themes of both articles are nominalised processes: first, gamekeepers have relaxed their zeal and coniferous plantations have spread; and second that the wildcat population has increased. The nominalised themes allow the writer not simply to describe processes but also to comment on them, to use some processes to explain others, and so on. In all that follows, it should be borne in mind that all the articles under study do employ nominalised themes for such reasons.

There is however a tendency in at least some parts of the scientific texts for the popular articles to select non-nominalised themes. These sections typically describe more complex processes, or narrate the experiments of researchers. The following matched pairs illustrate this tendency:

Figure 7: BP1:4/BL1:4

<u>Theme</u>	<u>Rheme</u>
The flow of water and the amount of sediment in it	provide clues to where brittlestar beds will or will not be.
Yet many rocky reefs	are swept by good currents carrying plenty of food and little silt
but	have no brittlestar beds. (BP1: 4)
Fine-grained sedimentary matter	presumably obstructs the function of the water vascular system in ophiuroids...
Areas of rapid sedimentation	are therefore avoided. (BL1: 4)

Figure 7 gives a brief and simple illustration: BP1 thematises non-nominalised participants in material processes; BL1 thematises one non-nominalised participant and then proceeds to nominalise the process ("sedimentation") to come to a general conclusion. The popular article does not take this second step. A more complex illustration is given in Figure 8:

Figure 8: BP2:4/BL2:4

<u>Theme</u>	<u>Rheme</u>
Secondly, they	find that each geographically distinct population stems from many lineages connected to the tree at widely separated points...
Thirdly, they	calibrate their "genetic clock" with archaeological data on the likely dates of the colonisation of New Guinea...

Theme

The Berkeley researchers

The second implication of the tree (Fig. 3) -- that each non-African population has multiple origins --

Asian lineage 50

Six other lineages

This small region of New Guinea (mainly the Eastern Highlands Province)

Each estimate

These numbers, ranging from 15 to 36 (Tables 2 and 3)

A time scale

One way of estimating this rate

People

Rheme

then extrapolate back to the likely date of the "common ancestral mitochondrial genotype."

(BP2: 4)

can be illustrated most simply with the New Guineans...

is closer genealogically to this New Guinea lineage than to other Asian mt DNA lineages...

lead exclusively to New Guinean mt DNAs, each originating at a different place in the tree...

thus seems to have been colonised by at least seven maternal lineages (Tables 2 and 3)

is based on a number of region-specific clusters in the tree..

will probably rise as more types of human mtDNA are discovered.

can be affixed to the tree in Fig. 3 by assuming that mtDNA sequence divergence accumulates at a constant rate in humans.

is to consider the extent of differentiation within clusters specific to New Guinea (Table 2; see also refs 23 and 30), Australia and the New World.

colonised these regions relatively recently: a minimum of 30 000 years ago for New Guinea, 40 000 years ago for Australia, and 12 000 years ago for the New World.



Theme  
These times

Rheme  
enable us to calculate that the mean rate of mtDNA divergence within humans lies between two and four percent per million years;

a detailed account of this calculation

appears elsewhere.  
(BL2: 4)

BP2 and BL2 differ from BP1 and BL1 in that, in the former case, none of the authors of the learned article was involved in the writing of the popular article. Perhaps for this reason the author of BP2 is happy consistently to thematise the researchers when explaining the research procedure: no false modesty is required. Whatever the reason, the popular article describes research procedure in terms of thematised researchers carrying out certain tasks. The learned article is different: there are non-nominalised participants as theme ("Asian lineage 50", "a time scale", "people", "these times", etc), but these participants exist at a greater level of generality, compared with the themes of the popular article. That is, they are more difficult for the non-specialist to visualise, or to grasp. They are therefore less useful as popular settings for a message. Moreover, there are also nominalised themes: "the second implication", "each estimate" and "a detailed account of this calculation". As in the extracts from BP1 and BL1, the learned article is more inclined to move from a description of a process (here in the subclause: "These times enable us to calculate...") to a nominalised use of it as a participant in its own right ("a detailed account of this calculation...").

This observation is supported by two further examples from the computing texts:

Figure 9: CP1:2/CL1:2; CP2:4/CL2:4

<u>Theme</u>	<u>Rheme</u>
Researchers	devised programs that did well at individual tasks.
Computers	played chess at a level close to world class;
they	rediscovered one of Kepler's laws and Ohm's law.
They	learnt to re-use successful planning strategies to meet new demands. (CP1: 2)
Mixed models	thus require multiplex forms of psychological/computational explanation.
Not just different <u>tasks</u> but different aspects of the <u>same</u> task	now look in need of different kinds of computational explanation.
Insofar as human beings are required to negotiate some truly rule-governed problem domains (eg chess, language, mathematics)	some form of mixed model may well be nature's most effective solution.
The apparent success of thoroughly soft PDP systems in negotiating some such domains (eg the model of past-tense acquisition)	may be due to the presence of a concealed 'bolt-on' symbol processing unit -- us! (CL1:2)

...

Theme  
Of course, a single rigid  
model

Many objects

In addition, an object

Some vision systems

One argument that is sometimes  
advanced against the use of  
precise spatial correspondence

Rheme

does not capture the potential  
variations in the appearance of  
many common objects.

have parts that move or bend.

may not have exactly the same  
measurements and shape as any  
previously encountered, yet  
we recognise it because it  
resembles a "generic" class  
of objects.

can manipulate such generic  
models.

(CP2:4)

is that many objects are  
non-rigid with internal degrees  
of freedom and variable  
dimensions...

Theme  
However, advances

Our knowledge of the visual  
appearance of objects

Rheme

will be made on these important  
problems only by explicitly  
representing the possible  
degrees of freedom and  
distortions that are present in  
a situation.

includes a large amount of  
information on internal degrees  
of freedom in their shape and  
visual properties, as well as  
potential transformations in the  
image domain itself.

(CL2:4)

The pattern which I have suggested is repeated in the above  
extracts: CP1:2 thematises participants which have referents  
in the physical universe -- researchers and computers -- while  
CL1:2 thematises an abstraction, a model, and then moves to a  
nominalisation -- "apparent success" -- via two themes which



are neither material or relational, but mental ("aspects...look") and circumstantial ("Insofar as..."). CP2:4 moves from an abstraction, again a model, to concrete "objects", rigid or bendy; while CL2:2 stays strictly in the realm of nominalisations: "argument", "advances" and "knowledge". The examples from the two scientific fields, then, suggest that while both popular and learned articles use a considerable proportion of nominalised processes as theme, learned articles are more inclined to use nominalisations when describing complex processes and experimental procedure. In such contexts, popular articles are more likely to revert to themes which have readily-identifiable referents in the universe of discourse.

This pattern is not easy to find in the history articles. Indeed both popular and learned history articles seem to use a high proportion of nominalisations, often similar. It is difficult to say whether the learned article and the popular article differ much in this respect: if they do, it will take a much wider survey to identify the nature and extent of the difference. One short set of matching extracts should serve as an illustration:

Figure 10: HP1:5/HL1: 5

<u>Theme</u>	<u>Rheme</u>
Developments in the resorts themselves	were more to the point...
The policies of the landowners	were particularly important in the early stages of resort

<u>Theme</u>	<u>Rheme</u>
	growth, especially at places like Eastbourne and Llandudno...
Large landowners	might also subsidise the promenades, utilities and drainage systems which were essential...
and they	might step in to support pier and entertainment companies when the latter faltered or were slow to materialise.
Large scale entertainment	was rarely profitable in the long run at the seaside, except at Blackpool...
...most such towns	owed their attractiveness, in part, to municipal socialism...
The rising demand for seaside holidays	owed much to the attractiveness of the resorts themselves... (HP1: 5)
The evolution of this distinctive Lancashire holiday system	had important implications for the resorts.
The demand for seaside visits	was spread over several weeks of the summer, as different towns took their holidays at different times;
and this accidental stagger effect	made it possible for a working-class holiday industry to emerge at an early stage.
...the longer season	enabled some of the resorts to make themselves attractive to the working-class visitor...
Rhyl, Douglas, New Brighton and Scarborough	were among the resorts which responded to these developments.. (HL1:5)
In both the popular and the learned article, the writer moves between nominalised and non-nominalised theme: nominalised	

themes include "Developments in the resorts themselves" and "the rising demand for seaside holidays" in HP1, and "The evolution of this distinctive Lancashire holiday system", "the demand for seaside visits", and "this accidental stagger effect" in HL1. Two of these themes are virtually paraphrases of each other. The other two history articles repeat the findings illustrated above: the apparently greater tendency to avoid nominalised themes that we find in popular scientific texts is not found in popular historical texts.

#### 2.4.2.1.2. Research-oriented themes

A feature of learned articles is the propensity for the writer to thematise the article itself and/or the procedure used.

Examples include:

this paper (BL3: 1)  
My strategy (CL1: 1)  
The matching process presented in this paper (CL2: 6)  
The structure of this paper (CL3: 1)  
Section 3 (CL3: 1)

It will be readily perceived that the majority of these thematic settings are found in the opening or closing passages of the article: the writers are setting out what the article aims to accomplish or has achieved. Such a self-conscious concern with the article as construct, as an embodiment of a research instrument, is largely lacking in the popular articles. We shall return to this claim with further



illustrations when considering the related question of circumstantial themes below (Section 2.4.2.2).

Another example of research-orientation in material and relational processes (as well as in verbal and mental processes) is found in naming conventions. In popular articles, other researchers are usually referred to by their full names and institutional affiliation; in learned articles, other researchers are usually identified by reference to their publications; thus:

Popular articles

Brendan Keegan (BP1:2)  
Cann and her colleagues (BP2:2)  
French and his co-workers (BP3:2)  
H.J. Eysenck (HP3:7)

Learned articles

Warner (1971) (BL1:2)  
Vevers (1952) (BL1:2)  
Corbett (1978, 1979) (BL3:2)  
Cockburn (1977b) (HL3:3)

This point may seem slight; it nevertheless remains true that when popular articles use other researchers as settings, they refer to the person or persons; when learned articles do the same, they refer to published work. This is consistent with greater orientation towards research in all learned articles.

This research-orientation can cause difficulties when the writers are referring to themselves. In popular articles this does not cause a problem: first person plurals and singulars are freely used. As we have seen, in learned articles there is greater variation in referring to oneself: the writers may refer to "this paper", as above, or to their own published articles "Aronson and Harms (1985)". Single authors still refer

to themselves as "We" (eg HL3: 6). This distancing is commonly regarded as part of the objective style of learned writing (cf Myers, 1989); it may also be seen in terms of research orientation.

#### 2.4.1.3 Specificity in material and relational themes

In the few cases where a near one-to-one correspondence between clauses in the popular and learned texts can be found, there is often a greater degree of specificity or explicitness in the themes from the learned article. Some examples may be seen in the following table:

Figure 11: Specificity of themes in popular/learned articles

<u>Theme</u>	<u>Rheme</u>
What	happens to brittlestar beds if predation increases?
Many beds in the western English Channel	have disappeared since 1970. (BP1: 7)
In fact, fluctuations in the occurrence of dense beds of <u>Ophiothrix fragilis</u> in the English Channel over a period of several decades	have been correlated with changes in predation pressure exerted by two species of the starfish <u>Ludia</u> (Holme 1984). (BL1: 7)
Not one brittlestar in a Jurassic population from Dorset	was regenerating an arm. (BP1: 8)
Of 55 well-preserved specimens of <u>Ophiomusium weymouthiense</u> from the Late Mid-Jurassic of Weymouth, Dorset, housed in the collections of the British	

Theme	Rheme
Museum (Natural History), only one	showed arm regeneration (Aronson personal observation). (BL1: 8)
	...
However, a careful analysis of several skull measurements	can reveal not only whether the cat is wild or domestic, but also if there has been any significant hybridisation. (BP3: 1)
Wildcat samples	were classified as 'old' (collected 1901-1941), 'recent' (1953-1963) and 'modern' (1975-1978)
and skull measurements of these three groups together with samples of hybrid and domestic cats	were compared using Fisher Linear Discriminant Functions (FLDF)... (BL3: 1)
	...
The first step in recognition	is to find a promising correspondence between a few features of the image and a few features of the object. (CP2: 5)
The initial viewpoint estimate for the model (shown in figure 6a in dark blue)	is made by using simple linear approximations. (CL2: 5)
	...
Changes	have taken place in the types of non indictable offences, reflecting changes in social and economic conditions. (HP3: 2)
Of course, changes in the administration of justice	were a vital influence upon this pattern, of which more in the next section. (HL3: 2)



Theme	Rheme
Violent and sexual offences and robbery	although receiving most publicity have generally accounted for only 5 per cent of all crime. (HP3: 3)

An analysis of violent offences in the mid-nineteenth century

points to an extremely low level of illegal homicides (Philips 1977).

(HL3: 3)

The above examples, from all three fields, suggest that learned texts are generally more specific than popular texts. Their specificity consists in a number of features. The above examples illustrate, first of all, the addition of qualifiers and modifiers to give additional information (eg "Changes in the administration of justice"). Secondly, where modifiers and qualifiers are used in both articles, we find a more precise term used in the learned exponent (eg "many beds" becomes "dense beds"; "several skull measurements" becomes "skull measurements of these three groups"). Thirdly, relexicalisation means that the learned text uses more precise, technical vocabulary (thus "brittlestar beds" become "Ophiothrix fragilis"; "the first step in recognition" becomes "the initial viewpoint estimate"). (By "relexicalisation", I mean here the selection, in different contexts, of alternative lexical items to represent the same, or very similar, entities or concepts. No temporal significance is intended, indeed the learned articles all predate their popular equivalent). Finally, we may even find in the popular article an exaggeration of the claim made in the learned article. For

example, in BP1 we learn of the "disappearance" of brittlestar beds, and that the writer found "not one brittlestar" regenerating an arm in a Jurassic community. In the corresponding learned article, we read of "fluctuations" rather than disappearances, and find that the writer found "only one" brittlestar regenerating an arm in what certainly seems to be the same Jurassic community.

Of course, we are bound to find some instances where the theme of the popular article is more specific than the corresponding learned theme. Even in the above table, BP1:7 is more specific about the location of brittlestar beds ("the western English channel") than the corresponding learned exponent. And again in HL1:3 we read of "Conflicts" while in the popular article we read of "Class conflict at the seaside". Local constraints on themes and their specificity will produce anomalies, but an analysis of the themes of the extracts suggests strongly that, in the ways indicated, the themes in learned articles are generally more specific than the themes of the corresponding popular articles.

Before leaving the subject of material and relational themes, it is worth mentioning other instances of relexicalisation. As noted above, relexicalisation of themes can take place in order to make the setting of the message more or less precise. Precision is related to formality: both technical and formal texts use latinisms, first to identify carefully-delineated



concepts, and secondly for decoration. And so we find that terms used in popular articles are avoided in learned articles, not only because they are imprecise, but also because they are too colloquial or simply give an inappropriate impression. Again, one-to-one matches are difficult to find; but two examples will serve to illustrate this point:

<u>Theme</u>	<u>Rheme</u>
The top carnivores in Sweetings Pond	are octopuses.
They	eat the small crustaceans and clams that live in the lake but leave brittlestars alone.
Octopuses	are relatives of the shelled cephalopods, <u>Nautilus</u> for example, that were predators before the Mesozoic marine revolution. (BP1: 6)
Another aspect of the lake's anachronistic character	is its high density of <u>Octopus briareus</u> , the Caribbean reef octopus.
The population density of this cephalopod	is also orders of magnitude greater in Sweetings Pond than off the coast. (BL1: 6)

The obvious marker of informality in the above example is the word "top" in the popular exponent. The popular article uses this colloquialism to establish a kind of league table of predators as the initial setting for messages about the position of octopuses and their actions and ancestry. The learned article uses formal, technical vocabulary ("aspect", "anachronistic", and so on) to establish a peculiar characteristic of the lake as a setting for messages about how



the presence of octopuses determines the lake's character. In the second example, below, there is a slightly different case of relexicalisation:

<u>Theme</u>	<u>Rheme</u>
A useful analogy	captures some of the flavour of this processing: the way commodity prices are fixed in an open market. (CP1: 3)
A homely example (which I first heard from J. Stone)	is that of the open market place. (CL1: 3)

In this case the "useful analogy" as a setting corresponds to a "homely example" in the learned article. Possibly the author of the latter does not wish to seem to insult his specialised readership's intelligence by implying that such an example would be useful to them in comprehending the intricacies of parallel processing. If the purpose of such comparisons is both to instruct and amuse, the emphasis in the popular article is on instruction, while in the learned article it is on amusement.

#### 2.4.2.2 Circumstantial themes: location

Of all the available circumstantial themes, by far the most numerous are circumstances of location; an understandable finding if we accept that the function of theme is to provide a setting for the message. There can be few readier settings than a point in time or space. I have included in my analysis of the articles "metaphorical" circumstances of location,

particularly location in space. Some themes, such as "In the males at least" (BL3:3) and "In the considerable majority of cases..." (HP1:5) direct the reader to an area of "abstract space", that is, a set of entities or concepts. Some might argue that such circumstances are better grouped with circumstances of matter; however, I have assumed that, for this study at least, direction towards an idea or a set of referents is more akin to location in space than to the expression of subject matter (cf. the discussion of metaphorical constituents in section 2.4).

The most significant finding of an analysis of the locational circumstances of our popular and learned articles is support for the characteristic of learned articles noted above (Section 2.4.2.1.2): research-orientation. Crudely put, the locational themes of learned articles (at least in the scientific fields) are more likely than those of popular articles to direct the reader towards the article itself. The extracts summarised below (Figure 12) illustrate this point. All locational themes in the selected extracts are listed.

Figure 12: Locational themes in popular and learned articles

Locational themes: popular  
 In 1885  
 Reporting on the expedition  
 A century later  
 Here  
 In the following weeks  
 From Chadwick's century-old  
 account and studies by a

Locational themes: learned  
 During the last few years  
 In this chapter  
 Where information is available  
 Under certain rare circumstances  
 (BL1: 1)

student in the 1960's  
Beginning 130 million years ago  
(BP1: 1)

today  
This time

By the end of the 19th century  
Over the past 60 years or so

Locational themes: popular  
As the Scottish wild cat  
was ruthlessly eradicated  
from Britain  
Once the wild cat began to  
recover from man's perse-  
cution  
Recently

(BP3: 3)

Locational themes: learned  
In this paper  
In PCA [Principal Component  
Analyses] and particularly in  
CVA [Canonical Variates  
Analyses]  
(BL3:3)

To an evolutionary theorist  
To many cognitive scientists  
(CP1: 5)

In the present paper  
(CL1: 5)

Before we recognize an object  
(CP2: 2)

In this paper  
(CL2:2)

It is evident from the above examples -- and from the absence of any locational theme in the popular extracts directing the reader towards the article or sections thereof -- that research-orientation is a feature of circumstantial themes as well as of material and relational themes in learned articles. As we can also see, popular articles generally direct the reader towards periods and points in time, and physical locations in space. In other words, the settings provide explicit times and places for a narrative: for sequences of events and actions to unfold. Learned articles do this to a certain extent, but they also orient the reader towards the research.



The exception to this is history: none of the extracts from the learned history articles (and they are substantial) contains a locational theme directing the reader towards the present research. Not surprisingly, they contain a high proportion of themes of temporal location, and the article on the development of seaside resorts also contains a considerable number of themes of spatial location. However, the concern with procedure, with explicitly constructing the article in accordance with a standard format, seems to be absent, or at least less obvious, in learned history texts.

The overall instances of locational themes in the articles are fewer than those of material and relational processes; it is therefore more difficult to identify any regularity other than research orientation in learned articles. An analysis of one-to-one correspondences gives a mixed picture:

Figure 13: One-to-one correspondences of locational themes

Theme	Rheme
Where there are predators about	brittlestars must spend their lives in hiding, coming out to feed only at night. (BP1: 5)
Where predation pressure from fishes (and crustaceans) is weak or absent, as in Sweetings Pond and some temperate and boreal coastal communities	exposed ophiuroids still occur densely. (BL1: 6)
Each time the computer locates an object,	it remembers the object's position and orientation

<u>Theme</u>	<u>Rheme</u>
and	removes all of the edges in the image that match edges in the model.
As the computer defines more and more objects in the bin of parts,	for example, the number of remaining edges in the image become fewer
and	the search area decreases. (CP2: 5)
As each successful match is found	the identified segments are marked as already matched
and	are no longer considered for further matching.
Therefore, the search space	actually decreases as more and more of the segments in the image are removed from consideration. (CL2: 5)

The examples from the two sets of articles above support the findings of the material and relational themes, in that the learned articles are more specific and more formal than the popular themes. In the example from the biology texts, the colloquial existential subclause ("where there are predators about") corresponds to a formal, highly specific subclause in the learned text, turning the concrete "predators" into abstract "pressure" from named predators in named contexts.

In the computing example, the formality of the learned theme resides in the passivisation of the thematised subclause: the popular article "unpacks" the information, that is, the agent and the affected are explicitly expressed. In the learned

article, the agent is taken for granted and omitted; the process is therefore more opaque to the uninitiated.

So far we have observed some regularity among material, relational and circumstantial themes; however, a possible anomaly can be seen in parts of HP1 and HL1. The author of these history articles, dealing with the rise of seaside resorts, favours long and highly explicit themes -- in the popular article. Examples from corresponding extracts are given below:

<u>Theme</u>	<u>Rheme</u>
Where family incomes were relatively high and sufficiently regular to encourage saving for future enjoyment as well as to guard against contingencies, and where traditional holidays had survived in moderation without disrupting the whole of the summer as they did in the Potteries or the Black Country	the seaside habit could develop early among the working class. (HP1: 4)
In some places,	indeed, new holidays were created in the 1840's, often arising out of seaside excursions organized by the employers or with their approval. (HL1: 5)

Here the theme from the popular text is much more specific than the theme from the corresponding learned article; a pattern repeated on several occasions in this particular pair (cf. for example, other locational themes in HP1:5 and HL1:5, and HP1:3



and HL1:3 in Appendix C). Among the history articles as a whole, patterns of specificity and formality are more difficult to identify: it is fair to say that the themes of the learned and the popular articles look more like each other than do the themes of the scientific articles, biology and computing. This is especially true of HP2 and HL2, whose themes both consist largely of dates. In this case the learned article is marginally more specific than the popular article (generally giving days, months and years, rather than seasons and years), but the difference in specificity is not very great. The conclusion from the data surveyed for this study must therefore be that history articles do not fall easily into our general argument that greater specificity and research orientation are markers of the themes of learned texts. That this is so, however, may account for the intuition that learned history articles are usually easier to read than, say, learned computing articles. Comprehension of the settings of history texts may demand less work from the lay reader, which indicates that it is possible that more non-specialists read learned history articles than read learned scientific papers (cf. Megill and McCloskey, 1987).

#### 2.4.2.3 Modal themes

Modal themes in our extracts are few enough to show in their entirety in a single table. In Figure 14, style adjuncts are marked by an asterisk (\*). The majority of themes are attitudinal adjuncts.

Figure 14: Modal themes in the popular and learned articles  
(\*style adjuncts)

<u>Popular articles</u>	<u>Learned articles</u>
BP1:2 Strangely	BL1:6 In fact In fact
	BL1:7 In fact
	BL1:9 *In particular
BP3:3 Unfortunately Without any doubt	BL3:3 Indeed
CP1:1 Perhaps Perhaps	CL1:1 *In short
	CL1:2: Perhaps
	CL1:3 in fact
CP2:1 In fact	CL2:5 In fact
CP2:2 In fact Fortunately In fact In fact	
CP2:4 Of course	
CP2:5 Unfortunately	CL3:5 in fact In any event
HP1:4 As will be clear	HL2:1 Not surprisingly Ironically
	HL2:3 Clearly
	HL2:4 probably obviously
	HL2:5 Of course
HP3:6 Indeed	HL3:2 Of course Of course
	HL3:5 *Broadly speaking Without doubt
	HL3:6 *More specifically
	HL3:8 Inevitably

The myth that Figure 14 explodes is that learned texts are less inclined to offer a direct expression of attitude: if anything, we are more likely to come across modal themes in learned texts than in popular texts. However, the types of modal themes found in learned texts seem to be more restricted than those found in popular texts. In the learned scientific texts (biology and computing) the most common modal theme is "in fact", which Halliday would describe as "verifactive" (1985: 50). Other attitudinal themes express assertion ("Indeed") and probability ("perhaps"). The history articles have a different bias: the most common attitudinal themes are presumptive "of course", and its near synonyms "obviously", and "clearly"; followed by predictive themes "inevitably" and "not surprisingly". Like the scientific texts, the history articles have a sprinkling of probability themes: "probably" and "without doubt". The one attitudinal theme which does not fall into any of these categories is "Ironically" (HL2:1). The learned texts also monopolise the style adjuncts, whose purpose is to make explicit degrees of specificity: "In particular", "Broadly speaking" and "More specifically"; or to indicate a summary: "In short".

The popular articles have their share of verifactive, probability and presumptive themes, in a similar distribution to those above (verifactive in scientific texts, presumptive in history texts), but they also range more widely: including desiderative ("Fortunately"; "Unfortunately") and a strong



expression of unusualness ("Strangely"). The evidence suggests not that popular texts express direct attitudes more often than learned texts, but that the former express a wider range of attitudes. Scientific texts are largely confined to expressing probability and verifying facts; history texts to expressing probability and stating assumptions and expectations. Popular texts can extend the attitudinal range to what is desirable. The one qualification to this neat pattern derives again from the use of "Ironically" in HL2:1. It is a single instance of an unexpected modal theme, but it suggests once more that the themes of learned history texts have more in common with those of popular science than those of learned science texts.

The greater incidence of style adjuncts as theme in learned texts supports the earlier claim that learned articles show more explicit concern for their own construction than popular articles. According to Quirk and Greenbaum (1973: 242), style adjuncts "convey the speaker's comment on the form of what he is saying". Learned articles direct the reader towards the form of the message because the construction of the article is the embodiment of a valid research procedure by which the author will be judged by the community of peers. Popular texts, however, are less self-conscious vehicles, conveying information to a less critical readership.

## 2.5 Summary

In this section I shall briefly summarise the previous sections and attempt to place the findings in a larger context.

First of all, the concept of theme adhered to in this work follows developments based on the work of Halliday. Fries (1987) offers a description of theme, essentially as "setting" for the message: this description shares some elements of Mathesius' notion of theme, but differs essentially in allocating the notions of given and new to the system of intonation. One consequence of this redefinition is that setting can contain either new or shared information. The idea of a setting is also more substantial than Halliday's rather vague formulations of theme as "what the message is about".

Secondly, a very broad survey of thematic types in matched extracts from the learned and popular articles is described. This survey suggests that there are various similarities between learned and popular articles; both generally favour participants in material and relational processes as theme: the settings privilege actions, events and states of being. These processes are frequently set in time and space, location being the commonest type of circumstantial theme. Both sets of articles have a low but persistent number of modal adjuncts as theme: neither category has the monopoly of direct expressions of attitude. Only at the textual level -- in numbers of



cohesive devices and wh- questions as theme -- do the articles differ: popular articles favour cohesive themes and question-forms more. These particular results would suggest that popular articles are more concerned than learned articles with signalling the status of the message in its co-text, and that popular articles are also more likely to use the simple but powerful question-answer discourse pattern.

Finally the realisations behind the statistics are discussed. The method used is to compare "near correspondences", that is, clauses and passages which give similar information. A perfect match is, of course, unlikely: all extracts are to some extent constrained by the text around them; the discourse function of the expression of identical information may be different in two different texts. However, it is possible that the analysis of a number of such "near correspondences" will reveal general regularities between learned and popular texts.

Such regularities are apparent, at least in the popular and learned scientific articles. A greater tendency towards nominalisation is apparent in the learned biology and computing texts, particularly when they are describing complex processes or experimental procedure. Where the popular text will use concrete participants as settings, the learned text will be more likely to thematise a process. Similarly, learned scientific texts have more specific themes: themes containing a higher degree of modification and/or precision. The impulse



towards a greater degree of technical precision may also result in the use of latinate vocabulary for largely stylistic purposes: to give the impression of precision. Colloquial vocabulary, sometimes found in popular texts, tends to be avoided in the corresponding learned texts. (A possible exception to this is CL1, which, significantly, is an unpublished draft of a learned article. Colloquialisms such as "a hot topic" (CL1:1) are also to be found in this article, while they are avoided in other learned articles.)

These regularities, however, are less apparent in the popular and learned history articles. Both learned and popular articles make use of nominalisations, and it is difficult to gauge which uses them most. Similarly, the popular texts can show a high degree of specificity in long, heavily-modified themes, while the corresponding learned text can show quite a low degree of specificity. At other times the learned article is slightly more specific. The formality of themes in popular and learned articles is also roughly equivalent. In short, in these respects, the themes of the popular and learned history articles are more difficult to distinguish from each other than the themes of the learned and popular scientific articles.

Some degree of research-orientation is evident in all learned articles, but is absent from the corresponding popular articles. This orientation is seen in the way research and/or the article itself (as a research instrument) frequently

becomes the thematic participant or location in learned texts. It is also evident in the naming conventions used to identify the authors and other researchers.

Finally, an analysis of modal themes shows that both popular and learned texts express attitudes directly; learned texts possibly even more so than popular texts. Here again the divergence is not learned-popular so much as science-history. All articles are prone to using modals of probability. Learned and popular scientific texts frequently use verifactive modals ("in fact"); whereas learned and popular texts use presumptive modals ("of course"). Popular science articles show a greater range of modality than their learned counterparts, particularly extending to desiderative modals ("fortunately/unfortunately"). Possibly learned history texts also have a wide range of modality; one example ("ironically") suggests this may be the case; a wider study would be needed to confirm or refute this claim.

It is interesting to compare the findings detailed in this chapter with the claims presented by Myers (1985c). Myers compares learned and popular biology articles, not so much from a linguistic as from a sociological point of view. He argues that learned articles create a "narrative of science" whereas the popular articles create a "narrative of nature". His views are worth quoting at some length:



I have shown that the popularization of texts in evolutionary biology involves not just translating some technical terms, substituting active for passive voice, and focusing on some angle of its popular interest, but turning one sort of narrative into another. The narrative of science and the narrative of nature remain consistent, and consistently different from each other, because they support two different views of science. As I have noted, a number of studies have shown how the form of the scientific article embodies the assumptions of the scientific community about the impersonality, cumulativeness and empiricism of scientific knowledge. Such texts function to integrate researchers and their findings into the work of the research community. Researchers show their findings are real because they meet disciplinary standards for methodology, they fit their work within disciplinary concepts, they submit the personal point of view to certain constraints. Each article is a demonstration of the need for scientific expertise.

The popular texts support an equally coherent and definite view of scientific practices, but one that is inconsistent with the view embodied by the scientists in their articles. In this view the scientist is alone, and proceeds without concepts and methodology, by simple observation of nature.

(Myers 1985c: 38-9)

Obviously, Myers' views are not incompatible with the analysis of scientific data above. Research-orientation in particular directs the specialist reader towards the "narratives of science" and away from the concrete participants found in the popular "narratives of nature". If we return momentarily to Halliday's crude definition of theme, research-orientation suggests that learned articles are "about" research in the same way that the occasional tendency to avoid nominalisation suggests that popular articles are "about" the physical universe. The impersonality of the researcher is not greatly compromised by the presence of a proportion of modal themes: given the nature of the themes, we would expect researchers to state a probability, verify a fact or make a presumption. We



would be more surprised if they were to say what they desired -  
- as authors occasionally do in popular articles.

Research-orientation apart, the themes of history texts fall less easily into Myers' two categories. The settings for learned and popular history articles are often very similar. A thematic analysis alone is unlikely to provide enough evidence to distinguish these two genres. In the case of the scientific texts, however, a thematic analysis -- a consideration of how the settings for the messages are established -- provides one useful indicator of the differing nature of the different genres.

## Chapter Three: Representation and Genre

### 3.0 Introduction

We now turn from a consideration of the participant roles found in thematic position (Halliday's textual metafunction) to a consideration of all participants, processes and circumstances in the primary clauses of the extracts (Halliday's ideational metafunction). In doing so, we shall first address some questions, so far left unasked, about the nature of the ideational constituents of the clause (that is, types of process, participant and circumstance).

### 3.1 Language as Representation

At first glance, Halliday's description of the ideational metafunction seems in danger of stumbling over one or more largely discredited semantic theories. His assumption is that language in some way represents reality (cf, for example Halliday 1987: 142, quoted in detail later in this section when we focus on his particular version of a representational theory). The difficulty for all semantic theories is explaining exactly how the linguistic representation of reality is accomplished. We need not go into great detail here about the pitfalls of a referential theory; as is frequently rehearsed (eg Fodor, 1977: 14ff), the meaning of an expression cannot be said to be its referent, if only because two expressions which share an identical referent do not necessarily have an identical meaning. Thus "I'll meet you when the morning star is in the sky" has a different meaning from "I'll meet you when

the evening star is in the sky", even though the two utterances share an identical referent: the planet Venus. Fodor (1977: 16) summarises a weaker claim which seems closer to Halliday's position, not least in the choice of label, the "ideational theory":

As a theory of meaning it says that an expression has meaning if and only if it is associated (universally? standardly?) with some idea, and that two expressions have the same meaning if and only if they are associated with the same idea. Note how this avoids the defects of the referential theory: the morning star is identical with the evening star, but an IDEA of the morning star need not be identical with an IDEA of the evening star.

The truth of an ideational theory inevitably depends on what ideas are taken to be and how the associative relation between expressions and ideas is defined. But the ideational approach to meaning has traditionally been combined with a very simplistic notion of ideas as mental pictures or images (as, for example, in Locke, 1689). As such it is simply false.

Halliday is less interested in a single defining criterion for meaning: an "if and only if" criterion. Indeed, he explicitly rejects such a possibility. Neither does he seem perturbed by Fodor's principal objection that ideas vary between individuals, and that one individual might conceive of an object differently on different occasions. As we shall shortly see, he takes account of such a possibility, viewing "ideas" as culturally determined, at least to some extent. In a final objection to an ideational theory, Fodor (1977: 17) argues that words like "how" are difficult to associate with ideas, although she allows that they may contribute to more complex ideas which "we have no way of characterizing". Presumably Halliday would argue that "how" does indeed function as a



signal of a complex idea, for example, a circumstance of manner. Fodor's objection is also met by Halliday's theory of the multifunctionality of language: only some words and phrases will be ideational; others will be textual (signalling the status of a clause complex or constituent) or interpersonal (expressing, for example, the attitude of the speaker). We need not, therefore, feel compelled to associate each word in the language with a discrete "idea", so long as the item can be accounted for within Halliday's range of functions. In this chapter, however, we shall concentrate on the ideational function.

In a conference paper, subsequently published, on "Language and the Order of Nature", Halliday writes:

It is my contention that natural language -- not as it is dressed up in the form of scientific metalanguage, but in its commonsense, everyday, spontaneous spoken form -- does in fact "represent reality" in terms of complementarities; and that these are complementary perspectives in precisely the same sense in which Bohr was using the term. Only, it does so non-referentially. Just as language construes the social order without referring to the system it is constructing, so likewise language construes the natural order -- through the unconscious, cryptotypic patterns in the grammar, which create their own order of reality independently of whatever it is they may be being used to describe.

(Halliday 1987: 142)

Here Halliday appeals to the seductively scientific theory of quantum physics to provide a metaphor for language: the notion of "complementarities", which Bohr linked to the uncertainty principle, is meant to account for the fact that the universe

can only be described via complementary and sometimes paradoxical theories. Halliday extends this notion to language. According to this argument, a unified linguistic theory is unattainable: language may only be accounted for by means of a multiplicity of complementary views. Two such complementary views would account for spoken language and the "scientific metalanguage" which concerns us in this study.

One essential difference between spoken and written language, so Halliday proceeds to argue, is that written language organises reality in a different way from spoken language: and because the grammar of written language differs from the grammar of spoken language, the world-view is altered:

The world of written language is a nominalised world, with a high lexical density and packed grammatical metaphors. It is these features that enable discourse to become technical; as Martin has shown, technicality in language depends on, not writing as such, but the kind of organisation of meaning that writing brings with it. Until information can be organised and packaged in this way -- so that only the initiate understands it -- knowledge cannot accumulate, since there is no way one discourse can start where other ones left off.

(Halliday 1987: 149)

The contrast between spoken and written representations of reality, though fascinating and provocative, are peripheral to the present study; of central interest, however, is the assumption, common to both the above extracts, that language does in some way represent reality, even if the manner of representation is ideational rather than referential, and culturally-determined rather than universal. In this chapter,



we shall investigate the means by which reality is "translated" (and so, necessarily, interpreted) by language. Halliday's ideational metafunction is constituted of processes, participants and circumstances. We shall consider the criteria for establishing categories of these "complex ideas", and we shall apply these categories to our texts in order to attempt to discover if and how academic articles present a systematically different representation of reality from popular articles.

### 3.2 The Criteria for Cases

One of the primary features of language as representation, as described by Halliday, is clausal structure, the clause being classified into three primary constituents: process(es), participant(s) and circumstance(s). Although the theoretical function of these categories is fundamentally different from the concept of cases in Fillmore's sense (at least in early formulations, eg Fillmore: 1968), there is enough common ground and there are enough common problems to make a comparison worthwhile. The contrasts are obvious: initially, Fillmore and like-minded case grammarians attempted to show that case relations are the fundamental "deep" semantic base from which "deep syntax" is derived: case relations should therefore be seen in the context of a generative grammar. Halliday has no apparent interest in the "depth" of his semantic constituents: their function is not to generate language from an abstract



semantic base, but to express our experience of reality via a system of categories whose semantic classification may highlight distinct views of the world.

And yet the similarities between case and functional categories are equally marked: no matter why you wish to identify a set of semantic constituents of the clause, whether to bolster a generative or a representational theory, you must establish a set of valid criteria for distinguishing those constituents.

Fillmore's original criteria (Fillmore 1968) have been thoroughly discussed and so need only be briefly summarised here. First of all he is interested in the underlying semantic relations between nominal group and verbal group, assigning cases to the nominal group and characterising the verbal groups by case frames, that is, an inventory of the cases with which they normally form relations. Fillmore's criteria for classifying cases can be summarised as follows:

1. Each case relationship occurs only once in a simple sentence.
2. Only noun phrases representing the same case can be conjoined.
3. Prepositions may be used to identify some cases, eg "for" marks the Benefactive, "to" marks the Dative, "by" marks the Agent if present, or the Instrumental if the Agent is not present, etc.

(based on Fillmore, 1968)

Counter-examples have been produced for all these criteria, for example by Nilsen (1972), although the second and third at least have enjoyed a stout defence by Anderson (1977).

Anderson's criteria for defining case relations are relatively similar to Fillmore's: Anderson defines "case" as "grammatical relations contracted by nouns which express the nature of their 'participation' in the 'process' or 'state' represented in the sentence (or noun phrase)...and which are represented superficially in various fashions, including inflexionally and by pre- and postpositions" (1971: 10-11). Anderson's principal departure from Fillmore's criteria is not to restrict noun phrases to one case relation each; as the preceding quotation suggests, Anderson views case relations as grammatical phenomena which may be realised in the surface structure by formal means.

In contrast, the entire thrust of Nilsen's monograph is to establish purely semantic criteria for cases: each case is identified by a configuration of features arranged in a set of pairs. There are three sets of these pairs, the Source-Goal pair being subclassified into Cause-Effect, which can again be subclassified into Controller-Controlled. The configuration of cases in relation to these features may be seen in the table below (Nilsen 1972: 37):

Cases	Features								
	Controller	v	Controlled	Cause	v	Effect	Source	v	Goal
Agent	+			+			+		
Instrument			+	+		+	+		+
Causative				+			+		
Patient						+			+
Source							+		
Goal									+



Fillmore, Anderson and Nilsen, therefore, represent two strands of thought in the debate about criteria for case: the first two argue that semantic and grammatical (ie surface structure) criteria should be taken into consideration, whereas Nilsen argues for a purely semantic set of criteria. As we shall see, Halliday chooses the former option, combining semantic and syntactic considerations in his definitions of participants, processes and circumstances. But before going on to analyse Halliday more fully, let us consider briefly some widespread criticisms of case grammar, summed up neatly by Ferris (1983: 88-9):

- i) Although many do agree in recognising certain case relations, it is disturbing that there is such wide divergence as to their number and identity. This reflects the lack of clear general criteria for recognising a case when one meets one, and for distinguishing different cases from one another. This leaves the whole field in a very unsatisfactory state of uncertainty and subjectivity.
- ii) While Case Grammar offers an account (or several accounts!) of relations between noun phrases and the main verb of their sentence, it has virtually nothing to say about any other syntactic relation.
- iii) Much the most serious, even if case relations are real and not invented by the linguist there seems no good reason to suppose that they are semantic values of syntactic relations as claimed. In fact they are classifications of various factual relations existing between things for which words stand. This applies most clearly perhaps with the Locative but is actually true for all the cases...To put it briefly, one should beware of confusing things and relations, from the perceived world, with the syntactic elements and relations of the language which describe them.

As we have seen, debate among case grammarians gives substance at least to the first criticism; as I now hope to demonstrate, Halliday's approach to the ideational function of language goes



some way towards answering both this criticism and the remaining two.

### 3.2.1 Criteria for Participants, Processes & Circumstances

Halliday would at least meet the third criticism head on: it is obvious from the excerpts quoted earlier that his contention is that language is organised in such a way as to represent reality: factual relations give rise to certain syntactic relations. They are not the same, but they can be related systematically to each other. Halliday writes (1985: 101):

What does it mean to say that a clause represents a process? Our most powerful conception of reality is that it consists of "goings-on": of doing, happening, feeling, being. These goings-on are sorted out in the semantic system of the language and expressed through the grammar of the clause.

Halliday breaks the grammar of the clause down into three general semantic constituents, corresponding to clause constituents: participant (typically realised by a nominal group), process (typically realised by a verbal group), and circumstance (typically realised by an adjunct). As we shall see, these constituents can be further sub-classified.

At a very general level, then, an intuitively satisfying connection between grammar and semantics is established: even if it is as superficial as saying that nouns (albeit non-referentially) represent "things" and verbs are "doing words". It remains to be established whether Halliday's more

sophisticated classifications are valid. Furthermore, Ferris's second criticism, that case grammar is too focused on noun phrases and verbs, is answered by Halliday's apparently comprehensive tripartite classification: processes in particular are dealt with in their own right and not simply as "frames" into which cases are emptied. Circumstances are equally important. But, to return to our main theme, by what criteria does Halliday establish his semantic functions and how do they relate to criteria for establishing case relations in case grammar? We shall first consider each semantic function in general, returning to specific analytical problems later (see Section 3.3).

#### 3.2.1.1 Processes

Halliday classifies processes into three major groups: material processes, mental processes (which can be further subclassified into perception, affection and cognition), relational processes (which can be subclassified into intensive, circumstantial and possessive, each of which in turn has two "modes": attributive and identifying). He also identifies three minor groups: behavioural processes, verbal processes, and existential processes.

As we have seen, the general criterion for identifying a process is that it is realised by a verbal group: the semantic function is associated with syntactic form. Verbs do seem to play a central part in most case systems. In criticising



Fillmore, Fodor (1977: 93) argues that "As a contribution to semantics...it seems best to regard Fillmore's analyses as merely stepping-stones on the way to a more complete specification of the meanings of verbs." Verbs also play a central role in several of Fillmore's later semantic descriptions (eg 1971; 1987), which, incidentally, quickly break free from a purely transformational-generative framework in favour of insights from pragmatics (for further critical discussion of this see McCawley, 1975). Verbs may be a good starting point because the range of meanings, or types of process, are apparently better-defined than the many types of participant and circumstance.

On what grounds does Halliday sub-classify processes? As stated earlier, he follows Fillmore and Anderson in proposing a mixture of semantic and grammatical criteria (Halliday 1985: 155). These criteria may be summarised as follows:

1. As in case grammar, Halliday's processes are defined partly by the participants that they are associated with. This criterion however is circular, because, as we shall see, participants are classified according to the processes they are associated with. This circularity is somewhat mitigated by other criteria for distinguishing processes: process-participant configurations mean that, or so Halliday claims (1985: 144-5), "Material, behavioural, mental, verbal relational and existential processes each has a grammar of its



own."

2. As well as the nature of the participants, the number of inherent participants and the sequence in which they are found in the clause are called upon as distinguishing criteria.

3. Again as in case grammar, some grammatical criteria are used to distinguish process types: not only, of course, the presence of certain prepositions, but also, for example, the form of the unmarked present tense (present progressive for the material and behavioural processes, present simple for the others). Voice, type of passive, directionality (ie whether the process allows "please/like" pairings), and the realisation of the pro-verb (if any) are other grammatical features selected as criteria.

4. Inevitably, semantic categories, which by nature involve a degree of subjectivity, are called upon.

5. Finally, phonetic criteria are selected: processes are distinguished partly in accordance with whether their verbs are accented, unaccented, or either.

The tables in which Halliday lists his criteria are reproduced below (Halliday 1985: 131,155). The first table is slightly adapted to include "minor" participants:

Process type	Key participants
material	Actor, Goal, Beneficiary, Range
behavioural	Behaver
mental	Senser, Phenomenon,
verbal	Sayer, Target, Verbiage, Receiver
relational	Token, Value, Carrier, Attribute Identified, Identifier
existential	Existent

Criteria for distinguishing process types

	Material	Behavioural	Mental	Verbal	Relational:		Existential
					attributive	identifying	
Category meaning:	doing (doing, happening, doing to/with)	behaving	sensing (seeing, feeling, thinking)	saying	being (attribute)	being (identity)	being (existence)
Number of inherent participants:	1 or 2	1	2	1	1	2	1 or 0
Nature of first participant:	thing	conscious thing	conscious thing	thing	thing or fact	thing or fact	thing or fact
Nature of second participant:	thing		thing or fact			[same as 1st]	
Directionality	one way	one way	two way: <i>please type/like type</i>	one way	one way	one way	one way
Voice:	middle or effective	middle	effective	middle	middle	effective	middle
Type of passive:	passive		passive	medio- passive		passive	
Pro-verb:	do	do	(do to)				
Unmarked present tense:	present in present	present in present	simple present	simple present	simple present	simple present	simple present
Accentuation of verb:	accented	accented	accented	(either)	unaccented	unaccented	unaccented

The first table simply lists the main processes and the participants associated with them; the second lists the criteria for distinguishing the types of process from each other. Therefore, for example, material processes express events in the physical world ("doing/happening"), have one or two inherent participants (actor plus optional goal or range), and have "present in present" (present continuous or progressive) as their unmarked tense. A constructed example would be:

Actor	Proc. mat	Goal
Bill	is burning	rubbish.

Verbal processes, on the other hand, express acts of saying, have one inherent participant (the sayer) plus various optional participants (including verbiage, what is said; target, the subject of the verbalisation; and receiver, the audience of the verbalisation). The unmarked tense of verbal processes is simple present, and examples might be:

Sayer	Proc. verb	Verbiage
Linda	says	she's sorry.

Sayer	Proc. verb	Target	Recipient
He	reported	me	to the authorities.



Evidently, Halliday's bag of criteria is very mixed, and far removed from the desire for "purity" of Nilsen's semantic criteria. It is debatable how many of Halliday's criteria are in fact necessary to distinguish the processes: the first table alone would seem to be sufficient if we exclude the "minor" participants, Range and Beneficiary, which are common to a number of processes, and in the second table the "Category: meaning" section would again seem to distinguish all the named processes by itself. Indeed most of the other criteria single out at best one or two process types. However, if we do focus on the more comprehensive criteria, we again face the problem of basing our judgement on purely semantic criteria: effectively we are setting up subjective "categories of meaning" and then classifying processes either directly by means of these criteria, or indirectly in terms of criteria established to label other functions (ie the participants).

Despite its apparently comprehensive coverage, then, Halliday's list of criteria for distinguishing processes is not entirely dissimilar to the case grammarians: the foundation is (a) a partly subjective semantic classification of verb phrases, and (b) an equally subjective list of semantic categories based mainly on noun-verb relations. This foundation is supported with a variety of surface grammar items. Perhaps the idiosyncrasy and the range of the grammatical (and phonetic) criteria alone make the system rather unsatisfactory. However one advantage of Halliday's system at least for genre analysis

is that the verb phrase is treated to some extent separately from the noun phrase: we can represent the semantic function of verb phrases (albeit on less than watertight criteria) not simply as magnets or frames for a cluster of associated participants, but as processes with their own category labels.

### 3.2.1.2 Participants

The table reproduced in section 3.1.1 above lists the main participant functions identified by Halliday -- although some of these categories can again be subdivided, for example Beneficiary can be divided into Recipient or Client in a material process; Receiver in a verbal process. As noted in the previous section, the criterion for distinguishing these sixteen general participant functions is very largely their association with certain processes; for example, Sayers and Receivers and Targets are defined by their relationship in verbal processes. Otherwise purely semantic (and so partly subjective) criteria are called up (the Beneficiary is "the one that stands to gain" and so on).

Halliday briefly notes (1985: 144ff) that the labelling of processes and participants depends upon an interpretation of how events are structured in language. One view would represent an event as transitive: a participant engages in a process which extends to another participant (eg Actor - Material process - Goal), whereas a complementary, ergative,



view would see the same event as caused by one participant (the Agent) and realised by another (the Medium). The former interpretation would be transitive and the latter ergative. Both interpretations would be valid to some clauses, for example:

Actor	Material process	Goal
Mary	sailed	the boat.
Agent	Material process	Medium

That Halliday describes two complementary systems to account for participants in processes is characteristic of his approach to the description of functional grammar: each system encodes a world-view, that is, each represents a particular way of interpreting events. Neither system can itself account for the complex possibilities in our human comprehension, interpretation and representation of reality. And so no label is absolute: the description of the participant type has to be partly subjective because our representations of reality are necessarily subjective.

In the analyses below, I concentrate on the transitive interpretation of the processes, partly for convenience, partly because transitivity has been more fully accounted for in the literature, and partly because it is, according to Halliday, the predominant system in English, despite a certain instability in the language today (1985: 146). However, I should state here that the definitions of Goal and Range in this study are probably slightly different from Halliday's



(whose labelling is not always consistent). It will be clear that my understanding of Range owes something to the ergative category Medium (see Section 3.3.4 below).

### 3.2.1.3 Circumstances

Circumstantial elements are related to participants: both often have nominal groups as their head, and sometimes the semantic distinction between a direct participant and an indirect participant (ie a circumstance) in a process is not clear-cut. Halliday (1985: 139) argues, for example, that in mental processes expressed in the passive, there is little to differentiate the agentive participant from the instrumental circumstance:

	agent/instrument	
She was pleased	by/with	his gift.

However, in general, circumstantial elements are not systematically associated with particular processes: they are optional elements. The criterion for distinguishing them is primarily semantic and the main test which Halliday uses to classify different circumstances is "Which interrogative do they correspond to?" Thus, circumstances of Extent may be probed by questions such as "how far?/how long?/how many?/how many times?" and circumstances of Role may be probed by "what as?"

A second criterion for identifying circumstances is grammatical: they are usually realised by adverbial groups or prepositional phrases. Certain circumstances are associated with certain prepositions, for example Behalf may be signalled by "for/for the sake of/on behalf of". However, as suggested above (and in parallel with criticism of Fillmore's cases), this criterion is not wholly reliable: some participant functions are also realised by prepositional phrases, most commonly perhaps the Actor in material processes which are expressed by a passive. Certain circumstances -- Purpose and Reason -- are also commonly realised by subclauses, for example "I am going to Edinburgh to buy this book/because I wish to buy this book."

However, Circumstances may best be defined as indirect participants in a process, and identified on a semantic basis by asking which question they answer: "who with? what else? why? how?" and so on.

### 3.2.2 Towards a Working Classification

To summarise thus far, Halliday's analysis of the "clause as representation" offers a set of constituents -- process, participants, circumstances -- which are in some ways analogous to the categories proposed by some case grammarians. The process is at the heart of the analysis in that one can be distinguished from another by an amalgam of semantic and grammatical criteria. Once processes have been established,

participants are identified by their relationship to them. And finally, circumstances can be identified by the type of question mentioned above. However, Halliday's processes and participants differ from earlier case grammarians' categories in that the former do not offer a set of universal semantic roles functioning as a "base component" from which phrase structure and transformational rules may be derived. Rather, they offer a set of categories which function as an indirect, or non-referential representation of reality. And although the set of categories is necessarily a system, it is not eternally fixed: as interpretations of reality change and evolve, the system evolves in parallel. Indeed, Halliday's point in "Language and the Order of Nature", and also in his paper on William Golding's The Inheritors (Halliday 1971), is that the system must vary to accommodate different world-views.

Possibly this very instability, or to put it less severely, this flexibility in the system, means that the categories are difficult to differentiate in objective, absolute terms. Ultimately a participant is a participant by the common consent of the discourse community, not because of some referential relationship to non-linguistic "reality". But within the discourse community there may be stresses and strains which will eventually lead to a change in conception of a particular process and its associated participants, as in The Inheritors Golding's use of material processes involves Actors but avoids



Goals, in order to represent a Neanderthal world-view which minimises direct human influence on nature.

Such a culture-specific view of semantic roles obviously echoes Whorf (1956), particularly his hypothesis that linguistic models of reality vary from culture to culture. The argument that the Hopi language represents reality in a radically different way from English is, of course, well-known:

In this Hopi view, time disappears and space is altered, so that it is no longer the homogeneous and instantaneous timeless space of our supposed intuition or of classical Newtonian mechanics. At the same time, new concepts and abstractions flow into the picture, taking up the task of describing the universe without reference to time and space -- abstractions for which our language lacks adequate terms.

(Whorf 1956: 58)

A sympathy with Whorf and the Sapir-Whorf hypothesis is implicit in most of Halliday's writings on language as a "social semiotic" (and explicitly acknowledged in Halliday 1978: 25ff, 76ff). However, elsewhere, at least the strong version of the Sapir-Whorf hypothesis has been seriously challenged, most critically perhaps by Berlin and Kay (1969). Their work on colour categories suggests that certain principles underlie the apparent differences found amongst different languages. Berlin and Kay emphasise the importance of the most typical members of any particular category, rather than the borderline cases. Rosch (1973) develops Berlin and Kay's insights for semantics, as prototype theory, and this in

turn has been applied to case grammar both by Fillmore (who views this theory, indeed, as "the one thing that gives me a little bit of hope now"; see Dirven and Radden, 1987: 104), and Dahl (1987). Dahl's approach to cases offers a compromise between the relativist position adopted by Whorf, and the universalist position adopted by Berlin and Kay.

Dahl argues that there is a restricted set of possible prototypes of semantic roles available to all languages. For example, prototypes of location and direction will probably be available to all languages, including Hopi and English:

Each prototype is associated with a set of properties. From this set of properties a subset is chosen the members of which are taken to be defining properties of the category assigned to the prototype. The important thing here is that one prototype can be the basis for several different delimitations of a category, and this is a way in which languages may differ.  
(Dahl, 1987: 154)

Dahl (1987: 152-153) explains how the prototype of direction and location may vary from language to language. Direction may be best represented by the complement of the verb "move", whose defining property might be "the final point of a movement" (which would involve movement) or "the point at which something is located as the result of what is said to take place in the sentence" (which would give a satisfactory definition of direction without necessarily involving movement). Some languages will choose the first definition of direction, others the second. This choice will not affect the "good example" of "move". But it will affect borderline cases such as "remain".



If direction is taken to be "the final point of movement", then directional complements would be appropriate only to the verb "move", as in English:

He moved to London.  
\*He remained to London.

But if the second definition of direction is allowed, then both "move" and "remain" can have directional complements, as in Russian:

On ostalsja v Londone.  
[Lit. He remained to London.]

Dahl therefore avoids the extreme relativist position of regarding speakers of radically different languages almost as alien beings. A universal ordering principle for the structuring of languages is granted, if not yet adequately described. Nevertheless, there is room for differences of emphasis here and there: borderline categories, surface differences in the way that we represent reality, suggesting different ways of thinking about the world.

It does not seem too strong a claim to suggest that the assignation of semantic roles does alter our view of reality. Neither do we need to seek examples from other languages to illustrate this claim; consider the semantic structure of the following (allegedly genuine) sentence from a motor insurance claim form, featured in a television comedy show:



Actor	Process	Goal	+
The pedestrian	hit	the car	and
Process	Circumstance: location		
went	under it.		

Here we are being asked to consider the pedestrian as the agent and the car as the affected; a representation of reality which conflicts with our knowledge of the world and so may result in our scepticism or laughter. The writer-driver, presumably, in structuring the sentence thus, either believes that he was not responsible for the collision, or seeks to convince his reader of this -- or perhaps both. In any case, different representations of reality -- different views of the world -- are evidently possible. This position is consonant with the views of so-called "critical linguists", such as Fowler and Kress, who also claim that systematically distinct versions of reality may be expressed between and within languages. A recent statement of this view is to be found in Fowler (1991: 31-2):

The fact is that a language like English, associated with a technologically, socially and economically various culture, is internally extremely diverse. Everyone has access, passively if not actively, to many varieties of English, and thus to numerous alternative semantic grids. (The materials are at least present but are not consciously exploited sufficiently; hence the need for critical linguistics or linguistic critique.) Given the fact of relativity of construction, not only between, but also within languages, it would seem perverse to claim that variants of structure all have some universal origin in the properties of the human mind. Whatever "natural categories" happen to be coded universally in all languages -- the concepts designated by terms in the fields of colour, geometrical configurations and logical relationships have been suggested as candidates for semantic universals -- it is obvious that the majority of structures that make up our

"semantic settings" are social in origin.

To summarise, this study will largely follow Halliday's classification of semantic roles in order to highlight different ways of representing reality, always remembering that the relationship between language and reality is not referential but ideational. The labels assigned to the semantic roles should not be seen as universal categories; grey areas will naturally exist within the English language. People are not consistent; we cannot expect their most sophisticated construct to be so either. However, the labels will be based on categories which, we shall assume, have some prototypical justification.

Even given the necessary element of subjectivity in the criteria for labelling processes, participants, and their associated circumstances, a comparison of categories between our academic texts and their popularisations should offer a revealing gauge of the similarities and differences in their respective representations of reality.

### 3.3 Towards a Representational Analysis of the Texts

In a series of lectures, partly published a decade after their presentation, Fillmore talks with disarming honesty of the frustrations of applying case grammar to the analysis of authentic (that is, naturally-occurring) discourse:



You heard me say that I have been feeling discouraged about case grammar, and that one of the reasons for my discouragement is the frequent experience of turning away from the set of principles and the apparently large set of example sentences which these principles seem to deal with adequately, toward a novel or a newspaper or an observed conversation, and looking or waiting for a long time before coming to a naturally occurring sentence that I felt I could deal with adequately.  
(Dirven and Radden, eds., 1987: 104)

Even given the array of criteria discussed in the preceding sections for the definition of semantic roles in clauses, from phonological to prototypical, a degree of argument, and so frustration, in the assignation of semantic labels to clause constituents, is inevitable. The procedure which follows, therefore, should be seen as a blunt instrument for comparing process types, participants and circumstances in and across pairs of texts. Claims arising from this procedure cannot, of course, be validated by an appeal to statistics alone: again the sample is too small to argue statistical validity for any figure I give. Instead, the fundamental procedure, as in Chapter One, is to compare like with like: excerpts are matched from paired texts on the basis of recognisable similarity of information and/or discourse function (eg giving requirements for brittlestar survival, coming to a conclusion, etc). Then process, participant and circumstance types are analysed and compared in an attempt to account for regularities or dissimilarities.

### 3.3.1 Difficult Circumstances

Halliday (1985: 137-144) discusses the following principal types of circumstance:



Extent: spatial/temporal  
Location: place/time  
Manner: means/quality/comparison  
Cause: reason/purpose/behalf  
Accompaniment  
Matter  
Role

These circumstances are largely expressed by prepositional phrases and adverbs (for problems in determining constituency, see the following subsection). Subclauses which realise circumstantial elements are treated as hypotactic enhancing clauses (Halliday 1985: 215ff). In brief, hypotactic enhancing clauses (traditionally and more succinctly known as adverbial clauses) express a circumstance by means of a subordinate clause containing either a subordinating conjunction and finite verb, or a non-finite verb. Taking such subclauses as further realisations of circumstances, we add the following categories to the above list:

Condition: positive/negative/concession

In my analysis, for the sake of conciseness, I have made only the distinction between Condition (positive and negative) and Concession, and so the following clause complexes are analysed thus (a carrier is a participant in a relational process which is characterised by an attribute):

<u>Carrier</u>	<u>Process: relational/intensive</u>
The predation argument	would be

<u>Attribute</u>	<u>Circumstance: Condition</u>
even more convincing	if it also applied elsewhere in the world

(BP1: 5)

Circumstance: Concession

Even though direct evidence concerning the level of predation pressure on dense populations of fossil ophiuroids is scanty

Actor

the temporal distribution of these communities and the data on predation in some extant assemblages

<u>Process: material</u>	<u>Range</u>
support	our hypothesis that dense communities of of epifaunal brittlestars were largely excluded from shallow water after the Mesozoic.

(BL1: 8)

Circumstances of concession and condition can usually be distinguished by the subordinating conjunctions with which they are associated: although/even though/etc versus if/unless/given/and so on.

Other circumstances which I have felt obliged to add to Halliday's list are Frequency and Reporter. I suspect that Halliday would class Frequency under Quality, which is "typically expressed by an adverbial group, with -ly adverb as

Head; the interrogative is how? or how...? plus appropriate adverb. Quality expressions characterize the process in respect of any variable that makes sense" (Halliday 1985: 139). Given the wide range of variables that might make sense, Quality is probably a candidate for a number of further subdivisions. For the time being, I have restricted myself to one -- that of Frequency -- partly because it can be realised by expressions which do not fit neatly into Halliday's criteria (eg "Once again") and partly because Frequency seems to have more semantic connection to Extent: temporal than to Manner, the overall category to which Quality belongs.

The final circumstance I have included is Reporter, a category which is probably restricted mainly to academic discourse. A related function, Sayer, is, of course, a participant in a verbal process; in another type of process Reporter may be realised in parenthesis as a reference to previous research. There is an obvious semantic relationship between verbal processes with Sayer, and other types of process with Reporter:

Sayer	Process: verbal	Target
Williamson (1982)	has... dismissed	paleoecology

Verbiage  
as "a poor-man's applied ecology performed on inadequate data."  
(BL1: 1)

and

Circ: Location/Place	Token	Process: intensive
In the North Sea	burial and smothering	is



Value	Circumstance: Reporter
the leading cause of death for ophiuroids	(Schafer 1962)
	(BL1: 4)

Certain problems arise from this interpretation. First of all, not every instance of a "reference item" (ie name plus date, referring to previous research) need be a participant in a verbal process, for example:

Actor		
Kesling (1969), Rosenkranz (1971) and Goldring and Stephenson		
	Process: material	Goal
(1972)	have analyzed	fossil examples of autochthonous thanatocoenoses of asterozoans due to rapid smothering by muddy sediment.

This problem is not severe: the previous chapter referred to the dual nature of items like "Kesling (1969)" which can function as Actors or Sayers, since they refer simultaneously to the researcher and the research. Interpretation may be achieved by studying the context, although even there we may find some grey areas, which are inevitable given the fuzziness of our semantic concepts; for example, the following clause submits to interpretation as either a material or a verbal process:

Kesling and Le Vasseur (1971) estimated original population densities for the Early Mississippian Strataster ohioensis at 4,500 individuals per square meter at a water depth of approximately 30m.

The two possible interpretations may be summarised thus:

<u>Sayer</u>	<u>P:verb</u>	<u>Target</u>	<u>Verbiage</u>
Kesling & Le Vasseur... estimated...densities...at 4,500...			
<u>Actor</u>	<u>P:mat</u>	<u>Range</u>	<u>Circ. Frequency</u>

The problem lies in whether to classify "estimate" as a verbal or a material process, the justification for the latter being that the process of estimation would require some physical acts, such as measuring. I prefer the former, verbal, interpretation because the semantic associations between Target and Verbiage are more clearly brought out, but the fact remains that some clauses may have a dual interpretation without jeopardizing the coherence of the clause. As Halliday says of metaphor, complementary interpretations may be unavoidable and may indeed be one of the features of the flexibility of a language.

A second problem concerns the status of clauses which are interpreted as having a circumstantial Reporter: should the rest of the clause be interpreted as Verbiage?

#### Verbiage

In the North Sea burial and smothering is the leading cause of death for ophiuroids

Circumstance: Reporter  
(Schafer 1962).

Again there are grounds for a dual interpretation: the reference item, after all, usually indicates that the clause is a restatement of something which has been said elsewhere. However, I have not analyzed such clauses as implicit verbal

processes, partly in the interests of clarity, and partly because the restatement has reduced the Reporter to an indirect participant in a process of a different kind (thus, too, the distinction in label between Sayer and Reporter).

Finally, some reference items do not indicate restatements, but rather direct the reader to further information which may be found in another text. Where it is clear that this is the function of the reference item, it has been categorised as a textual item [Directive], as its purpose is to direct the reader, not to another part of the clause, but to another text or a table or diagram, for example:

Circumstance: Reporter	Token
According to Cockburn (1972 and 1975), a majority of early-	
Proc: rel	Value
modern assize indictments are	factually worthless with
Quality	Circ:
regard to occupation of the accused and his place of abode	
[Directive]	
(cf. Wiener, 1976; Baker, 1977b).	

(HP3: 7)

Here the main Reporter is realised as a thematic adjunct; the concluding parenthesis directs the reader to other texts which presumably make similar claims but are not the source of the statement here.



### 3.3.2 Constituency

A separate problem affecting the analysis of circumstances goes to the foundations of Halliday's grammar. Functional grammar grows out of a tradition of scale and category grammar which assumes that the English language can be sorted into clauses which display various levels of structure: clause constituents are made up of phrases and groups, which in turn consist of lexical items. However, certain structures are difficult to allocate to these categories. Two problematic structures are prepositional phrases and so-called "projecting clauses" (Halliday 1985: 227ff).

#### 3.3.2.1 Prepositional Phrases

According to most grammars, prepositional phrases function in two ways: as adjuncts at clause level, or as post-modifiers at word level. I would not wish to dispute this. Sometimes, however, in written texts, it is unclear to which level to assign a prepositional phrase. An example illustrates the problem:

[Text]	Carrier	Proc: rel	Attribute	?Circ: Quality
For	it [the network]	becomes	structured	in a way which makes it yield outputs which... tend to 'conform to the rule'.

(CL1: 3)

Arguably, there are two possible ways to analyse the final prepositional phrase: first, as a clause adjunct, answering the

question "How does the network become structured?"; and, second, as a postmodifier to the attributive participle "structured". Part of the ambiguity here lies in the dual nature of the participle: verb or adjective?

I doubt if there is any way to resolve such problems systematically and to the satisfaction of all: when analysing the texts I have treated each case as it comes, paying due attention to the contexts. However, such problems are a salutary reminder that no analysis of naturally-occurring texts can be completely clear-cut.

### 3.3.2.2 Projecting clauses

Another problem in the practical analysis of clauses is how to deal with verbs which naturally "project" clauses, particularly verbs which have infinitive clauses, for example:

In this paper, we aim to provide a quantitative classification of Scottish wildcats... (BL3: 1)

A criminal underworld of master-thieves and receivers also seems to have had its locus in the metropolis... (HL3: 4)

The results of some of this work...are now beginning to find their way into textbooks and general interpretations. (HP1: 1)

Syntactically the subordinate clause in the above examples is, according to convention, the complement of the verbs "aim", "seems" and "beginning". Semantically, however, there is a strong temptation to see these verbs as pseudo-modals,

modifying the meaning of the following verbs, usually in similar ways to modal auxiliaries and adverbials. In the first example above the verb "aim" signals that the material process is the intention of the speaker, and in the second example the verb "seem" signals the speaker's uncertainty about the relational process. The third example is rather different: "beginning" does not carry modal meaning but something closer to aspectual meaning, that is, it shows that the (metaphorical) material process is in a particular phase, namely, the initial stage. Again the semantic function of the finite verb can be viewed as modifying the infinitive verb, and although it is admittedly unorthodox, this is how I have analysed such phrases in the text. Effectively "aim to provide" and its ilk are seen as complex verb phrases, a reclassification which raises the status of the complement of the infinitive verb to the rank of main clause constituent thus:

C: Place	Actor	P: mat	Range
<hr/>			
In this paper, we	aim to provide a quantitative		
<hr/>			
classification of Scottish wildcats...			

This interpretation seems intuitively more satisfactory than the alternative interpretation which would simply give us:

C: Place	Senser	P: ment	Phenomenon
<hr/>			
In this paper, we	aim	to provide a quantitative	
<hr/>			
classification of Scottish wildcats...			



I feel that the question "What do you aim to provide in this paper?" is more plausible than "What do you aim in this paper?" -- however, there are strong arguments for either interpretation. In the final analysis, perhaps the issue can only be decided on preference; and I must admit that I prefer the unorthodox interpretation and that is what I follow in the texts under consideration.

### 3.3.3 Coordination

Another practical issue is how to deal with coordinate participants and circumstances: should they be treated as one or two constituents when analysing the texts? In other words, which of the following interpretations is preferable?

Actor P: mat C: Place

---

They occur at the boundary between an object and its

C: Place + C: Place  

---

background, at sudden changes in surface orientation or where

---

pigment marks the surface of an object.

Actor P: mat C: Place

---

They occur at the boundary between an object and its

---

background, at sudden changes in surface orientation or where

---

pigment marks the surface of an object.

The decision as to how many times to label a semantic category which is realised through coordinate constituents is not theoretically taxing, but it does have a minor effect on the

admittedly crude statistics which I produce for the texts. Again it is best simply to state the practice I have followed: where a circumstance is expressed by coordinate constituents I have labelled it only once (as in the second interpretation above) -- except in the very few cases where two coordinate constituents are "interrupted" by another constituent or a comment in parenthesis. In such cases I have labelled the constituent twice.

#### 3.3.4 Range in material processes

Halliday lists two main participants which are involved in material processes: Actor and Goal. The former, obligatory, participant is "the one that does the deed" and the Goal is the optional "one to which the process is extended" (1985: 102-3). According to Halliday, the Goal, which roughly corresponds to Fillmore's Patient, may be probed by questions such as "What did X do to Y?", where X is the Actor and Y is the Goal.

Among "other participant functions" Halliday lists Range, "the element that specifies the range or scope of the process" or "indicates the domain over which the process takes place" (1985: 134). Among his examples are "a song" in "sing a song", where the Range is effectively another name for the process, and "the mountain" in "Mary climbed the mountain". In this case he argues:

Mountains exist whether anyone climbs them or not; but "the mountain" specifies the range of Mary's climbing. Note that

this is not a "doing" relationship; you cannot say "what Mary did to the mountain was climb it".

(Halliday 1985: 134)

This argument, apparently reasonable in itself, leads to inconsistencies in Halliday's interpretations. In an earlier section we discussed his transitive and ergative interpretations of the clause "Mary sailed the boat", where "the boat" is either Goal or Medium. Given the quotation immediately above, however, can't we say that "the boat" is the domain over which the process takes place? Certainly, the transformation "what Mary did to the boat was sail it" sounds odd to my ears, and the boat would presumably still exist whether Mary sailed it or not.

Halliday's categories, while often full of insights into language, equally often depend on ad hoc examples and loose definitions which irritatingly overlap. It is difficult, after all, to see much difference between "one to which the process is extended" (Goal) and "the domain over which the process takes place" (Range). The transformation-test (of the kind "what Mary did to the mountain was climb it") is, however, useful in distinguishing one type of participant from another.

Taking a wider view of Halliday's functional grammar, Range indeed seems much more of a "key" participant than Goal. Range turns up in a variety of guises in different processes: as



Verbiage in verbal processes, Phenomenon in mental processes, and, again, as Range in behavioural processes (eg "kiss" in "John gave Mary a kiss"). The ubiquity of the Range suggests that it is a fundamental participant in many processes; we should not be too surprised that it, rather than goal, is a key participant in material processes.

To come, I hope, to a clearer understanding of Range and its relation to Goal, I have adapted Halliday's description of Medium in ergative interpretations: "the one through which the process is actualized and without which there would be no process at all" (1985: 146). Although in ergative interpretations, the category thus defined would be used to label the subject of intransitive verbs, I would reserve it for the object of transitive verbs. Goal, then, would become a special subset of Range: a participant which in some way is altered by being the vehicle for the actualization of a process. Another possible subset of Range, not mentioned in Halliday (although cf. 1985: 104) but listed elsewhere (eg Fillmore, 1971, quoted in Dirven and Radden, 1987; and Fowler, 1991: 76ff) would be Result, a participant whose existence is due to the actualization of the process. However, in this study we shall limit ourselves to Halliday's labels, with the understanding that they are not necessarily all-inclusive, and that greater delicacy is possible.

Range, as I understand it, is much more common than Goal in the material processes in our sample texts. I have kept fairly strictly to the test that a participant has actually to be affected in some way to be classed as Goal; in some examples there will inevitably be room for argument. One such case might well be:

[Text]	Actor	P: "mat"	Range
Of course, a single rigid model does not capture the potential variations in the appearance of many common objects.			

(CP2: 4)

Here, the transformation "what a single rigid model doesn't do to the potential variations in the appearance of many common objects is capture them" again sounds odd, possibly because the process here is metaphorical (and possibly because of the effect of the negative). At any rate, I have classified such participants as Range. An example of Goal from the same text would be "such generic models" in:

Actor	P: "mat"	Goal
Some vision systems can manipulate such generic models.		

In this example the transformation "what some vision systems can do to such generic models is manipulate them" sounds more plausible, even though the process is again metaphorical.

To sum up, then, I take Range in material processes to be a key participant, alongside Actor, and defined as an optional

participant by which the process is actualised. In some cases the actualization may affect the nature of the participant; in such cases the Range may be subclassified as Goal.

Actor is less of a problem than Range/Goal; Halliday identifies it as the participant which is "doing something" (1985: 103ff), that is, I assume, the participant which is responsible for the action. In some theories this participant is animate, and categories such as Force are used for inanimate participants such as "the wind" in "the wind shook the trees" (cf again Fowler 1991: 75). I simply use the general term Actor to include such subcategories.

### 3.3.5 Ambiguous Processes

Although Halliday provides various grammatical "tests", such as the transformation test used in the foregoing section, to differentiate certain types of process and participant, the primary consideration is the lexical meaning of the item which expresses the process or participant. This procedure is explicit in the following section on mental processes:

Let us group together clauses of feeling, thinking and perceiving under the the general heading MENTAL PROCESS, and see whether such a category will turn out to possess other significant characteristics.

(Halliday 1985: 107)



Despite various similarities and differences Halliday contrives to find between process types, in practical analysis some processes are difficult to categorise. For example, Young (1990: 50) categorises verbal processes as a subcategory of mental processes. Although there are areas of overlap, this strategy seems rather extreme for non-controversial examples such as "say" and "tell". In our texts this is particularly true of some mental and verbal processes, both of which may be used to report findings of other researchers. Compare the following clauses:

(a) Kesling and Le Vaseur (1971) estimated original population densities for the Early Mississippian Strataster ohioensis at 4,500 individuals per square meter at a water depth of approximately 30m.

(b) Liddel (1975) reports densities for the middle Ordovician Stenaster salteri greater than 440 individuals per square meter.

(c) Warner (1971) studied an aggregation of of Ophiothrix fragilis off the English coast with a mean density of 1,300 individuals per square meter (water depth: 14m);

(d) Vevers (1952) counted about 340 individuals of this species per square meter at a depth of 48m near Plymouth.

These four clauses occur in close proximity in BL1: 2; the general function of the passage is clearly to report the research of others: accordingly, the thematic participant of each clause is the ambiguous indicator of researcher/research. However, only clause (b) has a clear verbal process: "reports". Clause (a) could be interpreted as a mental process, and clauses (c) and (d) are probably best seen as material

processes (although (d) particularly might be regarded as a mental process).

Clause (a) is the most difficult to label: the "core" meaning arguably is similar to "guess" or "make a mental approximation". This would give the interpretation:

<u>Senser</u>	<u>P: mental Phenomenon</u>
<u>Kesling and Le Vasseur (1971) estimated original population</u>	
<u>Attribute</u>	
<u>densities...at 4,500 individuals per square meter...</u>	

However, "estimate" may also mean "give an approximation verbally", and this is indeed how I have interpreted it in my analysis:

<u>Sayer</u>	<u>P: verbal Target</u>
<u>Kesling and Le Vasseur (1971) estimated original population</u>	
<u>Verbiage</u>	
<u>densities...at 4,500 individuals per square meter...</u>	

Nevertheless, the nagging question remains, not so much which interpretation is more plausible, but whether it much matters to the reader which interpretation I choose. In a criticism of the Sapir-Whorf hypothesis, which has relevance here, Hartley (1982: 103-4) attacks Whorf's alleged identification of a grammatical form with one semantic function, in this case the "implication that the English verb forms convey only temporal information", and concludes:



Whorf has been misled by the traditional label "past tense" into equating a single form with a single function. The validity of Whorf's reasoning rests entirely on the labels which he has proposed; his argument is a tautology.

I quote Hartley here to illustrate the danger of establishing categories and then trying to squeeze awkward members into them, an error which in this kind of study is probably unavoidable but which should at least be recognised and minimised as much as possible. To return to the specific instance of this problem, there is no reason to suppose that to comprehend the clause above, the reader needs to categorise the process as mental or verbal: the basic meaning "form an approximation" (whether verbally or mentally) is clear enough, whichever way it is taken.

However, for the purpose of analysis some decision has to be made in such cases. In this instance I have chosen to categorise the process as verbal, for reasons which will be obvious: the Sayer is a researcher/research item whose function is to communicate, and mental processes do not usually communicate, whereas verbal processes do. That this (and other) processes can often be disambiguated by reference to the context does not invalidate the basic point: that categorisation into processes is based not only on the "core" meaning of the lexical item which expresses the process. This meaning may be ambiguous, falling naturally into several or no obvious category. The process may be assigned to a category by



taking context into consideration, but this does not mean that the casual reader need necessarily go to the same trouble.

On the other hand, I would not go so far as Hartley and dismiss linguistic categories out of hand. Verb forms do not exclusively convey temporal meaning (as we shall see in Chapter 4), but few would dispute that there is a connection; similarly, I would grant validity to Halliday's general categories of process. As I have argued at length earlier, the existence of ambiguous examples does not irreparably damage the general theory.

### 3.3.6 Relational Processes and their Participants

In the textual analysis I have simplified, with some attendant loss of subtlety, or "delicacy", Halliday's system of categories of participant in relational processes, which mainly involve the lexical verb "to be". Halliday's main participants in such processes are as follows:

Token/Value  
Carrier/Attribute  
Identifier/Identified.  
Possessor/Possessed

Three of the four pairings listed here are easy to illustrate from our texts, for example:

Carrier	P:rel	Attribute	
...the numbers are		simply staggering.	(BP1: 1)

Token	P: rel	Value
Today's brittlestar beds are		a living link to this ancient

type of community.

(BP1: 1)

Possessor                      P: rel Possessed

Brendan Keegan...has           a team studying them around Ireland.

(BP1: 2)

The differences between these examples are obvious: in the first there is only really one participant, the Carrier, which is being described attributively. In the second example there is again only one participant, but it is realised as two distinct "things" -- "brittlestar beds" and "a living link". The relationship between these two expressions, as is obvious from the category labels, is that one expresses the value of the other.

There are other ways of expressing value: the most common is to give some kind of numerical or quantitative value to the participant, for example:

Token                                      P: rel Value

The ophiuroid density...is           two orders of magnitude higher...

(BL1: 5)

I have also classed Halliday's Identifier/Identified distinction under Token/Value, although I acknowledge that there are certain differences in the categories as Halliday describes them. Essentially, Token/Value usually expresses a class relationship in an identifying clause: "today's brittlestar beds are members of the class of living links..." and so on. Identifier/Identified differs from Token/Value in

that the value is the sole member of its class. If we changed the sentence quoted above, we would easily perceive the distinction: "today's brittlestar beds are the living link to this ancient type of community." Here, the value is not one of a number of class members, but the only class member (its exclusivity being signalled by the definite article), and it can therefore be used to identify the token.

Token, Value, Identified and Identifier, however, are not always so easy to untangle. Indeed, Halliday merges the two pairs:

In any identifying clause, one element will be the Value (meaning, referent, function, status, role) and the other will be the Token (sign, name, form, holder, occupant). These functions are then conflated with those of Identified and Identifier; and the conflation can go either way. Either the Token or the Value can serve as the identifying element (the Identifier)...

(Halliday, 1985: 115-6)

Two examples given by Halliday are:

Identified/Token	Process	Identifier/Value
King Louis	was	the king of France.
Identified/Value	Process	Identifier/Token
My name	is	Alice.

The Identifier is not always easy to pinpoint in written language; it is usually (but not always) located in the New constituent of the clause and is therefore signalled by intonation (Halliday 1985: 117). Given the problematic nature of identifying the Identifier in some clauses, I have decided



in this study to avoid the issue, and concentrate on labelling Token/Value, Carrier/Attribute and Possessor/Possessed.

### 3.3.7 Metaphorical Elements

Another, final, practical problem to be discussed is that of metaphorical elements in the clause, particularly metaphorical processes (which will consequently be associated with a cluster of metaphorical participants), and metaphorical circumstances. Although metaphorical elements in discourse is an extremely interesting topic, an in-depth analysis of the use of metaphor in different genres is outwith the scope of this study -- doubtless it deserves a full-scale study of its own. Comments on metaphorical uses will therefore be kept to a minimum here, although they cannot be completely ignored.

#### 3.3.7.1 Metaphorical Processes

Halliday (1985: 319-345) touches on some metaphorical modes of expression; essentially the "core" meaning of a clause is extended by virtue of its constituents being, strictly-speaking, incompatible, or inappropriate to the situation or action being described. Obvious examples are:

- (a) ... take a complex skill such as complex multiplication.  
(CP1: 5)
- (b) This approach is based on one simple assumption...  
(BP2: 2)
- (c) Ceaseles persecution...nearly saw the extinction of the  
Scottish wild cat at the turn of the century. (BP3: 1)

Example (a) uses the imperative form of the expression of a material process, "take", to signify a mental process which could be expressed as "consider". Example (b) expresses the "basis" of an "approach" -- the metaphor which lies submerged beneath this conventional usage is one of building a physical construct (which is extended to "constructing an argument"). The underlying metaphor is also evident in the pseudo-circumstance of place: "on one simple assumption". The final example uses a mental process to express a causal relationship.

When analysing texts it is necessary to have a policy on dealing with metaphor: should the analyst label the "core" category (material in the first example above) or the metaphorical category (mental in the same example)? Ideally, as Halliday (1985: 321ff) states, both metaphorical and literal interpretations have equal value and both should be considered. This procedure would, however, unnecessarily complicate the present study. Here, therefore, metaphorical processes have been taken at face value, and labelled accordingly..

The reason for following this procedure is quite simple. As in example (b) above, metaphors are often used to make the abstract concrete: to allow readers or listeners to "grasp" a concept. I suspect that the process of making the abstract concrete is more heavily employed in popular texts -- labelling the metaphorical category would highlight any greater tendency towards material processes in popular texts, a tendency which

would provide some tentative support for this theory. I have therefore followed this procedure even for such established "idioms" as those in the above examples. Obvious metaphorical processes in the texts are nevertheless marked with inverted commas, thus:

Range                      P: "mat" C: "Place"

This approach is based on one simple assumption...

Note that only metaphorical processes and circumstances are so marked.

#### 3.3.7.2 Metaphorical Circumstances

Much of what we have said of metaphorical processes can also be said of circumstances: the congruent meaning is extended in some way to the point that multiple interpretations are possible. This is particularly true of circumstances of location:

- (a) ...in some cases it is clear that the use of these parallel machines was essential... (CL3:5)
- (b) Thus in the past tense acquisition model, the system received stems and then inflected versions... (CL1:1)
- (c) Insofar as human beings are required to negotiate some truly rule-governed problem domains...some form of mixed model may well be nature's most effective solution. (CL1:1)



Examples (a) and (b) here are examples of what Halliday calls "abstract space" (1985: 137): effectively, the function of these expressions is not to represent a physical place, but to orient the reader towards a relevant concept or set of situations. This function is reminiscent of that of theme, and it is no accident that such circumstances are usually clause-initial. Example (c) might be labelled "abstract extent": its function is not to delimit physical space, but to delimit a condition.

Such examples are common in the texts, and I have dealt with them in the same way as I have dealt with the metaphorical processes: namely, I have labelled them according to the congruent category and marked them with inverted commas.

### 3.3.8 Non-representational elements

As noted earlier in this chapter, some items do not submit easily to interpretation as participants in processes, direct or indirect. Some of these items correspond in Halliday's terms to "cohesive devices": their function is not representational but textual: they are there to shunt the reader around the larger discourse, signalling continuity or changes in direction. Such non-representational items include "Yet" in the following clause:

Yet the fossil record, despite its inherent limitations, provides the only direct evidence for patterns of biotic change through time.

Even here, though, there are possible grey areas. Many textual devices have a semantic content similar in kind to circumstantial elements. "Yet" may be related to a concession, for example; and items such as "first" and "then" may be related to time. "Then" may function as a textual device or a circumstance of time, depending on context:

a) HP2:5

Textual	Circumstance: time	Actor	Proc: mat	Circ.: "place"
Then	in the same year	England	collapsed	into civil war

b) HL2:4

Textual	Goal	Process: material	Circ.: time
in the event	[the army]	was not fully assembled	until mid-July

Textual	Circ.: Time	Beneficiary	Proc: relat.	Attribute
and	even then	it...	required	training.

In example (a) above, "then" is interpreted as a textual device, relating the clause to previous clauses. The function of the adverb is not to direct the reader to the year (the following prepositional phrase does this), but to make the reader aware of the clause as one of a narrative sequence. In contrast, in example (b), the adverbial phrase "even then" does refer the reader to a time: "mid July". The two examples suggest that some adjuncts vary in function, moving between textual and ideational, and we may expect some difficulties in interpreting borderline cases. Most cases, however, should be resolvable through the context.

Other adjuncts are interpersonal in function, serving as authorial comments on the processes and participants described. Such items include "Strangely" in "Strangely, I know of only two North American populations, both off the coast of California." The function of textual and interpersonal signals are discussed in more detail in other chapters. Suffice it to say here that these items are not included in our analysis of the text as representation.

The tables in Appendix B show matched passages from the corpus, analysed into constituent processes, participants and circumstances. In the following sections, the findings will be discussed.

### 3.4 Results and Discussion

Appendix B shows a full analysis of the matched extracts from the learned and popular articles, and a summary of the number of process, participant and circumstance types in each set of extracts. As in Chapter Two, only the constituents of the primary clauses are analysed. The summary (Appendix D) gives both the total number of each constituent category in each set of extracts, and, for reasons of comparability, this number is also converted into a percentage. The percentage shows each constituent subcategory (eg Actor or Sayer) as a proportion of the total number of constituent types (eg Participants) in that set of extracts (eg the extracts of HP1 or HL1). These percentages are again quite rough, being rounded off to the



first decimal place. They can only be used to make broad generalisations.

The following sections discuss this broad analysis, and also look in detail at some case studies: individual matched extracts which illustrate the differences and similarities between genres. We shall consider first the process types with associated participants, and then the circumstances.

### 3.4.1 Material Processes

An analysis of the extracts in full supports the findings of the analysis of themes in Chapter Two: material and relational processes dominate all of the extracts under consideration, both learned and popular. In most cases the proportion of material processes is greater than that of relational processes: the main business of most articles is apparently to express events and states in the world; states of being coming a close second, and in a few instances even coming first. The proportion of material processes (as a percentage of the total number of processes in each set of extracts) is given below:

Figure 1: Proportion of Material Processes

Extract:	BP1	BP2	BP3	CP1	CP2	CP3	HP1	HP2	HP3
%age	50.4	52.2	44.0	50.5	37.8	47.5	49.4	57.7	48.95
Extract:	BL1	BL2	BL3	CL1	CL2	CL3	HL1	HL2	HL3
%age	41.3	61.6	39.5	35.6	49.4	45.6	62.85	45.5	54.0

As the table shows, the proportion of material processes is consistently high, without being consistently similar. Given the different rhetorical demands on writers, even within one genre, it would, of course, be unrealistic to expect the proportion of material processes to be exactly similar in any group of texts. However, the lowest figure here (CL1: 35.6%) is still over one third of all processes; while the highest (HL1: 62.85%) is nearing two-thirds of all processes in that set of extracts. There is no discernible pattern here of popular articles containing a greater proportion of material processes; both learned and popular articles spend a considerable amount of time expressing actions and events in the world.

Figure 2 below shows the distribution of main participants (Actor, Range and Goal) in the material processes.

Table 2: Proportion of Participants in Material Processes

Extract:	BP1	BP2	BP3	CP1	CP2	CP3	HP1	HP2	HP3
%age Actor	26.1	24.7	20.0	21.1	18.9	21.15	24.2	24.6	21.15
Range	10.55	13.1	16.5	18.3	11.8	19.2	13.1	15.4	14.7
Goal	8.3	8.1	3.5	5.55	3.1	4.8	4.6	6.9	1.9

  

Extract:	BL1	BL2	BL3	CL1	CL2	CL3	HL1	HL2	HL3
%age Actor	17.0	23.9	18.1	13.9	12.7	14.65	30.1	18.5	23.2
Range	15.4	21.4	16.8	13.9	21.4	16.4	22.15	13.5	20.3
Goal	2.6	6.8	1.3	3.6	4.0	7.8	6.25	4.5	6.3

The results indicate that Actors and Ranges are the most common participants in material processes, with Actors figuring most prominently, certainly in popular texts. There is a slightly lower proportion of Actors in learned texts (perhaps excepting



the History articles). This possibly lends some support to the widespread popular view that passives are more common in learned scientific texts, although it should also be noted here that the differences are such that they may not be statistically significant. Tarone (1981) gives a detailed examination of passives in astrophysics articles, arguing that actives are also widespread in scientific texts. The results here support her findings; my only tentative modification is that there may be less focus on Actors in learned scientific texts than in popular texts. There is a corresponding focus on Range in learned scientific texts, but not on Goal. The indications -- admittedly slight -- are that popular articles are likely to express actions/events in the world as initiating Actors realising material processes through a second participant (usually itself unaffected); learned articles often do the same, but have a slightly greater tendency than popular articles to express actions/events simply as a participant through which a process is realised. History articles prove the exception to the pattern of learned texts: presumably given the nature of the discipline, namely, to examine the causes and effects of actions in the past, there is a greater tendency to focus on Actors -- such a tendency would not be contradicted by Figure 2, although again there is not a substantially greater proportion of Actors in the History articles, except perhaps HL1.



Figures 1 and 2, then, support the broad generalisation that all the texts under consideration favour material processes, and that Actors and Ranges figure prominently in those processes. More tentatively, they suggest that the focus on Actors is greater in popular scientific and all History articles -- all of which may plausibly have a keen interest in making explicit the agency involved in processes. Popular scientific texts would make agency explicit for an uninitiated audience; popular and learned History texts would have agency of past actions as a primary disciplinary concern.

The analysis so far is only partially useful: it reveals the similarly high proportion of material processes realised in the popular and learned articles. But the bare figures fail to distinguish, for example, between material processes which have concrete participants and represent events in the physical world (eg "Divers encounter them [ie brittlestars]" in BP1) and material processes which have abstract participants and take place, for example, in the world of information (eg "The fossil record... provides the only direct evidence..." in BL1). In order to give an overall picture of subcategories of material process, one would have to add a whole new descriptive apparatus to functional grammar -- subclassifying material processes and participants according to their lexical meaning. Such an undertaking, making functional grammar increasingly "delicate", is outwith the scope of this study. Here we shall simply look in detail at a number of matched extracts and

attempt to identify certain recurring patterns in the types of material processes and participants found in our learned and popular articles.

As we saw in Chapter Two, particular settings tend to be favoured by different genres: learned articles lean towards nominalised and research-oriented themes. It is not surprising that such tendencies extend to non-thematic processes. Table 1 in Appendix E lists all material processes and participants in eighteen selected extracts (one per article). Using principally those extracts for illustration, we shall consider three characteristic features of some or all genres: nominalisation, research orientation, and abstraction. Some of these subjects arose in Chapter Two; here we shall deal with them in greater depth.

#### 3.4.1.1 Nominalisation

All the articles under consideration show some tendency towards nominalisation, that is, some participants in material processes are themselves processes. Examples from the popular texts include "the work" (BP3: 4), "the excitatory and inhibitory connections" (CP1: 3) and "urbanisation" (HP3: 6). However, although nominalisation is a feature of all our articles, there is some evidence that it will more probably occur in learned texts. This evidence is quantitatively very slender but qualitatively interesting: in the texts we can occasionally find short passages which convey similar



propositional content but in slightly different ways. I shall argue that the differences are regular and therefore significant. In the examples that follow, the material process is underlined in the popular article, and the corresponding nominalisation is underlined in the learned article.

1a Wrasses and other reef fish ate virtually all tethered brittlestars in the Bahamas, the Virgin Islands and Belize. In stark contrast, they all survived in Sweetings Pond.  
(BP1:5)

1b When assemblages of ophiuroids comparable in density to those in Sweetings Pond were exposed in open arenas (from which they could not escape) at a coastal site off Eleuthera, the brittlestars were completely consumed. No significant ophiuroid mortality occurred in similar arenas in the lake.  
(BL1:5)

2a Not one brittlestar in a Jurassic population from Dorset was regenerating an arm.  
(BP1:8)

2b Of 55 well-preserved specimens of *Ophiomusium weymouthiense* from the Late Mid-Jurassic of Weymouth, Dorset, housed in the collections of the British Museum (Natural History), only one showed arm regeneration (Aronson, personal observation).  
(BL1:8)

3a Nigel Easterbee is trying to sort out this problem with Alexandra Hubbard by looking at differences in the DNA of wild, domestic and hybrid cats. He is also working with Richard Boid and Steven to look at genetic markers in the blood of cats. It should be possible to find out how much interbreeding has been going on, where it is happening and whether there are any pure-bred wildcats left in Scotland. The work has only just begun so that it will be some time before we know the extent of the threat to the Scottish wild cat.  
(BP3:4)

3b Whether 'pure' wildcats will ever become re-established can only be determined by similar future studies. A revision of the analyses reported here, after, say, 20 years or so, could show whether the 'pure' form of the wildcat is effectively extinct in Scotland.  
(BL3:4)



4a A useful analogy captures some of the flavour of this processing: the way commodity prices are fixed in the open market. In such a market, we find only the local interactions of buying and selling, albeit a large number of them.

(CP1:3)

4b A homely example (which I first heard from J. Stone) is that of the open market place. Here global patterns of supply and demand are established by local interactions of buying and selling.

(CL1:3)

5a Once the computer finds the viewpoint, it projects its model of the object onto the image from this viewpoint and predicts new matches. As the computer finds new matches between edges, it adjusts its estimate of the viewpoint to take the new information into account. The process ceases when no more matches are left.

(CP2:5)

5b The initial viewpoint estimate for the model (shown in figure 6a in dark blue) is made by using simple linear approximations. This is then refined as shown in figure 6b by two iterations of Newton's method (shown in dark blue), producing a least-squares viewpoint estimate (shown in red).

(CL2:5)

The examples (1 and 2 above) from BP1 and BL1 show straightforward examples of nominalisation in the learned article: "survived" becomes "no...mortality"; "was regenerating" becomes "regeneration". BP3 (example 3) does not show such a direct match: the popular article nevertheless expresses the present research in terms of actor ("Nigel Easterbee") and material process ("is trying to sort out"), whereas the learned article expresses the consequences of such research in terms of a nominalisation ("A revision of the analyses reported here"). Nominalisations figure in both popular and learned articles in example 4. However, in CP1 one participant is concrete ("we"), and the nominalisation ("the

local interactions of buying and selling") is the range of the process "find". In the learned article this range becomes the passive actor, and the range is another nominalisation ("global patterns of supply and demand"). In the final example, the actions of the computer ("projects...predicts...adjusts") become a nominalisation ("the initial viewpoint estimate") which is then "refined". In all the examples given, the learned texts put a greater emphasis on nominalisation than their popular counterpart. There is no discernible contrary pattern of popular articles favouring nominalisation in close matches of the kind exemplified above. It is worth noting that this pattern is not found in the few history articles studied here: as in the thematic analysis of Chapter Two, the process and participant types seem similar throughout the learned and popular texts in this genre.

We have already discussed the views of Francis (1989) on the use of nominalised themes; more generally, Halliday (1988) offers an explanation of the use of a high proportion of nominalisations throughout learned scientific discourse. Referring to nominalising strategies in the work of Sir Isaac Newton, he writes:

By nominalizing in this way, Newton is achieving two important discoursal effects:

1. packaging a complex phenomenon into a single semiotic entity, by making it one element of a clause structure, so that
2. its rhetorical function -- its place in the unfolding argument -- is rendered fully explicit.

(Halliday 1988: 168)



The key idea here is "the unfolding argument". Bazerman (1988: 80-127) offers a comparison of various writings by Newton: articles, books, lectures and notebooks. What distinguishes the articles from the notebooks and lectures is an argumentative structure. In Bazerman's words:

[Newton's] lectures, because aiming at a complete exposition, do have a structure, but not an argumentative one -- they are tedious and argumentatively confused in the accepted, pedagogically useful, academic sense. Here [in his article] he has neither the space nor the appropriate relation with his audience to be the tedious professor.

(Bazerman 1988: 99)

What applies to Newton also applies to modern scientific writers: in a learned article the authors' authority is subject to scrutiny by their peers. An argumentative structure is necessary if the writer is to be accepted into the scientific community. However, such an impetus is less necessary in a lecture, or indeed a popular article, where the author has a certain given authority, and the argument may be downgraded or curtailed.

This concept of the importance of the "unfolding argument" to learned articles also corresponds to the distinction that Myers (1985b) makes between "the narrative of science" found in learned biology articles, and "the narrative of nature" found in their popular equivalents. In the former, information and facts are manipulated in arguments, and their realisation through processes, including material processes, involves the abstraction of participants. In the latter, events happen in



the physical universe and are represented by participants corresponding more directly to "concrete" entities. Therefore, as we have seen in our examples, the popular article reports facts "transparently" (eg "[the computer] projects its model of the object"), whereas the learned article nominalises the event to transform it into a stage in an unfolding argument (eg "the initial viewpoint estimate is made").

Our observations support a greater degree of nominalisation as part of a necessary argumentative strategy -- at least in scientific texts. As noted, the history articles do not fall into this pattern so easily. We may speculate as to why this may be the case, although further study would be required to confirm or deny our speculations.

The scientific disciplines from which our articles are drawn -- biology and computing -- rely for their data on observation and/or experiment. Events are observed in natural or laboratory conditions and reported via the narrative of nature, or transformed into arguments via the narrative of science. History, in contrast, relies upon data different in kind: a chronological record of events. The very act of historical writing -- popular or learned -- involves transforming this chronological sequence into an argument of causes and effects. Thus even popular historical writing is likely to have a relatively high proportion of nominalisations: a supposition borne out by the extracts analysed here. Nominalised processes

taken from the popular history articles include "class conflict" (HP1:3, also found in its learned counterpart), "open opposition to the war" (HP2:4), and "urbanisation", and "a substantial and growing amount of crime" (HP3:6). It is possible -- though I would hesitate to push this argument too far -- that the double nature of scientific narrative, both as observation of facts and as construction of argument, has led to a popular misconception of all scientific writing as objective: somehow outside the constraints of argument, simply the transparent recording of observation. Historical writing, however, perhaps shares with the other humanities a fundamental argumentative base, and has no equivalent to the "narrative of nature". Nominalisation is therefore to be expected in both popular and learned historical writing.

#### 3.4.1.2 Argumentative and Observational Narratives

We have seen that the drive towards nominalisation in learned articles is fuelled by the necessity to create an argumentative structure in contrast to the tendency of popular articles to favour the raw description of observation. I prefer the terms "argumentative" and "observational" narratives to Myers' "narratives of science and nature", if only because the present study extends beyond the discipline of biology. Chapter Two found a "research orientation" in learned articles, that is, a tendency to find thematic participants and circumstances which established a framework for the message in the research literature rather than the physical world. I would argue that



both within and outwith the theme, the research itself becomes a participant in the processes found in learned articles. To conclude this section, I wish to take a detailed look at three matched extracts (all found in full in Appendix B and summarised in Appendix D): BP1:5 and BL1:5, CP2:5 and CL2:5, and HP3:6 and HL3:6. These extracts will illustrate how the learned and popular articles differ in narrative motivation.

The two biology extracts describe a key incident: experiments to measure the effect of modern predators on brittlestars, and their results. These sections are interesting partly because they do represent tangible events in the physical universe: the author tied some brittlestars down in various locations to find out what would happen to them. Some were eaten, some were not. This event is represented in different ways in the learned and popular articles.

The first, obvious, point is that the popular article is more extensive than its learned counterpoint; that is, it contains considerably more material processes. A probable reason for this is that the experiment that the passages describe is essential to the popular article because it provides the clinching "clue" which will solve the "murder mystery" of the title. In the learned article, on the other hand, the same experiment functions more as circumstantial evidence: one jigsaw piece, small but important, which when added to those contributed by other researchers will help clarify the overall



picture. As we shall see in Chapter 4, there is a rhetoric of modesty in learned articles, whose function is to downplay the contribution of the author, by placing it in the context of the contributions of the scientific community. In contrast, popular articles favour individual enterprise rather than the recognition of community effort.

Secondly, as we have noted above, the participants in the processes are markedly different in character. The ostensible actors in BL1:5's seven processes are a lake (twice), density, mortality, and Aronson and Harms (1985) -- this last is the authors' distancing reference to themselves via their research. Only twice are the actors actually animate: brittlestars. In almost diametric opposition, the popular article favours animate actors such as cod, starfish, ballan wrasses, the animals and Ophiocomina nigra. The author refers to himself directly as "I", and only twice in nineteen cases is the actor inanimate: once in the general "Nothing much happened" and once again in "The results mirrored..."

This pattern is repeated in the extracts from the computing articles. Here the articles describe the process by which computers recognise the edges of disposable razors in a bin of parts -- no mean feat for computer vision.

The eleven material processes in the popular extracts contain four animate actors: the computer (four times). An inanimate

actor "Newton's method" participates in three processes normally associated with animate beings ("starts...measures...calculates"). There are two nominalised processes ("the process" and "the search"), one place ("the search area") and an inanimate entity ("many uninterpreted edges") in the actor slot. A sizeable proportion of the description involves animate or quasi-animate actors in material processes.

In contrast the learned article contains no animate actors in twenty material processes. The nearest equivalents are a series of references to diagrams in the article -- "Figure 4 shows..." etc -- which are part of this extract's research focus. Five of the processes have this type of actor. Many of the processes are passives and therefore do not have actors (eleven of the twenty processes). Of the remaining four actors, two are abstractions ("the SCERPO vision system" and "the viewpoint consistency constraint"), one is a place ("the search space") and the last is a nominalisation ("all the remaining matches").

In short, an analysis of the material processes in these four extracts suggests that the learned article favours inanimate actors, such as nominalised processes, places, and research. The material processes in turn serve less to represent processes in nature and more to represent the place of the participants in the unfolding argument. In the popular

article, animate participants in material processes tend to represent events in the physical universe.

Finally, let us consider two matched extracts from the historical articles. Both HP3:6 and HL3:6 consider the historical relationship of crime with other variables, such as poverty, urbanisation, the price of food, and so on. The popular article contains six material processes; none have animate actors. Two are passives; two have a nominalised actor ("urbanisation", twice); one is a place ("London and the big provincial cities and towns"); and the last is a quantity ("a substantial and growing amount of crime").

The learned article is not so different. Of its ten material processes, only one has an animate actor ("more took to this form of self-help"). Four clauses are passives; of the actors in the remaining clauses, two are nominalisations ("this relationship"; "rising prices"); the final three may be said to exist in the world of research or information ("Samaha (1974) and Cockburn (1977b)"; "the major peaks in indictments" and "the recorded levels of property crime"). Indeed, the focus on actors from the world of research is the only substantial difference here between the learned and popular article. There is little quantitative evidence here, of course, but if we are correct in saying that both learned and popular historical texts share an argumentative narrative (unlike popular and learned scientific texts), then there may still be a difference



in that learned texts may be more likely to place their participants in the world of research.

Our analysis of material processes in the learned and popular articles has suggested some regularities which distinguish scientific texts of those types. We have argued that the two narratives, observational and argumentative, are associated with two distinct perceptions of the scientific discipline: the (popular) reported observation of physical events, and the (learned) transformation of these observed events into an argument. The former perception results in the linguistic deployment of animate actors and material processes representing events in the physical world; the latter perception results in the nominalisation of these processes to allow them to be tokens in an argumentative strategy, and a preference for participants and processes taken from the world of research. We have seen that historical articles do not fit easily into the pattern established by scientific texts, and we have suggested that this is because an argumentative strategy is fundamental to the discipline of history: one cannot simply observe and describe historical events. Popular and learned historical articles therefore share an argumentative narrative. However, there is some slight evidence that learned historical articles share with learned scientific articles a preference for participants and processes from the world of research.

### 3.4.2 Relational Processes

Closely following material processes in importance in our learned and popular articles are relational processes. The proportion of relational proportions in each set of extracts is given in the table below:

Figure 3: Proportion of Relational Processes

Extract:	BP1	BP2	BP3	CP1	CP2	CP3	HP1	HP2	HP3
%age	33.7	28.0	42.0	30.7	40.5	45.9	34.1	15.5	30.2
Extract:	BL1	BL2	BL3	CL1	CL2	CL3	HL1	HL2	HL3
%age	36.5	26.0	38.4	40.2	34.9	41.2	25.7	22.3	27.95

As this table shows, relational processes, like material processes, are consistently numerous, without there being a marked similarity between texts. Again, there is no discernible pattern of learned texts having a consistently higher level of relational processes than popular texts, or vice versa. The only generalisation that these figures allow is that both popular and learned articles spend almost as much time expressing processes of being as they do expressing actions and events in the world.

The only noticeable exception to this broad generality is HP2, which contains only 15.5% of relational processes. There is a correspondingly high proportion of material processes (57.7%) in the same set of extracts. HL2 also contains the lowest proportion of relational processes among the learned articles. A possible reason for this is that HP2 and HL2 are the only

texts which are principally concerned with the actions of people, namely covenanters and the supporters of King Charles in the Bishops' Wars. The other history articles are concerned with the rise of seaside resorts and changes in the crime rate. It is likely that the rhetorical constraints of the subject matter determine that HP2 and HL2 downplay processes of being in favour of the actions of the people and groups. It is notable that both the learned and popular articles share this tendency, which suggests that even within the genres we have defined the content matter plays a major part in determining the types of processes employed.

Figure 4 below shows the distribution of participants in relational processes:

Figure 4: Proportion of Participants in Relational Processes

Extract:	BP1	BP2	BP3	CP1	CP2	CP3	HP1	HP2	HP3
%age									
Token	10.0	10.1	11.8	9.4	15.0	11.5	12.4	2.3	16.0
Value	10.0	8.1	14.1	10.9	15.0	9.6	12.4	2.3	15.4
Carrier	6.1	4.0	9.4	5.45	4.7	7.7	5.9	5.4	2.6
Attrib	6.1	4.0	9.4	5.45	4.7	7.7	5.9	5.4	2.6
Poss.'r	1.7	3.5	1.2	1.8	3.9	6.7	0.65	0.8	0.6
Poss.'d	2.2	3.5	1.2	1.8	3.9	6.7	0.65	0.8	0.6

  

Extract:	BL1	BL2	BL3	CL1	CL2	CL3	HL1	HL2	HL3
%age									
Token	10.1	10.25	8.05	15.15	11.1	16.4	5.7	7.0	10.3
Value	10.1	9.4	7.4	13.3	11.1	16.4	3.4	5.0	9.6
Carrier	8.5	4.3	9.4	6.1	7.1	6.0	5.1	3.5	4.4
Attrib	8.5	4.3	10.1	6.1	7.9	6.0	5.1	3.5	4.8
Poss.'r	1.6	0.85	3.35	2.8	4.0	0.9	4.5	2.0	1.1
Poss.'d	1.6	1.7	3.35	3.3	4.0	1.7	4.5	2.0	1.1



Since the participants associated with relational processes are usually (but not always) matched one-to-one, the proportions for Token and Value, Carrier and Attribute, and Possessor and Possessed are often identical. As Figure 4 shows, in the majority of cases (learned and popular), processes of being involve the giving of a value to a certain token. The assignment of a descriptive attribute to a carrier is less common -- the two exceptions being HP2 (again) and BL3. BP3 also contains a relatively high proportion of Carriers/Attributes. Again this apparent discrepancy may be explained by referring to the content of the articles: HP2, as we have said, focuses on the covenanters and royalists in the Bishops' Wars. We would expect a high level of description in this kind of article, although it seems that the descriptive emphasis is lessened in the learned article. BL3 and BP3 are concerned with the differences between various types of domestic and wild cat, and their hybrids. Once more we would expect a high degree of description here -- perhaps more extensively in the learned article this time. BP3 and BL3 have to establish the characteristics which distinguish three categories of cat. The other biology articles do not have the same descriptive motivation: BP1 and BL1 seek the answer to the problem of why ancient ophiuroids became extinct; BP2 and BL2 seek to find when the "original mother" of all people was alive.

Relational processes of possession are the least common in all the extracts analysed -- a finding which is not very

surprising. In general the analysis shows that the main business of processes of being in learned and popular articles is to assign values to tokens (or, as we shall shortly see, to assign tokens to values). Then attributes and carriers are matched, and, lastly, relationships of possession are expressed. In the next section, we shall consider in more detail the types of relational participant found in some closely-matched extracts.

#### 3.4.2.1 Types of participant in relational processes

The tendency towards learned and popular articles favouring certain types of relational participant is less marked than the tendency towards certain types of participant in material processes. Again there is some little evidence that participants which represent entities in nature in popular articles are transformed into nominalisations in learned articles:

Ophiothrix oerstedii are 100 times more abundant...  
(BP1:5)

The ophiuriod density...is two orders of magnitude higher...  
(BL1:5)

However, there is a high proportion of nominalisations among all the participants in the relational processes of learned and popular articles. Examples from the popular texts include "predation" (BP1:5), "graceful degradation" (CP1:3), "the first

step in recognition" (CP2:5), and "class conflict" (HP1:3).

One of the discourse functions of relational processes is evidently to assign a value or attribute to a material process which is implicit or explicit in the context:

In stark contrast to coastal non-specifics, Sweetings Pond brittlestars expose themselves night and day. This behavioural difference is causally related to the difference in predatory activity by fishes (Aronson 1985).

(BL1:5)

All classes mingled in Edwardian Blackpool at the Tower Ballroom and Winter Gardens, for example; but for the most part, the classes continued to be segregated geographically, residentially or (in a few cases) seasonally, at the seaside just as they were inland. The social harmony of the Edwardian seaside, such as it was, owed more to class segregation than to social integration.

(HP1:3)

In both examples above, the underlined phrases show a material process and equivalent relational participant. Given that the function of relational processes is to assign values and attributes to participants, it is not surprising that many of these participants -- in both popular and learned texts -- are nominalisations of important processes. However, as noted, there is still a slight tendency for popular articles to favour participants representing objects from nature. One further example from BP1 and BL1 supports this claim:

Brittlestar beds are interesting for what they tell us about the past.

(BP1:1)



Of particular interest have been recent efforts to uncover causal connections between physical events of global and even galactic magnitude and periodic, catastrophic extinctions (Alvarez et al. 1980; Silver and Schulz 1982; Raup and Sepkoski 1984).

Equally interesting to both neontologists and paleontologists are the dynamics of biotic interaction that caused global-scale community interactions.

(BL1:1)

In the popular article the "interesting" participant is an object from nature, "brittlestar beds"; in the learned article it is first of all a nominalisation, "efforts", and secondly a label given by scientists to a pattern of behaviour "dynamics of biotic interaction". Both participants in the learned article are here distanced from the natural world.

Participants deriving from the universe of research are less evident in relational processes. Those which are to be found are distributed throughout both the learned and popular texts. Again, as relational processes are used to express the significance of entities and processes, so they are also used to give the value or attribute of previous research, and stages or components of the present work. Such processes include:

The results were identical... (BP1:5)

The predation argument would be even more convincing... (BP1:5)

This [estimate] fits with data from other species... (BP2:4)

A homely example...is that of the open market place. (CL1:3)

Generally, compared to material processes, relational processes are quite similar in learned and popular articles.

In both genres they are not concerned with describing events in

various "worlds" -- of nature and of science -- but with giving attributes and values to different kinds of participant. This function remains constant among the the various genres analysed.

#### 3.4.2.2 Order of participants in relational processes

Before leaving the topic of relational processes, it is useful to consider the order of participants involved (assuming for now that attributes, for example, can be classed as participants). The unmarked order is Carrier-Process-Attribute and Token-Process-Value (cf Halliday 1985: 115-118). However, different, marked, orders are common (they are marked in Appendix E, Table 2, by an asterisk, \*).

One common way of reversing the order of participants is to use a cleft sentence:

It is...more than coincidental that there are no reef fish that eat brittlestars in this lake... (BP1:5)

it is equally possible that the exodus occurred as recently as 23-105 thousand years ago... (BL2:4)

It is critical that we find out exactly what is happening to the Scottish wild cat... (BP3:4)

It is in this sense that distributed models...provide alternatives to a variety of models... (CL1:3)

it is unlikely that more than a few matches will be consistent with the initial estimate of the viewpoint... (CP2:5)

it was not until the twentieth century...that most working-class day-trippers became metamorphosed into staying visitors (HL1:3)



Cleft sentences can put Tokens/Carriers into the new position in the clause (cf Quirk and Greenbaum 1973: 414ff); it is notable that the Tokens and Carriers are all subclauses: in other words, a complete process with participants is given a value or attribute in a relational process, and is also slotted into the new position in the clause.

The examples given above show that the value given to the token is frequently one of possibility ("it is possible/likely/unlikely", etc). Other types of value here include explicit expressions of the significance of the token ("it is critical"), specific definitions ("it is in this sense") and common circumstantial values ("it was not until the twentieth century").

The first two of the above categories of value -- possibility and significance -- make this kind of expression suitable for the end of a discourse unit. An evaluation of possibility or significance falls naturally towards the end of discourse units (for a discussion of discourse units, see Chapter Five):

PROBLEM	The trouble with skull measurements is that we can not really be sure what is happening.
---------	--

RESPONSE	Nigel Easterbee is trying to sort out this problem with Alexandra Hubbard by looking at differences in the DNA of wild, domestic and hybrid cats. He is also working with Richard Boid and Steven McCrorist to look at the genetic markers in the blood of cats.
----------	--

EVALUATION OF RESPONSE	<u>It should be possible to find out how much interbreeding has been going on, where it is</u>
---------------------------	--



happening and whether there are any pure-bred wildcats left in Scotland. The work has only just begun so that it will be some time before we know the extent of the threat to the Scottish wild cat.

(BP3:4, Conclusion)

If cleft sentences are common in the concluding stages of discourse units, other "reverse" relational processes are common at their beginning:

A homely example...is that of the open market place.  
(CL1:3)

The first step in recognition is to find a promising correspondence between a few features...  
(CP2:5)

The processes begin with an easily-grasped Value (often specifically part of an argument or sequence, as here), and this is related to a new or salient Token, which is then expanded upon. These functions of reverse relational processes, to kick-start or conclude a discourse stage, are evidently found in both learned and popular articles.

### 3.4.3 Other Processes

Material and relational processes are by far the most numerous of the processes found in our articles. Behavioural processes are by far the least significant (there is one instance in all the extracts), and existential processes are likewise few and far between. Verbal and mental processes are however numerous enough to warrant a brief consideration.

The table below shows the proportion of verbal processes in the extracts from our popular and learned texts:

Figure 5: Proportion of Verbal Processes

Extract:	BP1	BP2	BP3	CP1	CP2	CP3	HP1	HP2	HP3
%age	4.95	11.7	2.0	10.9	1.35	0	2.35	4.2	13.5
Extract:	BL1	BL2	BL3	CL1	CL2	CL3	HL1	HL2	HL3
%age	11.5	4.1	10.5	13.8	3.6	8.8	0.95	15.2	9.9

In six of the nine pairs analysed here, the learned article has more verbal processes than its popular counterpart. This lends some support to the observation that learned articles are more concerned with the explicit construction of arguments: not simply reporting events but saying what the events signify. The conclusions of BP3 and BL3 contain claims which follow this pattern:

It is possible that now the Scottish wild cat population has stabilised, hybridisation with domestic cats is reduced. Or, a new type of wild cat may have evolved with a mixture of wild and domestic cat features.

(BP3:4)

Our results suggest that a (possibly considerable) part of the apparent increase in 'wildcats' is probably not due to 'true' wildcats but to hybrids... We therefore suggest that there may be a slow drift back towards the old (pure) wildcat type; slow because of the increased opportunities for backcrossing.

(BL3:4)

The claims, modified in the popular article by "it is possible" and the modal "may", are modified in the learned article by being cast as suggestions. Despite the modalisations, the

popular article forms its claims as facts; the learned article forms its claims as verbalisations by the authors (and indeed their results).

Figure 6 shows the distribution of mental processes:

Figure 6: Proportion of Mental Processes

Extract:	BP1	BP2	BP3	CP1	CP2	CP3	HP1	HP2	HP3
%age	7.9	7.2	8.0	7.9	14.9	1.6	12.9	21.1	5.2

  

Extract:	BL1	BL2	BL3	CL1	CL2	CL3	HL1	HL2	HL3
%age	9.6	5.5	5.8	9.2	12.0	0	6.7	16.1	5.0

The pattern of the verbal processes is here reversed: in seven of the nine pairs, the popular article contains a greater proportion of mental processes. However, the differences in percentages are comparatively smaller, and may not be significant. CL2 and HL2 have the largest proportions of mental processes: again the content may explain the apparent anomaly. CL2 is concerned with computer vision -- and therefore there is likely to be a relatively high proportion of mental processes; HL2, as we have noted already, is concerned with human actions in the past, and therefore it is more likely that the participants will take part in mental processes. The corresponding popular articles also show a relatively high proportion of mental processes, which would support this claim.

#### 3.4.4 Circumstances

We shall conclude this chapter by considering the main type of



circumstance found in our texts. As Appendix E, Table 3 shows, the thematic tendency towards locational circumstances is continued in the texts as a whole; the other main type of circumstance is that of Reporter in some learned articles. The remaining circumstances show up infrequently in the texts and consequently little else can be said about them. Figure 7 shows the proportion of the three main types of circumstance in the extracts analysed:

Figure 7: Proportion of Circumstances

Extract:	BP1	BP2	BP3	CP1	CP2	CP3	HP1	HP2	HP3
%age									
Place	46.1	18.4	14.3	29.4	19.0	20.7	31.0	25.3	22.7
Time	9.0	8.0	30.95	8.8	19.0	18.5	18.0	22.8	27.3
Reporter	0.0	1.1	2.4	2.9	2.4	0.0	0.0	0.0	1.1

Extract:	BL1	BL2	BL3	CL1	CL2	CL3	HL1	HL2	HL3
%age									
Place	25.5	32.7	14.6	18.9	28.75	32.9	32.2	19.5	17.0
Time	6.9	9.1	20.4	11.3	8.75	10.0	30.9	32.2	13.5
Reporter	27.45	0.0	6.8	7.5	0.0	2.9	0.0	0.0	25.0

Given the greater number of circumstances (compared to process types) from which to choose, it is not surprising that there is a greater variation between the percentages shown in Figure 7, compared to those seen in earlier tables. The most common circumstance type is obviously Place. In both learned and popular texts, processes are most likely to be anchored to a location in space, whether this space is abstract or concrete. Neither learned nor popular texts have a greater tendency to favour this type of circumstance: in both sets of texts the

proportion varies roughly from 15-35%. One set of extracts (BP1) has an unusually high proportion (46.1%): it is evidently extremely important to communicate the location of anachronistic brittlestar communities, clues to the solution, to the general reader. There is a substantial proportion of Place circumstances in the learned text too, but here they take second place to the Reporter circumstances.

Time is also a useful "anchor" for a process, and as we would expect, this circumstance is especially marked in History texts, learned and popular. There is also a high proportion of Time circumstances in BP3 and BL3, both of which concern the differences between types of cat (wild, domestic and hybrid) in Scotland. Time is evidently an important part of the narrative in both the popular and learned texts: the texts seek to establish when 'pure' wild cats began interbreeding with domestic cats to produce the hybrids.

The predominance of Place and Time circumstances in texts seeking to make knowledge claims about the world, past and present -- that is, all the texts under consideration here -- should cause us no surprise at all. Bazerman (1988: 141) talks about the importance of "representation" in the development of the genre of experimental article:

With the failure of ethos as the primary means of validating results unwitnessed by others, the burden of persuasion fell on detailed accounts of each individual experiment -- that is on the representation: to establish the proper procedure (that is,



the experiment is done as any scientist might have done it), to specify all the conditions and procedures (that is, replication instructions), and to indicate how the experimental procedure answers potential objections.

Not all the articles that we are considering here hinge on experiments -- the History articles obviously do not. However, the prestige of the experimental article has shaped the non-scientific article in the emphasis put on procedure and "specifying all conditions". In a scientific article this specification would normally include details of where and when procedures take place (as well as order of events, realised through such textual items as ordinals). In a History article identifying the location of events in space and time is a necessary precursor to establishing causation. Circumstances of Time and Place therefore should be plentiful in all our learned and popular articles. It remains to be seen whether all the circumstantials are of a similar nature.

Appendix E, Table 3, shows all the circumstances of place and time in the introductory and concluding sections of the learned and popular articles. As observed in Chapter Two, the learned articles have a far greater share of circumstances of place referring to the text itself (eg "in this chapter" (BL1), "in this paper" (BL3), "in what follows" (CL1), "in this paper" (CL3)), and to other research literature ("in the same monograph" (HL3)). These circumstances are often thematic. A review of all the circumstances in the introductions and conclusions bears out the observations of Chapter Two, with a



minor modification. Non-thematic circumstances of place in the popular article HP1 refer several times to general literature on the topic: eg "into textbooks and general interpretations", "on the textbook and the school examination syllabus", "in general analyses of urbanisation and social change during the key decades of transition...". There is also a reference to a more learned text, Town, City and Nation: England 1850-1914, but this is explicitly in the context of the learned work filtering into the school syllabus and general knowledge.

HP1 is the only substantial example of this type, but it offers some support for the claim that popular History texts are more self-consciously argumentative than their scientific counterparts: as a learned article is created in an explicitly academic context, so some popular History texts -- at least -- are created in a more general but still knowledgeable context: a context of school examinations and what the educated layman should know. If we, fancifully, view the learned work as the sun, the popular article is the moon whose reflected beams offer the layman some measure of enlightenment.

Given that circumstances may be expressed in a wide variety of ways, we should not expect too many close "matches". An analysis of one set of extracts at random (BP3/BL3) gives an idea of the comparability and contrasts in the realisation of circumstances of time and place.

The circumstances of place in BP3 concentrate on the origins of the present threat to the Scottish wild cat ("not from man but from the feral domestic cat") and on the exotic ancestors of the British cat ("in Cyprus and the Near East"; "in the tombs of Ancient Egypt"). BL3 focuses very much on home territory, giving the former distribution of wild cats in Britain, the regions from which they are now excluded, and the present distribution of feral domestic cats. The other two place circumstantials in the learned article refer to "abstract" space (the recovery of the wild cat "from its nineteenth century 'low'") and to the article itself ("in this paper").

The place circumstantials of the popular article are governed partly by "news values" (cf Fowler 1991) -- the popular collocation of cats and magic and the mummies of Ancient Egypt -- whereas the place circumstantials of the learned article are governed more by the demand for precise information on the given subject, wild and domestic cats, and how an argument about these creatures is to be presented.

BP3's time circumstantials refer to the threat to wild cats ("today", "this time"), the domestication of cats ("by about 6000 BC"), two processes (the ruthless eradication and later recovery of wild cats in Britain), and investigations into the degree of hybridisation ("recently"). BL3 refers to the previous wide distribution of wild cats ("formerly"), the earliest known examples of cats in Britain ("at least as far



back as the Pleistocene"), their near eradication ("by the end of the 19th century"), the introduction into Britain of domestic cats ("much later, in about the 11th Century" or "earlier"), the present distribution of feral domestic cats ("now"), the recovery of the wild cat population ("over the past sixty years or so", "in recent years").

There is less of a marked difference between the time circumstantials of popular and learned articles: both articles refer to the decline and subsequent recovery of wild cats, and to details about the domestication of cats. Compared to place circumstantials, those of time are apparently less susceptible to the demands of a good story versus a detailed argument.

Turning now to circumstances which refer principally to previous research (reporter circumstantials), we can see in Figure 7 the widest variation so far in proportions (0-2.4% in the popular articles; 0-27.45% in the learned articles). Part of the wide variation in the learned articles is accounted for by the style in which the article is written. If the research reference is given in the text -- eg in the form "(Aronson, in press)" -- then it shows up in the table. If, however, the research reference is in the form of a superscript footnote reference, it is not included in the linguistic analysis.

Given the variations, it is nevertheless clear from Figure 7 that there is a greater tendency in the learned articles to



favour reporter circumstantials: two of the three scientific texts have a proportion at least equal to and usually substantially greater than the highest percentage in the popular texts, and one of the History articles -- admittedly a literature review -- has 25% Reporter circumstantials. However the references to research are indicated -- by footnote or Reporter circumstantial -- learned articles are thus characterised as highly allusive discourses. The explicitly intertextual nature of learned articles is an aspect of their apparent impersonality: many of the processes expressed are presented as points in a communal argument, jigsaw pieces marshalled by an authoritative initiate of arcane knowledge. The reader is constantly made aware of a community of researchers and an accumulation of research, climaxing in the present study. Such a high degree of allusion is less evident in popular articles where researchers and their pronouncements, though often present, are few: academics here are lonelier figures, unravelling their mysteries in charismatic isolation.

A final point to note about circumstances is that, with lexical choice and noun phrase modification, their frequent expression is possibly a marker of the higher degree of specification in learned articles. Compare the following close matches from different articles (circumstantial expressions are underlined):

- 1a A second requirement for brittlestar beds is that the water must be relatively free of churned-up sediment.  
(BP1:4)

1b In the North Sea, burial and smothering is the leading cause of death for ophiurids (Schafer, 1962).  
(BL1:4)

2a Each time the computer locates an object, it remembers the object's position and orientation and removes all of the edges in the image that match edges in the model. As the computer defines more and more objects in the bin of parts for example, the number of remaining edges in the image become fewer and fewer and the search area decreases. The search ends after a fixed time.  
(CP2:5)

2b As each successful match is found, the identified segments are marked as already matched and are no longer considered for further matching. Therefore the search space actually decreases as more and more of the segments in the image are removed from consideration. The final results of this process are shown in figure 8...  
(CL2:5)

In example 1b the presence of a place circumstantial makes the claim more specific than the circumstance-free example 1a. In the more complex example 2a, there are three circumstances in five clause complexes, these being circumstances of time. In the corresponding learned extract, there are five circumstances in four clause complexes, and the range of circumstantial is wider: as well as time (twice) we have role, place and purpose. The examples suggest that learned articles express circumstances more frequently, probably, as Bazerman (1989: 141) claims, to communicate the conditions of the processes all the more clearly in order to make the procedure "experientable" by the critical scientific community.

### 3.5 Summary

Notwithstanding the many remaining theoretical weaknesses of the semantic categories used as a basis for this chapter's



analysis, functional grammar's ideational metafunction still performs the useful service of highlighting areas of contrast and similarity between the learned and popular articles.

Similarity is evident in the types of process which predominate in popular and learned factual discourse: both genres are constructed largely of clauses expressing material and relational processes. Both genres are equally concerned to represent events and actions, and to assign values or attributes to tokens or carriers.

The differences between the genres lie in the province of the events described and the nature of the tokens valued, or the carriers assigned attributes. Popular scientific discourse represents events in the physical universe as its main concern, and assigns values primarily to participants drawn from the physical universe. The discourse of learned science has a greater emphasis on events in an abstract universe of argument -- what Myers would call the "narrative of science".

Correspondingly greater interest is taken in assigning values to the abstract tokens which serve as participants in these arguments. The distinction between science and nature in scientific narratives does not extend to historical discourse: both learned and popular history articles are created in an intertextual context -- although the popular articles place themselves in a "narrative of general knowledge" whereas the learned articles place themselves in a "narrative of



specialised knowledge". Both these narratives are argumentative, and are therefore akin to the narrative of science. They are less like the popular scientific articles in that they do not take up the position of simply coming across facts and recording them.

These various differences should not be seen as absolute: learned and popular discourses, scientific and historical, each contain similar linguistic ingredients in different quantities. It is the shifts in emphasis which offer the reader a different perspective of the same undertaking.

Chapter Four:  
Modality and Genre

4.0 Introduction

So far the structure of this study has followed Halliday's division of the functions of the clause into "metafunctions" which organise the clause as (a) message (theme + rheme), and (b) representation of reality (participants + process + circumstances). In this chapter we shall complete our inquiry into the influence of the perception of an audience on the realisation of the clause, by examining the third and final metafunction, namely the interpersonal function, or the clause as exchange. Halliday (1985) identifies mood as the major functional component which signals the attitude of the speaker or writer both to the audience and to the text. Possibly because academic discourse, and scientific discourse in particular, is generally assumed to be impersonal in style, the subtle ways in which author-reader relationships are determined in this genre have a certain fascination, reflected in a number of studies: Myers (1989) adapts Brown and Levinson's (1987) model to consider the pragmatics of politeness in scientific articles (both learned texts and -- briefly -- popularisations), while Butler (1990) focuses on the use of modal verbs in academic articles and textbooks in biological and physical science. Simpson (1990) combines both a systemic and a pragmatic approach in his analysis of FR Leavis's 1948

article "The Great Tradition".

In the following sections we shall re-examine the concept of mood and attempt to apply it to our data. We shall compare our findings with those of previous researchers in an attempt to determine whether there is systematic variation in the realisation of Mood, according to genre. The pragmatics of politeness and the authors' rhetorical stance in our texts will also be briefly considered.

#### 4.1 Mood

Halliday (1985: 68ff) identifies a small range of possible speech roles in English, the principal ones being the giving or demanding of information or goods and services. Language as exchange of information is made up of propositions; propositions, therefore, are likely to be the majority of clause types in learned and popular discourse. Propositions have a "clearly defined grammar" (Halliday 1985: 70): characteristically these clauses are indicative, that is, they consist of a mood plus residue, the Mood element in turn consisting of subject plus finite. The order and realisation of the subject and finite determine whether the clause is declarative, polar interrogative or wh- interrogative.

##### 4.1.1 Subject

The function of the subject is to supply "something by reference to which the proposition can be affirmed or denied"



act as theme, and so the "thing" by reference to which the proposition can be affirmed or denied will also act as the point of orientation for the audience (see Chapter Two). Moreover, as we have seen in Chapter Three, in learned articles that "thing" often represents an object, state or action from the "universe of science", whereas in popular articles the "thing" is more likely to represent an object, state or action from the "universe of nature". The difference is often subtle but telling; thus we find in a popular article (BP1:5):

<u>Subject</u>	
<u>...Ophiothrix oerstedii</u>	are 100 times more abundant there than they are off the Eleuthera coast

-- and in the corresponding learned article (BL1:5):

<u>Subject</u>	
<u>The ophiuroid density</u>	...is two orders of magnitude higher than that found in nearby coastal habitats

Here, as we saw in Chapter Three, the participants realised as subject in the popular article are drawn from the physical universe -- they are types of starfish -- whereas the participant in the learned article -- density -- is drawn from the abstract scientific universe of measurement and calculation.

The preceding chapters, therefore, have already made some points which relate to the subject, and indeed the status of subject as an independent constituent in functional grammar has

subject as an independent constituent in functional grammar has generated debate: Berry (1975: 77ff) argues that the subject is best regarded as the conflation in unmarked clauses of the theme, initial participant (eg actor, carrier, etc) and mood marker. In support of Berry, Butler (1985: 53-4) writes:

The definition of Subject as mood indicator in Halliday's work betrays a somewhat anglocentric approach: attempts to characterize the notion of Subject cross-linguistically (see Comrie, 1981, p.98ff) have led to the proposal that prototypically the Subject is the intersection of what, in terms of functional roles as discussed here, would be Actor and Theme.

Butler goes on to suggest that the mood-indicating function may not be the best way of identifying the subject in English: first of all, the subject in subclauses does not indicate mood; and secondly, the subject could be characterised equally well and probably better by its syntactic properties, for example by person and number concord with the verb. He concludes that it would be more accurate to categorise subject, predicator, complement and adjunct as syntactic constituents rather than as functional constituents such as actor, goal, theme and so on.

Certainly the constituents SPCA cannot easily be regarded purely or even primarily as functional constituents: to take another example, the adjunct may fall into the interpersonal or ideational category depending on whether it realises a comment or a circumstance in the clause. However, the example also suggests that although the adjunct need not be primarily a functional constituent, it is still associated with certain



functional roles; such an association also holds true for the subject. Therefore I shall continue to regard the subject as a functional constituent on the following grounds:

(i) the language analysis in this study concentrates very largely on independent clauses; the role of subject in subclauses, where it does not indicate mood, is outwith our immediate attention

(ii) more importantly, it is not the main goal of this study to identify and rank the criteria for characterising functional constituents. Berry and Butler accept that the subject has some part to play in the marking of mood, even if this role is not necessarily the best criterion for its classification. The label "subject" is less cumbersome and more accessible than "mood-marker 1", even if the latter is more precisely what is meant in the following discussion.

#### 4.1.2 Finite

The second mood-marker is the finite, the particular function of which, according to Halliday, is to relate the proposition "to its context in the speech event" (Halliday 1985: 75). Halliday continues:

This can be done in one of two ways. One is by reference to the time of speaking; the other is by reference to the judgement of the speaker. An example of the first is "was" in "an old man was crossing the road"; of the second, "can't" in "it can't be true". In grammatical terms, the first is PRIMARY TENSE, the second is MODALITY.



Finiteness may be "fused" with the lexical verb or signalled by the verbal operator. Examples of primary tense and modality from our data would be the following:

<u>Subject</u>	<u>Finite</u>	
Octopuses	are	relatives of the shelled cephalopods, Nautilus, for example, that were important predators before the Mesozoic marine revolution.
		(BP1)

<u>Subject</u>	<u>Finite</u>	
...the abundant octopuses in Sweetings Pond	may	be functional analogues of ammonoids and/or nautiloids in Paleozoic marine communities.
		(BL1)

Halliday would presumably argue that in the above examples the primary tense is present in the first instance and the positive polarity expresses certainty. Non-modal finites are either positive or negative, and so either assert that something is or is not the case. Certainty is implicit in this assertion or denial. In the second example, the modal finite expresses possibility and so uncertainty. Modal finites explicitly express a range of judgements such as possibility, as above, or necessity ("Octopuses must be relatives...").

However, Halliday's summary of the nature of finiteness quoted above concentrates mainly on the role of the finite as an expression of time. In the following sections I shall review the function of the finite and address the associated questions of polarity and modality.

#### 4.1.2.1 Immediate/Remote

As noted above, Halliday divides the mood into two components, (i) the nominal group (subject) which "earths" the proposition, by providing a "thing" to make an assertion about, and (ii) the finite component of the verbal group which "places" the proposition, either in time or according to the speaker's judgement.

The finite therefore has a deictic function, rather similar to determiners in nominal groups: "this/that" locate the nominal headword, usually in space. However, as we have also seen above, the questions of time and judgement are not so easily distinguished: polar finites express an implicit certainty, and pairings such as "can/could" suggest that some modal finites may be associated with concepts of time. Quirk and Greenbaum provide a salutary caution to those who would separate tense and mood: discussing tense, mood and aspect, they note "...to a great extent these three categories impinge on each other: in particular, the expression of time present and past cannot be considered separately from aspect, and the expression of the future is closely bound up with mood." (Quirk and Greenbaum 1973: 40). To complicate matters further, James Thorne, in an article on the language of synopses, argues that the text-type influences the interpretation of tense and aspect. Conventionally, synopses refer to all events in past time using the present simple:



...it is immediately obvious that we interpret the verbs in a synopsis in quite a different way from the way in which we interpret them in a commentary. In a commentary they are used deictically. They are used to relate states of affairs described by the sentences to the time at which the sentences are uttered. But the present tense forms in a synopsis are not used to relate the states of affairs described by the sentences to the time at which they are uttered, nor to any other time. They are not used deictically.

(Thorne 1988: 142)

If tense and mood overlap and also vary according to text-type, the question arises as to the nature of the finite. I believe the answer lies in a partial redefinition of the finite so as to retain the deictic function that Halliday claims, and which appears to be valid. Such a redefinition would bring the finite closer in meaning to the nominal deictic while making it less dependent on the notion of time.

As the core meaning of the nominal deictic is "proximity to the speaker", so the semantic contrast which determines the choice of finite is "immediacy/remoteness to the speaker". In the vast majority of utterances the choice of finite will signal immediacy/remoteness in time, but, as we shall see, other possibilities exist. As we shall also see, such a redefinition of the finite accounts for the use of the present simple in synopses, and allows for the verbs in such discourses to retain a deictic function -- albeit not one which necessarily places the event in time. The choice of finite places a process in close or distant proximity to the speaker principally in terms of:



- a) fact/hypothesis (eg he is singing/he would be singing)
- b) present/past (eg he is singing/he was singing)
- c) real/unreal (eg he has been singing/he would have been singing).

The paradigm of the verb "to sing", (active: third person singular) contrasting immediate and remote finites, is shown below (Table 1). Section A shows non-modal forms; section B shows the main modal forms; and section C gives examples of marginal modals and other analogous verbal constructions. The paradigm given is for exemplification; it is not necessarily exhaustive and does not extend to dubious forms such as Halliday's "will have been going to be taking" (Halliday 1985: 181). The form "\*he shall sing" has been asterisked because some would argue that the third person with "shall" is not acceptable, or at most limited to rules and regulations (see eg Leech 1987: 71ff).

Table 1: Immediate and Remote Finite Forms of the Verb		
	Immediate	Remote
A	he sings he is singing he has sung he has been singing	he sang he was singing he had sung he had been singing
B	he will sing * he shall sing he can sing he may sing he must sing	he would sing he should sing he could sing he might sing -----
C	he has (got) to sing he dares sing	he had (got) to sing he dared sing

he ought to sing  
he is going to sing  
he is to sing  
he needs to sing  
he seems to sing  
he appears to sing  
etc

-----  
he was going to sing  
he was to sing  
he needed to sing  
he seemed to sing  
he appeared to sing  
etc

The above table cannot pretend to disguise the complexities of meaning embodied in the English verb: to take one example, the immediate forms "he can/may sing" occur with the sense of POSSIBILITY (theoretical and factual, respectively); however, as Leech again observes, only the theoretical form with "can" is normally found in questions (1987: 77ff). What, then, are the advantages and implications of the immediate/remote distinction?

As already observed above, one of the main advantages is that the distinction neatly and powerfully captures the deictic function of the finite without basing this function on the concept of time.

The notion of immediacy/remoteness applied to verb forms is, of course, not a new one. It is raised by Joos (1964), and supported by Lewis (1986) in a provocative guide to the English verb aimed principally at teachers of English as a Foreign Language. Lewis' tone indeed borders on the polemical:

The essential characteristic of the "present simple" is that it expresses the speaker's view of the event as a timeless fact. Paradoxically, not only is the present simple not about Present Time, but it is not about time at all. This is a



characteristic which it shares with "the past simple". Each of these forms is "simple" in the sense that the speaker sees the events described as single, simple entities, unities, totalities. The "present simple" and "past simple" contrast with each other in that with the first the speaker sees the event as immediate, and with the "past simple" the event is seen as remote. These are not essentially temporal concepts.

(Lewis 1986: 66)

Huddleston (1984) takes a more critical look at the same question, and his sceptical but not unsympathetic judgement is worth quoting at length, as it offers a concise statement of the pros and cons of reducing the finite element to the fundamental concepts of Immediate/Remote:

According to this view, the inflection itself would simply indicate remoteness, and it would depend on other features of the sentence or context whether this is interpreted more specifically as remoteness in time or remoteness in factuality. The problem that faces us here is of a type which commonly arises in semantic analysis. As we try to bring in more and more uses of a category or item within the scope of our semantic analysis of it, the meaning proposed will become more and more general, with less and less content -- and the burden of accounting for the more specific features of the interpretation of sentences containing it will fall elsewhere, on other linguistic items in the sentence or on pragmatics. The alternative to giving a single, very general meaning, which may be fairly empty, is to allow for polysemy, recognising a range of related senses (some of which may be more central than others): different writers may take widely varying positions on this issue. As far as the particular case of it that we have raised here is concerned, my own view would be that we do need to recognise distinct senses of past tense, for it is not clear why remoteness as such should select past time as opposed to future time when interpreted temporally (we do not say "He was here yesterday, is here now and was here tomorrow"). Nevertheless the proposal is certainly useful in showing a relation between the past time and factual remoteness uses.

(Huddleston 1984: 148)



There are dangers, then, in identifying immediacy/remoteness as a general contrast embodied in the finite, and suggesting that context and pragmatics allow this fundamental contrast to be interpreted in a limited range of related ways: present/past, fact/hypothesis, real/unreal. However, I would argue that in this case the general term is still sufficiently meaningful, and the range of applications sufficiently limited to offer valuable insights to text analysis. Incidentally, Huddleston's point about "was" not signalling future remoteness may be answered by arguing with Lewis that the non-modal forms are used for factual statements (remote finite for past; immediate finite for present). Futurity entails speculation rather than fact, and so the modal form "will" is used (immediate finite signalling certainty rather than uncertainty in this context).

To sum up my recasting of the function of the finite: like Halliday, I would argue that it has a deictic function, but I would not identify this function with placing the process in time. I would rather introduce the notion of immediacy/remoteness from sources outside Functional Grammar to account for not only the (arguably central) present/past distinction but also fact/hypothesis and real/unreal.

The consequent implication is that all finite verbal forms carry the stamp of the speaker's judgement -- Halliday's justification for classifying the finite component as interpersonal. Although I have immediately above identified

the non-modal "present and past tenses" as "factual statements", a more precise description would be "factual -- according to the speaker". Thus a statement such as the opening sentence of BP1: 1 paragraph 4 -- "The southwestern tip of the Isle of Man is one big brittlestar community" -- may be interpreted in a limited number of ways: "is", a non-modal verb, immediate finite, signals that the relational process may be factual, present time and/or real. In this case the context neither signals out any of these options for precedence or invalidates any one. Consequently all are invoked.

Speakers' judgements are therefore partly signalled by the choice of finite; however, they may also be signalled lexically, by the choice of a modal verb or adjunct. And it is to this topic -- modality -- that we must now turn.

#### 4.1.3 Modality

Halliday, as we have seen above, classifies utterances into propositions and proposals. These utterances may express positive or negative propositions/proposals (ie assertions or denials), but many utterances express intermediate positions between these two poles. According to Halliday (1985: 86ff), the intermediate positions in propositions consist in degrees of probability or degrees of frequency, whereas in proposals the intermediate positions consist in degrees of obligation (commands) or degrees of inclination (offers). Propositions, with which we shall be mostly concerned, realise these



intermediate positions through the use of modal verbs and/or modal adjuncts.

Halliday expresses the range of intermediate meanings in propositions as follows: probability ranges from "possible" to "probable" to "certain"; frequency ranges from "sometimes" to "usually" to "always" (1985: 87). Even considering the analogous range of meanings for proposals, this description of modal meaning represents a considerable simplification of what most commentators regard as a messy subject. Leech (1987: 71) typifies a widely-held view of modal verbs:

What makes it so difficult to account for these words...is that their meaning has both a logical and a practical (or pragmatic) element. We can talk about them in terms of such logical notions as 'permission' and 'necessity', but this done, we still have to consider ways in which these notions become remoulded by the psychological pressures of everyday communication between human beings: factors such as condescension, politeness, tact and irony.

To give an indication of the extent of simplification in Halliday's description, let us adapt one of his examples: "They must know" (1985: 87) and compare it to Leech's analysis (1987: 71ff). Halliday would presumably interpret this proposition as expressing certainty, the upper limit of the range of probability. Leech would presumably interpret it in three related but slightly distinct ways, depending on context:

1. Obligation/Requirement:     You've got to tell them.  
                                      They must know.
2. Logical Necessity:            Irene told them yesterday.  
                                      They must know.



3. Reasonable assumption:      They'll have talked to Irene.  
   They must know.

The problem in adopting Halliday's brief description of modality, then, is similar to the problem of describing the Finite: the general terms of description are in danger of being so general as to be practically meaningless, whereas a more "delicate" description would probably result in the proliferation of more and more subtle nuances. The notion of certainty does thread through the three examples above, albeit in rather different ways; the examples may be paraphrased as follows:

1. It is certain that they are required to know.
2. It is certain that they know.
3. The evidence suggests it is certain that they know.

For the purposes of the present study, I shall largely adopt Halliday's simple descriptive system, with the proviso that his range of intermediate positions represents only a rough guide to the complex of inter-related meanings.

However, a more fundamental theoretical criticism of Halliday's description of modality comes from Huddleston (1988: 172).

Referring specifically to obligational "have to", Huddleston writes:

Halliday classifies this as a modal operator, more particularly a high-value one, like must (75). It is, of course, semantically similar to the modals, but grammatically it is sharply distinct in that it has the full set of verbal inflections and thus is not restricted to occurrence in Halliday's Finite function -- cf. "she is having to revise it", "she had had to abandon it". Instead of being in paradigmatic

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contrast with the modal operators, it can combine syntagmatically with them, even must: "he must have to get up early." In Halliday's description of the verbal group, primary (ie finite) tense and modalization are mutually exclusive, so that "they write well" is present unmodalized while "they must write well" is tenseless modalized.

As will be evident from my treatment of the finite above, I depart from Halliday in not regarding finiteness and modality as being mutually exclusive. As the brief paradigm of the verb "to sing" shows, most modal verbs have both an immediate and a remote form: will/would, can/could, and so on. Only the modal operator "must" and the analogous verbal construction with "ought to" do not have Remote forms. (Incidentally, it will also be obvious from the table that I classify "have to" with the group of "quasi-modal" verbal constructions which have semantic similarities to the modal operators, but are grammatically distinct.) Again it should be emphasised that the neat tabulation given above masks the semantic complexities of the modal verbs: "may" and "can" both express different types of possibility, for example, but only "can" occurs in questions with this meaning. Compare:

1. Celtic can still win the league. (Theoretical  
Can Celtic still win the league? possibility)
2. Celtic may still win the league. (Factual  
\*May Celtic still win the league? possibility)

To conclude, then, modality may be defined as the lexical realisation of an explicit attitude to a proposition. This attitude may be realised by a modal operator and/or analogous verbal construction and/or a modal adjunct. The interpretation



of the attitudes expressed depends partly on contextual or pragmatic features; however, here we shall employ a broad classification of these attitudes mainly into a range of values under the labels "probability" and "frequency".

Of less concern to the present study is the concept of "modulation" (also referred to as deontic or root modality, as opposed to epistemic modality, which expresses probability). Modulation is the lexical realisation of an explicit attitude to proposals: modulation is realised by modal operators and/or analogous verbal constructions, modal adjuncts, and also certain complements (Halliday 1985: 86 gives the example "I'm anxious to help them".) However, proposals figure less prominently than propositions in scientific and academic writing, and so we need give them little consideration here.

The significant departure from Halliday's description is the recognition that finiteness and modality are not mutually exclusive: although finites do not explicitly realise an attitude, they implicitly express certainty (as Halliday acknowledges, 1985: 86); and most modal verbs have an immediate and remote form.

#### 4.1.4 Polarity

Compared to modality and finiteness, the question of polarity is relatively straightforward. As Halliday states, some



propositions assert and others deny. Assertion and denial are typically realised through the finite: denials add the form "not/n't" to the positive form: eg "is/isn't", "can/can't" etc. When the finite is "fused" with the lexical verb in the positive form, the negative form is realized through the operator "doesn't", as in "sing/doesn't (sing)". Halliday notes that:

The Finite element is inherently either positive or negative; its polarity does not figure as a separate constituent. It is true that the negative is realized as a distinct morpheme "n't" or "not"; but this is an element in the structure of the verbal group, not in the structure of the clause.  
(Halliday 1985: 85-6)

To Halliday's brief account, I wish only to add the reminder that, if we accept that modal operators also have a finite element, "not" does not always function as part of the finite; in some contexts it is the main verb and not the operator which is negated (see Leech 1987: 89ff). The position of the negator can partly determine the communicative value of the modal:

You may not go (Finite: negative; Modality: possibility  
Communicative value: "permission" ie "It is not possible for you to go")

They may not arrive (Finite: positive; Modality: possibility  
Communicative value: "possibility" ie "It is possible that they will not arrive")

However, the above examples do not invalidate the main point that when the negator "not" or "n't" falls into the same

constituent as the finite, the proposition may be classified as a denial rather than an assertion.

## 4.2 Residue

Given that the mood consists of the subject and the finite, the residue then consists of the remaining clausal constituents, predicator, complement and adjunct. Since our main concern here will be certain adjuncts, we shall limit ourselves to a brief sketch of the predicator and complement, following Halliday (1985) quite closely.

### 4.2.1. Predicator

If the finite has a deictic function in the verbal group, the different forms of the predicator add on different types of meaning: phase, aspect, voice and process-type. Thus the following four utterances function as described below:

- a) Sir Alex conducts.
- b) Sir Alex is conducting.
- c) Sir Alex will have been conducting for 20 years.
- d) Sir Alex would have conducted this performance.

In the first example, the finite and predicator are fused: the finite is immediate and the fusion suggests that the process is certain, a unitary fact.

In the second example the finite ("is") is immediate and non-modal, suggesting present time and certainty. The predicator ("conducting") is the durative form, signifying that the process is extensive in time.

In the third example the finite ("will") is immediate and modal, suggesting future time and certainty (ie it expresses a likely prediction). The complex predicator ("have been conducting") combines the retrospective form ("have + en") and the durative form, signifying that the process is both extensive in time and being regarded from a subsequent point of time.

In the final example the finite ("would") is remote and modal, indicating hypothesis and unreality. The predicator ("have conducted") signifies that the (hypothetical) process is again being regarded retrospectively but this time as a single event.

The systems of aspect and phase are treated extensively in Comrie (1976), Lewis (1986), Leech (1987) and Palmer (1987); however, as they will not figure greatly in the text analysis here, the examples above will suffice in giving an idea of how the predicator functions.



#### 4.2.2 Complement

As Huddleston (1988: 165) rightly comments, Halliday fails to give a satisfactory account of the interpersonal function of the complement:

In spite of the cited claim that all functions are semantic in origin, Halliday does not in fact give a semantic account of the Complement/Adjunct contrast: what he says, rather, is that the Complement is an element "that has the potential of being Subject but is not" whereas the Adjunct is "an element that has not got the potential of being a Subject" (79) -- which I take to be a grammatical criterion.

We noted in the discussion of the subject in a preceding section that SPCA are possibly best defined as syntactic classes with some functional attributes. The complement and circumstantial adjunct are easily distinguished on the ideational plane, and the subject does function as a mood-marker on the ideational plane. Halliday's attempts to define complement and adjunct quickly falter: exceptions abound. Halliday himself provides one: attributive complements such as "a noble king" in "King Alfred was a noble King" cannot function as subject in a related clause (1985: 79). Another would be the ability of certain temporal adjuncts to double as nominal subjects: "Tomorrow is another day/Yesterday was awful."

Complements and circumstantial adjuncts are "weak" interpersonal elements if they function on this plane at all.

Halliday himself sets a precedent for omitting items from the mood-residue organisation by arguing for the exclusion of conjunctive adjuncts, which are textual elements (1985: 81-2). In any case, I have not included them in the analysis of the texts below. Modal and comment adjuncts, however, do merit attention.

#### 4.2.3 Adjuncts

Circumstantial and conjunctive adjuncts have been dealt with briefly in the preceding section, if only to suggest their exclusion from the interpersonal plane of clause organisation. Two classes of adjunct, however, do function on this plane: Modal adjuncts "relate specifically to the meaning of the finite verbal operators" and comment adjuncts express "the speaker's comment on what he is saying" (Halliday 1985: 82-83).

Mood adjuncts differ from other adjuncts, so Halliday claims, in that they are properly part of the mood, not the residue. Their semantic function is to reinforce and extend the range of meanings expressed by the modal verbs; the fact that adjuncts are relatively mobile in the clause compared to verbs also allows their semantic value to map onto different functional slots: theme, new and so on.

The adjuncts are subject to the same problems as modal verbs when attempting to specify their semantic values; except where

stated in the discussion, I shall follow Halliday's (1985: 82) classification:

Adjunct Type	Example
a) probability/obligation	definitely
b) frequency	regularly
c) inclination	willingly
d) time	soon
e) degree	entirely
f) intensity	really

Comment adjuncts, paradoxically, are interpersonal in function but fall outside the Mood-Residue organisation because they are not, strictly speaking, part of the proposition uttered. Again I shall follow where possible Halliday's classification of Comment adjuncts (1985: 50) summarised below:

Adjunct Type	Meaning	Example
admissive	I admit	frankly
assertive	I assure you	seriously
presumptive	how presumable?	apparently
desiderative	how desirable?	regrettably
tentative	how constant?	provisionally
validative	how valid	on the whole
evaluative	how sensible?	understandably
anticipatory	how expected?	amazingly

Note that I have changed the label of the final category from Halliday's "predictive" to "anticipatory", saving the label "predictive" for the modal finites "will/would" and "shall/should". I have also omitted "presumption" from the list of modal adjuncts -- adjuncts such as "apparently" seem better placed as comment adjuncts although Halliday classifies them as both.



### 4.3 Summary

The discussion above has outlined and adapted where necessary Halliday's description of the interpersonal function of the clause, that is, the function of the clause as exchange.

The main components of this function are subject, finite, predicator and certain adjuncts (modal and comment): complements and other adjuncts (conjunctive and circumstantial) contribute little if at all to interpersonal meaning.

Subject, finite and, optionally, modal adjuncts, may be categorized as the mood element of the clause: the subject provides a basis for the proposition and the finite "places" the proposition as immediate or remote in temporal/factual/real terms. Non-modal finites assert or deny the proposition with an implicit assumption of certainty; modal finites explicitly express an intermediate position such as probability or frequency. Such intermediate positions may be extended through the use of mood adjuncts.

The predicator is the main component of the residue: to the meaning of the finite it adds secondary notions of retrospection, duration, and so on. Complements and circumstantial adjuncts also fall into the residue.

Conjunctive and comment adjuncts technically fall outside the mood-residue organization. The former type has a textual

function, but the latter is interpersonal, offering the speaker's comment on the proposition.

#### 4.4 Pragmatic Considerations

The systematic use of comment adjuncts and other regularities in scientific texts has been interpreted by Myers (1989) as positive and negative politeness strategies. Myers posits a two-part audience for learned articles -- a specialist audience (the "esoteric audience") and the wider academic community (the "exoteric audience"). Both audiences have to be shown the proper respect by the writer of learned articles:

I will assume in the subculture of science: (1) that the social distance between individuals -- D -- must be treated as very great; (2) that the relative differences in power between individuals -- P -- are supposed to be small, but (3) that the community as a whole is supposed to be vastly more powerful than any individual in it.

(Myers 1989: 4)

Developing the arguments of Brown and Levinson (1987), Myers sees the basic business of learned articles -- that is, making claims to knowledge -- being part of a more general system of social interactions. For example, positive politeness strategies may be found in the "gifting" of credit via citations or the assumption of shared knowledge which lies behind playful or punning article titles (eg "PDP or not PDP: is that the question?" in our corpus). The first person plural "solidarity" pronoun may also be used -- as in the previous sentence (Myers 1989: 7-12). Negative politeness strategies

involve recognition that one's own claim to knowledge infringes on the reader's freedom to act -- a new knowledge claim may well undermine a rival researcher's work. The consequences of this recognition are strategies which mitigate the knowledge claim: conditional modals, modifiers or clauses framed by verbal or mental processes function as "hedges", downplaying the so-called "face threatening act" (Myers 1989: 12-20). Unmodified knowledge claims are usually secondary to the thrust of the article.

Myers devotes a brief coda to popularisations of learned articles, noting that the audience configuration changes: the author is now communicating the work of the esoteric (specialist) group for an exoteric (lay) audience:

The main interactive problem here is to avoid insulting the readers, to try to make them feel like part of the community of molecular geneticists, while still maintaining the proper deference towards the scientific community.

(Myers 1989: 28)

Popularisations are thus less tactful and more familiar than learned articles.

Working in another genre, namely literary criticism, Simpson (1990) applies Brown and Levinson's model to F.R. Leavis's "The Great Tradition". He finds that Leavis adopts the opposite strategy to Myers' scientific writers -- primary claims to knowledge are unmodified, secondary claims are modified:



...the tactic seems to be to present potentially controversial information as if it were self-evidently true or part of the shared knowledge between critic and reader, and to present information that is less "risky" by comparison as if it were dubious or likely to cause affront.

(Simpson 1990: 91)

If we can generalise from Leavis to literary criticism in general -- admittedly a rash thing to do -- then Simpson's analysis suggests that this genre is more polemical than scientific writing: whereas Myers' writers tentatively advance their inconvenient claims with an implicit invitation (to the esoteric group) to duplicate the experimental results, Leavis's claims gain authority largely by the baldness of their expression. Possibly this difference is idiosyncratic and Leavis's authoritative stance is an exception, but it is also possible that the difference is motivated by differences in disciplinary procedure: literary criticism does not deal in repeatable experiments but, in some traditions at least, on the insights of sensitive and informed readers. Authority in literary criticism in part derives from the critic's ability to express it; external controls are seldom available.

Pragmatic approaches promise to be a powerful instrument in the further analysis of learned and popular articles and they will be taken into consideration in this study. Halliday, after all, sees language as a form of behaviour, and it should be fruitful to consider modality -- the explicit expression of the

interpersonal metafunction -- in the context of wider social interactions carried out through learned and popular articles.

#### 4.5 Authorial reference

Closely related to the questions of modality and pragmatics are recent developments in rhetoric, particularly "rhetoric of inquiry" (cf Nelson et al, 1987). Like many investigations in this field, rhetorical studies are partly motivated by pedagogical concerns:

Rhetoric of inquiry does not deny that there are things to discuss in the methodological midlands that intellectuals now cultivate so intensively. But it does connect discussions of methodology to concrete inquiries in various contexts, and especially to the languages of their conduct. Thus it encourages methodology to become comparative, situating itself in actual researches and exploring their mutual implications for better inquiry.

(Nelson et al, 1987: 5)

In the marriage of code and behaviour, then, such rhetorical studies parallel functional grammar and pragmatics. But perhaps more than its sister disciplines, rhetoric places emphasis on the author as craftsman and persuader, and creator of a convincing persona:

Although it is the final, publicly stated claim that has rhetorical power, one cannot simply think in terms of the final shape claims will take. Early choices of questions to consider, claims to pursue, literature to read, colleagues to discuss ideas with, investigative techniques to employ, analyses to carry out, and so on will affect what kind of product will emerge at the end. These choices will generate thinking, data, formulations and arguments which may well find expression in the final article. Moreover, the experimental article requires a certain amount of explicit representation of



selected parts of the process that goes into its creation, such as the after-the-fact reconstruction of the intellectual genealogy in the review of the literature, the focused procedural account of methods and the selective narrative of results. Finally, the representation of the final paper implies a web of activities and relations engaged in by the author as part of the construction of the argument, implicit activities that may be summed up by saying that the author has in the preparation of the article acted as a scientist (with whatever local meaning that takes on within the relevant speciality).

(Bazerman 1988: 328)

The extended quotation above summarises neatly the concerns of the rhetorician: the construction of a streamlined argument from the messy raw materials of experience, presided over by the controlling hand of the scientist/rhetor. Authorial presence is a vital ingredient in the construction of a persuasive argument: should writers refer to themselves explicitly and so assume responsibility for their actions, or should they coyly take modest refuge behind passive structures and discreet nominalisations? Are these roles genre-specific? Our analysis should provide some answers to these questions.



#### 4.6 The Analysis of the Texts

This section will focus on the major components of mood: subject, finite, and modal and comment adjuncts. When discussing the finite, we shall consider its deictic function, its polarity, as well as modal finites. To conclude this chapter, we shall also look briefly at the pragmatics of social interaction implicit in the texts, and consider the question of authorial presence across the genres analysed.

##### 4.6.1 The Realisation of the Subject

In a preceding section (4.1.1) we suggested that subjects, which in the main are nominal groups representing "things", are, like other participants in the clause, more frequently drawn from the "universe of science" in learned articles, and "the universe of nature" in popular articles. On the textual plane (discussed in Chapter Two), this distinction has the effect of altering the "mind-set" of readers of popular and learned science. On the interpersonal plane, this distinction has the consequence of basing the propositions found in learned articles more frequently on abstract entities, whereas the propositions found in popular articles will be more frequently based on concrete entities. This generalisation is broad: individual counter-examples will easily be found. Moreover the distinction between science and nature is less clear-cut in history articles, where, not surprisingly, there is widespread nominalisation of events.

A sample of analogous passages extracted from popular articles and learned articles will, I hope, demonstrate how the Subject functions across genres. Any selection is of course subjective; the criterion for extraction is that the sentences have a roughly similar content -- that is they refer to the same states and events, or have a similar rhetorical function. In what follows, I shall discuss the function of Subject with reference mainly to BP1 and BL1, providing supporting (or contradictory) examples from the other texts where appropriate. A full list of subjects found in the extracts analysed is given in the Appendix F.

To the example quoted earlier in this chapter (4.1.1) we might add more examples of concrete subjects in the popular articles corresponding to abstract subjects in the learned articles. In the following quotations the subjects are underlined:

BP1:1: (1) A closer look at today's brittlestar beds might tell us why such huge aggregations thrived in those oceans and what happened to push them into a few scattered retreats...(2) We can look at fossils to see how and when the number of brittlestars beds changed in geological time.

BL1:1: (3) Results from this living community [of extant ophiuroids] are then used to formulate testable hypotheses concerning the structure of similar fossil assemblages...

(4) Such anachronistic communities of organisms can be strongly reminiscent of fossil "pre-Modern" assemblages in trophic patterns, relative species abundance and even high-level taxonomic composition. (5) These rare circumstances are crucial to understanding why such assemblages persisted in the geological past...

(6) We have shown how extant anachronistic communities can be used to make paleoecological inferences.



It is clear that these two extracts do not exist in a one-to-one correspondence: I certainly do not wish to give the impression that a popular article is a learned article whose clauses have been or can be mechanically transformed into more "concrete" terms. Some sentences indeed have very similar structures: (2) and (6) in fact have identical subjects, and (4) confirms the obvious point that learned articles also contain concrete subjects. However, the two closest sentences are probably (1) and (3) in that both are statements of the purpose of paleoecological studies. In these key statements it is noteworthy that the learned article has as a subject "results" -- again from the universe of science -- whereas the popular article has as its subject "A closer look" -- the reification of a perceptual process and so not technically "concrete", yet still in the domain of nature.

Another parallel set of extracts locates the position of dense brittlestar beds around Britain:

BP1:2: (1) Although they are rare elsewhere, dense populations of Ophiothrix and another species, Ophiocomina nigra live all around Britain from the western Channel to the Shetland Isles...

(2) Brendan Keegan, a marine biologist at University College, Galway, has a team studying them around Ireland.

BL1:2: (3) Population densities in the autochthonous assemblages can be very high...

(4) Ophiocomina nigra occurs at up to 500 individuals per square metre in the Irish Sea at 10m to 30m depth (Brun 1972)...



(5) Even higher population densities have been recorded off the British Isles by Keegan and Konnecker (1980).

Again the learned article's "population densities" is a telling shift from the popular article's "dense populations", even though the learned article then follows on with the concrete subject "*Ophiocomina nigra*". The reference to Brendan Keegan is made the basis of the proposition in the popular article; in the learned article science is elevated above the scientist in what seems to be at least one easily-discernible pattern: cf the later extracts:

BP1:7: (1) Norman Holme of the Marine Biological Association in Plymouth links this decline to recent increases in the population of a predatory starfish.

BL1:7: (2) In fact, fluctuations in the occurrence of dense beds of *Ophiothrix fragilis* in the English Channel over a period of several decades have been correlated with changes in predation pressure exerted by two species of the starfish *Ludia* (Holme 1984).

Examples from other texts largely supporting this distinction in the province of subjects -- the universe of nature for popular science, and the universe of science for learned science -- can be seen in Appendix G. The passages from BP3 and BL3 are concerned with the hybridisation of Scottish wild and domestic cats. The subjects found in the popular article refer to the researchers and the wild cats: both of which have referents in the universe of nature. The learned article also has subjects from the universe of nature ("forests" and "they" [wildcats], as well as a researcher, "he") but there is a

higher proportion of subjects from the universe of science: nominalisations of events ("hybridisation", "combination", "crossbreeding") and statistics ("wildcat numbers").

This pattern is repeated yet again in the computing extracts illustrated in Appendix G: expressing ideas about "the smell of intelligence", CP1:2 takes as its subjects the researchers, the computers, and an elusive but apparently tangible "something". Expressing a very similar idea, CL1:2 finds its subjects in abstractions and mentalistic nominalisations: "the power behind our gross symbol processing capacities" and "intuition". And in the final science example, which considers computer detection of objects, CP2:4 has a considerable proportion of tangible subjects ("objects" [twice] and "robots") but here moves also towards some abstractions ("model", "computer vision", "vision systems"). The corresponding learned article is completely dominated by subjects from the universe of science: for example, "argument", "knowledge", "advances" and the relational subclause detailing the properties of human vision.

These extracts support the claim that, as themes in popular and learned scientific articles tend to be drawn from the universes of nature and science respectively, so too are the subjects of these genres. Therefore, not only is the "mind-set" established in a particular province (nature or science) by the theme, the proposition is also anchored there. Chapter Two



drew a distinction between the scientific articles (biology and computing) and the history articles; again the analysis of subjects bears this out. An examination of the subjects of the history articles does not show a distinction between "nature" and "science" similar to that found in the scientific articles. The final example in Appendix G, HP2 and HL2's account of the Treaty of Berwick, illustrates the greater similarity between subject realisation in learned and popular history articles. HP2:4 takes as its subjects mainly the major protagonists -- "the Covenanters", "the king", "a force" -- and the place ("Aberdeen"). The learned article does nominalise one subject ("the king's failure") and postpones one nominal clause ("It was no doubt intended that..."), but like the popular article its subjects are mainly concerned with the protagonists ("Charles", "Donald Gorm", "Antrim", and so on). The place -- "Ireland" -- is also one of the subjects. The "nature/science" distinction, then, seems to be confined to scientific articles, at least those scrutinised here, and seems not to extend to history.

Other patterns evident in the thematic analysis are mirrored in the analysis of subjects across genres. In some examples the dissimilarity between learned and popular subject realisation lies not in the province of the subject but in its complexity, as the following examples demonstrate:

BP1:4: (1) If silt clogs up their tube feet, the brittlestars cannot feed.



BL1:4: (2) In the North Sea, burial and smothering is the leading cause of death for ophiuroids (Schafer 1962)...  
(3) Fine-grained sedimentary matter presumably obstructs the function of the water vascular system in ophiuroids (Rosenkranz 1971).

As in thematic realisations, the subject of the learned articles display greater syntactic complexity. These extracts describe an identical process: in (1) the popular article bases its proposition on a concrete entity from the world of nature; in the corresponding passage from the learned article, (2) and (3), two propositions are affirmed: in the first an abstraction ("cause") is the basis, and in the second the long nominal group ("fine-grained sedimentary matter") is preferred to the popular article's simpler noun ("silt"). The relatively greater specificity and complexity of Subjects in learned articles is also exemplified by the examples below:

BP1:5 (1) Nothing much happened at Bay Stacka.  
BL1:5: (2) No significant ophiuroid mortality occurred in similar arenas in the lake.

--and --

BP1:1 (3) Evidence from fossils suggests that millions of years ago, similar communities were commonplace throughout the world.

BL1:1: (4) Yet the fossil record despite its inherent limitations provides the only direct evidence for patterns of biotic change through time.

As (1) and (2) suggest, the scientific demand for precision may be one motive for the greater specificity, and, therefore, in some cases, complexity of nominal groups in all positions, including subject and theme, in learned scientific articles. However, in other cases, the construction of nominal groups in

popular and learned articles may depend on other considerations.

Dubois (1982), discussing the construction of nominal groups in biomedical journal articles, argues that the piling up of premodifiers in learned articles is a consequence of the presumed reader's shared knowledge: this argument is based on the presupposition that in phrases as in clauses the leftmost position corresponds to Given information while the rightmost position corresponds to New information. Dubois appeals to Functional Sentence Perspective to validate her argument.

Sentences (3) and (4) would seem to support Dubois' conclusions, although with such a slight example it is always possible that other considerations -- immediate discoursal considerations, or even whim -- might influence the writer. Nevertheless, in the popular article the information is contained in a single nominal group constructed as determiner + classifier + head; whereas the popular article has the structure: head + prepositional phrase. I take issue with Dubois only in disputing her appeal to FSP to validate the argument that learned articles are more likely to have more complex nominal groups with longer premodifiers. If we grant that Given and New are determined largely by tone unit (See Chapter 2), then we can argue that the use of postmodifying phrases in nominal groups allows the possibility at least of breaking the group into more than one information unit. The



use of premodifiers does not usually allow for this possibility. Sentences (3) and (4) might then be interpreted according to their potential information units:

- (23) /Evidence/ from fossils/suggests//
- (24) /Yet/the fossil record//despite its inherent limitations//

The above interpretation assumes a very deliberate plodding reading of the sentences, yet it is their potential for being broken into information units which, I suggest, is the main point. Phrases can function as individual information units and so there exists the option of realising them as such when they function as postmodifiers. This option is not normally open to premodifiers. This factor may well be crucial when presenting the basis of propositions to a general or a learned reader with different levels of shared knowledge.

Table Two shows a selection of subjects from the other texts which again supports the claim that the learned articles show a greater complexity. Again, a full list of subjects is given in Appendix F.

Table Two: Analogous Subjects from Popular and Learned Articles

<u>Subjects from Popular Articles</u>	<u>Subjects from Learned Articles</u>
BP2:5: The study of mitochondrial lineages	BL2:5: Studies of mtDNA
BP3:1: a careful analysis of of several skull measurements	BL3:1: skull measurements of these three groups together with samples of hybrid and domestic cats



Table Two: Analogous Subjects from Popular and Learned Articles (cont)

<u>Subjects from Popular Articles</u>	<u>Subjects from Learned Articles</u>
BP3:3: The large black Kellas cats	BL3:3: a series of large black cats trapped or shot in Morayshire
CP1:2 These cognitive achievements	CL1:2 The apparent success of thoroughly soft PDP systems in negotiating such domains (e.g. the model of past tense acquisition)
CP2:4 a single rigid model	CL2:4 One argument that is sometimes advanced against the use of precise spatial correspondence
CP2:5 The first step in recognition	CL2:5 the initial bottom-up stages of vision
CP3:5 the real objective	CL3:5 the realisation of this potential in real applications
HP1:2 the Lancashire cotton towns, which pioneered the seaside holiday as a mass experience	HL1:2 textile Lancashire
HP1:5 The rising demand for seaside holidays	HL1:5 The demand for seaside visits
HP3:2 the pattern of increase in crime	HL3:2 the criminal patterns

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As before, the tendency towards greater complexity is more evident in the science articles than the history articles. Even so, differences are occasionally minimal, as in BP1:5 and BL2:5. Here the popular article has an expanded nominal group

in the postmodifier, whereas the learned article has an abbreviation, more familiar to the research community, as a form of shorthand.

BP3:1 and BL3:1 show some support for Dubois' thesis. The popular article has the new phrase "skull measurements" in the postmodifier of the given group "a careful analysis"; the realisation in the learned article has "skull measurements" as given, with two postmodifiers adding greater specificity about their origins. An apparently anomalous pattern is seen in BP3:3 and BL3:3. The popular article has a group with premodification only -- "The large black Kellas cats". This time "black cats" is part of the postmodifier in the learned article, and therefore new, but it is itself also postmodified by a specifying phrase: "trapped or shot in Morayshire". It is interesting that the popular article here assumes that its readers are more familiar with the Kellas cats than perhaps the readers of the learned article are -- however, given that the reference is to reports in the popular press, the apparent reversal is not entirely surprising.

CP1:2 and CL1:2 again show greater postmodification and therefore greater specificity in the subject realised in the learned article: here the "achievements" or successes of the PDP systems are broken up into different clauses (and so information units) in the popular article, but are condensed into one highly modified subject in the learned article. In

the example from CP2:4 and CL2:4 we see again the tendency of learned articles to draw on the universe of science: the "rigid model" of the popular article corresponds to "one argument" in the learned article. The final example from the computing extracts -- CP2:5 and CL2:5 -- shows some greater specificity in the premodifier of the learned article: "the first step" corresponding to "the initial bottom-up stages".

The history articles again refuse to fall into the pattern of the science articles. The realisations given from HP1:2 and HL1:2 show greater specificity in the postmodification of the subject in the popular article; those from HP1:5 and HL1:5 show greater specificity in the premodifier of the popular article. Only the third example, from HP3:2 and HL3:2, conforms to the pattern of the science examples: here the new information contained in the popular article's realisation is found in the (given) premodifier in the learned article. No examples are given from HP2 and HL2 because in many cases the subjects are identical -- the main protagonists being realised by their individual or collective names -- "Charles", "the covenanters", and so on. It is therefore difficult to discern a pattern in the history articles in this respect.

In conclusion, then, an analysis of the subjects of learned and popular articles finds a tendency -- albeit slight -- for the scientific learned article to base its propositions on abstractions from the "universe of science", while the popular



article leans towards "the universe of nature", particularly concrete entities. However, it must be stressed that neither article's subjects are exclusively concrete or abstract. Moreover, in common with other nominal groups in the texts, there is a tendency for the subjects of the learned article to be complex. This complexity lies partly in the abstraction mentioned above, partly in the (new) information contained in the popular article's postmodifiers being found in the (given) premodifiers of the learned article, and partly in the specific information found in the postmodifiers of the learned article being omitted from the subjects in the popular article.

Some of these aspects have strong parallels in the patterns of nominal group realisation found in the theme, and suggest more general nominal group patterns in learned and popular articles. However the function of the group differs according to position in text: nominal group themes establishing a setting for the message and nominal group subjects supplying "something by reference to which the proposition can be affirmed or denied" (Halliday 1985: 76). Since these two functions may often be conflated in one nominal group, we should not be surprised if our findings regarding theme and subject show marked similarity.

#### 4.6.2 Finites and Adjuncts

We shall consider the related issues of finites and adjuncts together; as suggested earlier, their functions are distinct and yet interact to the extent that they express the speaker's judgement on the proposition.

##### 4.6.2.1 Immediacy/Remoteness in the Texts

A cursory glance at the lists of mood realisations given in Appendix F will confirm that the overwhelming majority of finites in the extracts from the learned and popular scientific articles are immediate forms. Table 3 below shows a summary of the percentages of immediate and remote forms article by article (figures rounded up or down to the nearest percent). The raw figures -- that is, the totals of verb forms analysed -- are given in brackets. As usual, only the verbs of main clauses are analysed.

Table 3: Percentage of Immediate/Remote forms of the verb in the Analysed Extracts from the Popular and Learned Articles

Popular				Learned			
Article:	Total	I	R	Article:	Total	I	R
BP1	100 (100)	62	38	BL1	100 (114)	79	21
BP2	100 (110)	75½	24½	BL2	100 (71)	76	24
BP3	100 (50)	64	36	BL3	100 (83)	47	53
CP1	100 (98)	79	21	CL1	100 (86)	88	12
CP2	100 (68)	97	3	CL2	100 (89)	85	15
CP3	100 (58)	90	10	CL3	100 (67)	89½	10½
HP1	100 (83)	29	71	HL1	100 (103)	21	79
HP2	100 (72)	3	97	HL2	100 (114)	5	95
HP3	100 (96)	67	33	HL3	100 (160)	67	33

There are a number of points arising from these figures. One is that with the exception of BL3 the immediate form of the verb predominates in the science articles. This trend is reversed in the history examples, with the exceptions of HP3 and HL3. (We shall speculate about possible reasons for these apparent anomalies later.) Another point to note is that, roughly speaking, popular and learned articles have a similar proportion of immediates and remotes: indeed three pairs in our small sample (CP3/CL3, HP2/HL2 and HP3/HL3) turn out to have nearly identical proportions in the extracts analysed. We shall now elaborate on the possible significance of these results.

Table 3 bears out the claim that the present indicative is commonly used in scientific writing (eg Leech 1987: 6; Trimble 1985: 123-4). The immediate finite in combination with the Simple Present Predicator expresses "timeless" or "non-temporal" facts (eg "Our world-wide survey of mitochondrial DNA...adds to knowledge of the history of the human gene pool in three ways" BL2:1). The immediate form is also used with the Perfect, to link the process to the present, (eg "It [molecular biology] has provided new insights into our genetic divergence from apes..." BL2:1) and with modal verbs, for example to increase the degree of possibility/ability expressed (eg "A pair of breeding individuals can transmit only one type of mtDNA..." BL2:1).



Similarly, a general survey of the mood realisations shows that the majority of remote finites distance the processes in time: to express past narratives or report others' research. Very occasionally they are used with modal verbs, for example to diminish the degree of possibility expressed.

One question which arises is whether extracts similar in content or purpose show systematic differences in the realisation of the finite. To answer this question, let us look at those passages in the scientific extracts where the remote form is -- untypically -- found in high frequencies. A close study of the use of the remote form in BP1 and BL1 shows a high degree of similarity: the remote is used, as suggested, to express narrative action and states in the past, and to distance certain modals. The main use is to express events in the past, including, as a large subset, the reporting of others' research. Examples of this use (remote finites underlined) include:

BP1:5 (1) Nothing much happened at Bay Stacka. (2) Starfish consumed bits of a few tethered brittlestars, but most of them survived. (3) At Port Erin, on the other hand, ballan wrasses and flatfishes ate most of the experimental animals.

BL1:5 (1) No significant ophiuroid mortality occurred in similar arenas in the lake. (2) Gut content and fecal analyses of all Sweetings Pond predators of Ophiothrix, including the large majid crab Mithrax spinosissimus, confirmed the virtual absence of predation. (3) Through observation and experimentation, Aronson and Harms (1985) demonstrated that density variations within the lake are determined by variations in the degree of small-scale topographical heterogeneity, not by variation in predation pressure.

The passages above demonstrate the various uses of the remote finite: BP1:5 (1)-(3) and BL1:5 (1) and (3) are examples of past narratives, that is, the expression of facts (events and states) with past reference. BL1:5 (2) expresses a fact, here the results of research, using a non-modal remote finite signifying a certain but "distanced" fact.

BL1:5 (2) and (3) are related in that they both report research; here there is the choice of reporting the facts via immediate or remote finite, effectively as "timeless" fact or as "distanced" fact, distance being here interpreted as "distant in past time". Indeed as the extract BL1:5 continues, the finite shifts from remote to immediate:

BL1:5: (4) In stark contrast to coastal conspecifics, Sweetings Pond brittlestars expose themselves day and night. (5) This behavioral difference is causally related to the difference in predatory activity by fishes (Aronson 1985).

The sequence of remote to immediate finite here may be interpreted in a number of ways: an experiment in past time is expressed using remote finite, and timeless facts are expressed through the immediate finite. Such an interpretation may be valid but it obscures the relationship between BL1:5 (3) and BL1:5 (5), both of which express the results of research by the writer, Aronson. Obviously there are differences in thematic orientation and information focus; the further difference in finite realisation may signify the contrast between a fact of primary or secondary importance. This interpretation should be



seen as complementary to the past/timeless interpretation, and the option is only open to contexts where the fact to be expressed can be realised by using either immediate or remote finite -- reports of research usually fall into this category. Here the past to timeless sequence may be interpreted as part of the rhetoric of persuasion: secondary facts being presented as a narrative of past research; important or salient facts (also arising from past research) being presented as timeless truths. Such shifts in finite and also predicator forms are evident in the following extract from BL1:4:

BL1:4: (1) In the North Sea, burial and smothering is the leading cause of death for ophiuroids (Schafer 1962). (2) Schafer noted that only 5cm of sediment is required to trap and prevent the upward movement of these animals. (3) Fine-grained sedimentary matter presumably obstructs the function of the water vascular system in ophiuroids (Rosenkranz 1971). (4) Areas of rapid sedimentation are therefore avoided. (5) Kesling (1969), Rosenkranz (1971) and Goldring and Stephenson (1972) have analyzed fossil examples of autochthonous thanatocoenoses due to rapid smothering by muddy sediment. (6) Articulated ophiuroids are usually found in fine-grained Paleozoic and Mesozoic sediments, often with some clay content (see review in Rosenkranz 1971).

In this extract the salient facts are expressed through immediate finite forms (BL1:4: 1, 3, 4, 5 and 6). BL1:4 (2) and (5) are interesting: both report previous research, one using the remote finite, the other the immediate finite. In this case the remote form signals secondary (additional) information, and the immediate form (part of the Perfect aspect) here signals past action with current relevance: the research reported in BL1:4 (5) is instrumental in arriving at



the climactic conclusion in (6). Again the use of the remote finite form distances the fact expressed, not simply in time but in importance.

To sum up thus far, the remote finite form can signal secondary information when used to refer to previous research; it can also realise narratives in past time. Immediate forms, consequently, indicate salient information and "timeless" facts. These uses are common to both popular and learned scientific articles, as a briefer survey of the other biology and computing articles demonstrate. See Appendix F for further details of the language used in the extracts referred to below.

BL2:3 is untypical in that 13 of its 16 verbs are remote forms: again this passage is a narrative, telling the "story" of a particular experiment in restriction mapping. Typical verbs in this passage express experimental processes ("were subjected", "were mapped", "were surveyed", "was found") and results (such as "occurred" and "contained"). As the passage moves towards a summarising expression of the salient facts the verb form switches from remote to the three consecutive immediates.

The corresponding section on restriction mapping in BP2:3 also contains a fair proportion of remote forms, as the experiment is narrated from a third-person point of view. Verbs expressing the experimental process here include "started", "digested" and "plotted". But here the narrative is broken by

a description of how restriction mapping works: this explanation, necessary for the layman but not the specialist, is realised as "timeless fact" and immediate modals expressing high degrees of probability ("can"/"will"). The final clause in this passage, again summarising the hypothesis, is again in the immediate form, signalling a salient fact ("Cann, Stoneking and Wilson advance... ").

One further example will illustrate this trend: CL2:3 has 9 out of a total of 10 verbs in the remote form, against a global percentage of only 15% for the total sample from this article. Yet again this passage is a narration of experimental research (verbs include "assumed" (twice) and "hypothesized"), this time the "seminal work of Roberts" on vision systems. Since this work was completed in the 1960s it is obviously distanced in the past. Its relevance to the present is affirmed, again in the final clause of the passage, as the form switches to immediate: "It is unfortunate that this work was poorly incorporated in much subsequent computer vision research."

Most of our science articles, then, reserve a high proportion of remote forms for narratives of experimental research, and will also use remote forms for "secondary facts". The anomalous science article is BL3, which alone has a slight majority of remote forms -- even the corresponding popular article BP3 has substantially more immediate forms than remote



forms. We shall now briefly look into possible reasons for this anomaly.

BL3 is concerned with the extent of hybridisation of wild and domestic cats in Scotland. Remote forms predominate in BL3:1 (22 remote forms to 15 immediate forms). The article begins with a narrative telling the story of the virtual extinction of the Scottish wildcat earlier this century, and remote forms are obviously appropriate here. There follows a section of utterances with present relevance ("...there has been a considerable recovery in the Scottish wildcat population") and reasonable speculation ("This increase may have been partly due..."). The authorial intentions are signalled using immediate forms ("we aim"; "we attempt"). In the opening section, then, immediate forms outnumber remote forms 11 to 7. However, BL3:1 also includes a concluding summary where the same information is repeated but in the past: in effect the "story" of the development of the article is narrated ("This paper aimed..."; "Wildcat samples were classified..."; etc). Such a summary of the paper, re-telling the main facts but from a remote perspective, is unique to this article in the sample and in itself accounts for 15 of the 44 remote forms in the extracts analysed. This summary concludes with 3 immediate forms giving salient facts and reasonable speculation ("'Modern' wildcats tend to be..."; "it may be..."). If this summary is excluded from calculations then the total would be 60% immediate forms, and 40% remote forms, which is much closer



to the corresponding percentages in the popular article (64% to 36%).

I would suggest, then, that the presence of a concluding summary section in BL3 is the main reason why this article has an uncharacteristically high proportion of remote forms. Even so, taking the summary out of our calculations, the article has a relatively low proportion of immediate forms: BL3:2 also has a relatively high proportion of remote forms. Closer scrutiny of this extract shows that the author opts to give the experimental results in the remote form (eg "recent and modern wildcats both overlapped the hybrid group..."; "This was particularly so in females..."). However, the modulation switches to immediate again as the significance of these results is pointed out (eg "this corroborates"; "the results imply..."). The article then, despite its apparently anomalous proportion of remote forms, follows the pattern seen in the other scientific articles: remote forms are reserved for narratives and secondary facts. Here the proportion of remote forms is boosted by a concluding summary, and the secondary facts include the results of the experimental procedure. However, when the author moves to the (more salient) evaluation of the results, the modulation switches to immediate.

We now turn our attention to the history articles, whose consistently high proportion of remote forms cannot be explained away by reference to a concluding summary. There is

a much greater distribution of remote forms throughout the history extracts analysed. The reason for the preponderance of remote forms in history articles seems quite clear: narrative is highly privileged in this field. History tells the story of the past, and we should expect there to be a high proportion of remote forms.

That being said, the opening section of HP1 consists exclusively of immediate forms: the author makes propositions about the status of urban history, and research on it, in the form of "timeless" facts and past processes with present relevance (eg "Waller pays attention to...He looks...he analyses..." and "Urban history has been..."; "The richness of the sources...has attracted...", etc). Only once the field has been established does the author switch to a past narrative to tell the story of the rise of the seaside towns (for further discussion of field-establishment see Chapter 5 and, for example, Swales 1990). HP1's learned counterpart, HL1, does not begin with such an extensive "establishing passage": here we launch straight into the past narrative, probably because the case for urban history is considered as given.

Neither, it must be said, do the popular history articles HP2 and HP3 have an establishing opening passage. HP2 begins its narrative with only a circumstantial adjunct to set the scene ("By 1637, Charles I had provoked his Scottish subjects into revolt..."). This time it is the learned article which



establishes a situation with present relevance ("The shortness of the sea crossing between Ulster..and Argyll...has always ensured close contacts between the subjects of Scotland and Ireland."). Here the greater specificity of the learned article (the topic is not the Bishops' Wars generally but these wars viewed from a perspective of Scottish-Irish relations) probably demands a greater effort to establish the field. However, immediately afterwards the narrative begins -- and the extremely high percentage of remote forms in both the popular and learned articles is an indicator of the importance of narrative in these two texts.

HP3 also begins with an immediate form ("The history of crime in the twentieth century is inevitably dominated by the explosion of criminality...") which establishes an important fact before the narrative is entered into. Here it is the learned article which concentrates more on field establishment: again past research is referred to in an immediate form which implies present relevance (eg "In the last decade...serious and systematic research...has created a lively and important part of social history.") HP3 and HL3 contain substantially fewer remote forms than the strongly narrative HP2 and HP3: this is probably due to the former pair being essentially reviews of the literature rather than accounts of historical events. The present relevance of different strands of research is an integral part of these texts throughout.



The above discussion suggests that modulation should in many cases be a clear field-marker: in scientific texts immediate forms predominate and the emphasis is on "salient" and "timeless" facts; whereas in history texts remote forms predominate and the emphasis is on past narrative. Narrative is of course evident in scientific articles (especially when experimental procedure is related) just as "timeless" facts are evident in history articles (especially when fields are being established and past research is being discussed), but the emphasis in each field is markedly different. Modulation, however, does not mark out learned or popular texts: indeed it is noticeable that in our sample the proportion of immediate and remote forms is similar in most corresponding pairs. Some historical articles use immediate forms especially in the opening sections to establish the field; however, this seems to be an option in both learned and popular articles. A determining factor here is probably where the article is appearing: urban history may be a new field to the readers of History Today and so the popular article HP1 takes time to establish the field. The readers of the learned equivalent may be more familiar with the sub-field and so accept its claim to centrality. In contrast, a general article on the Bishops' Wars published in a supplement to a Scottish tabloid newspaper may require no field-establishment in the popular article (presumably any war with the auld enemy would not require an argument pleading its centrality!); but a learned article

treating the Irish aspect may require a little special pleading on the writer's part.

#### 4.6.2.2 Modality in the texts

A brief glance at Appendix F is all that is necessary to confirm that the great majority of independent clauses in the texts under analysis consists of non-modal finite verbs, which therefore implicitly state facts. A minority of these finites is modal and/or tempered by modal or comment adjuncts. Of these, the most frequently used express possibility, and may be considered as part of a "hedging" strategy which is common to discursive texts.

#### 4.6.2.3 Possibility and Politeness

Most if not all writers will admit uncertainty at some point in their texts, either because they are genuinely unsure of the validity of their results, or, as Myers (1989: 12ff) claims, as a "negative" politeness strategy: the writers do not wish to seem to constrain the readers' freedom to act. We might expect learned articles, then, to exhibit more "negative politeness" than popular articles, since a validated claim in a learned article might be expected to influence the specialist reader's future research options, whereas a validated claim in a popular article would simply extend the lay reader's general knowledge. Corresponding extracts from BP1:1 and BL1:1 show different ways that modality is realised (modal finites underlined):



BP1:1: (1) Evidence from fossils suggests that millions of years ago, similar communities were commonplace throughout the oceans of the world. (2) A closer look at today's brittlestar beds might tell us why such huge aggregations thrived in those oceans and what happened to push them into a few scattered retreats.

BL1:1: (1) In this chapter, we hope to demonstrate how general ideas of predation may be used to interpret the structure of an extant ophiuroid-dominated community in a Bahamian saltwater lake. (2) Results from this living community are then used to formulate testable hypotheses concerning the structure of similar fossil assemblages.

First of all, it is clear from the examples that hedging may be lexical as well as grammatical: the lexical items "suggest" and "hope" are themselves signals of tentativeness. Myers (1989:13) makes the point that any language items suggesting an alternative point of view -- from the use of an indefinite article via lexical items such as "plausible" to the use of conditional forms -- can be used as "hedges". Our analysis then can provide only a partial guide to the degree of hedging which takes place in popular and academic texts. (One might argue that "suggestion" and "hope" are statements of fact and therefore more assertive than otherwise modalised declaratives; however, this would be a fine line to draw.) Both articles, nevertheless, seek to express the uncertainty which is inherent in the investigative procedure. BP1:1 (2) realises this uncertainty in a remote modal finite of possibility in the main clause; BL1:1 (1) uses the corresponding immediate form in the subclause. It is understandable that the learned article would seek to cast as little doubt as possible on the investigative procedure, while being realistic about its fallibility. In



contrast, a popular article, arguably, might want to dramatise the element of risk in the scientific adventure.

On the other hand, there are times when the learned article will be more cautious than the popular article: while being bullish about the scientific procedure adopted, the learned article will be more careful about the claims to knowledge arising from this procedure:

BP1:6: (1) Octopuses are relatives of the shelled cephalopods, Nautilus, for example, that were important predators before the Mesozoic marine revolution. (2) A cephalopod at the top of the food chain makes the analogy between Sweetings Pond and ancient communities of suspension-feeders all the more plausible.

BL1:6: (1) It is not unreasonable to imagine that cephalopods were common predators in some ancient ophiuroid-dominated communities, as they are in Sweetings Pond. (2) Ectocochliates and coleoids are certainly common in the Late Jurassic deposits at Solnhofen (Kuhn 1963) and La Voulte-sur-Rhone (Dietl and Mundlos 1972). (3) Based on data from Sweetings Pond, we suspect that many cephalopods in Paleozoic and Mesozoic communities did not consume brittle-stars, even when the latter were extremely abundant. (4) To our knowledge the only living cephalopod that preys on ophiuroids is the deep-dwelling Bathypolypus arcticus (O'Dor and MacAlaster 1983). (5) In the absence of fish, crustacean, and cephalopod durophagy, then, dense populations of ophiuroids could thrive in "Paleozoic" communities.

Again, much of the tentative quality of these extracts results from the lexical items "plausible", "not unreasonable", and "suspect". As far as modality is concerned, BP1:6 (1) and (2) state facts, as do BL1:6 (1), and (3). BL1:6 (2) makes an explicit statement of certainty through the modal adjunct "certainly" -- this claim to knowledge is based on others'

research. BL1:6 (4) and (5) express the author's own claim to knowledge, and in both statements the assertions are modalised: in BL1:6 (4) by the presumptive adjunct "to our knowledge", and in (5) by the remote modal finite "could" expressing possibility. The learned article, then, is at greater pains than its popular counterpart to stress the limits of the knowledge claims asserted. This would support the "negative politeness" theory.

However, there are no hard and fast prescriptive rules which can be applied to the form of knowledge claims in popular and learned articles, as the final climactic claim to knowledge and its possible consequences demonstrates:

BP1:9: (1) So it appears that ancient brittlestar beds and crinoid gardens were severely affected when new, more efficient predators appeared in the Cretaceous. (2) Today, epifaunal brittlestar beds survive only where predation pressure is low. (3) The next step will be to explain why dense populations are so common around the British Isles yet so rare in North America and elsewhere.

BL1:9: (1) Even though direct evidence concerning the level of predation pressure on dense populations of fossil ophiuroids is scanty, the temporal distribution of these communities and the data on predation in some extant assemblages support our hypothesis that dense communities of epifaunal brittlestars were largely excluded from shallow water after the Mesozoic. (2) In particular, we see a relation between the explosive Cretaceous radiation of teleost fishes and the virtual disappearance of dense assemblages of fossil ophiuroids in the Cretaceous.

...  
(3) The study of ecological release in saltwater lakes has practical application. (4) Information culled from Sweetings Pond and other lakes may enable us to predict the biotic consequences of large-scale overfishing in shallow-water marine habitats. (5) The high abundance of Octopus in a back-reef community on the north coast of Jamaica may be related to the severe overexploitation of local fish resources (Aronson, in press). (6) We recommend that



overfished habitats be examined to ascertain whether the removal of predatory teleosts is increasing the abundance of epifaunal suspension-feeders and therefore is perhaps driving those communities toward anachronistic faunal compositions.

As the above extracts suggest, verbs expressing mental Processes ("appears", "see", "hope" etc) are frequently used to signal a tentative attitude to the content of the text: these are usually classed as ideational rather than interpersonal elements, but they nevertheless present the content as subjective rather than objective. BL1:9 (1) also moderates its assertion through a concessive circumstance ("Even though..."). Here, as elsewhere, there is perhaps more overlap between the metafunctions than Halliday would allow. Subjectivity and concessive circumstances notwithstanding, both the popular and the learned article present their final conclusions as unmodalised facts. Differences appear only in the consequences of these conclusions: BP1:9 is blithely predictive ("The next step will be..") whereas BL1:9, while strongly asserting the practical value of the research, professes less certainty as to where it will lead ("Information culled from Sweetings Pond...may enable us..."; "The high abundance of Octopus...may be related..."). Myers again would claim that in the learned article the author mitigates a "face-threatening act" by refusing to dictate the future course of research to the esoteric audience (ie those of the peer group involved in similar research). Moreover, a strong affirmation of the value of the research, together with explicitly uncertain hypotheses about its possible results, support the final



recommendation that the writer's investigation (and presumably his funding) continue. In the popular article, the continuing course of scientific research appears to be more predictable, even inevitable. In Myers' terms, the audience here is more likely to be exoteric (ie uninvolved in the research process), and so a definite statement of the course of future research is not such a face-threatening act.

A significant degree of modality is evident in the concluding sections of all the science articles, as the following extracts illustrate (modal verbs and adjuncts underlined):

BP2:6: The "mitochondrial clock hypothesis" assumes a uniform rate of mutation over long evolutionary time. But researchers find it hard to see how this could be tested. However, should they discover that a significant proportion of supposedly neutral mitochondrial mutations affect genetic fitness, researchers relying on the accumulation of mutations as a clock to time evolution would need to think again.

The Mother Eve hypothesis is an important insight into human origins. The study of mitochondrial lineages will doubtless help us to unravel some of the movements and migrations of people as they spread around the Earth.

BL2:6: Studies of mtDNA suggest a view of how, where and when modern humans arose that fits with one interpretation of evidence from ancient human bones and tools. More extensive molecular comparisons are needed to improve our rooting of the mtDNA tree and the calibration of the rate of mtDNA divergence within the human species. This may provide a more reliable time scale for the spread of human populations and better estimates of the number of maternal lineages involved in founding the non-African populations.

It is also important to obtain more quantitative estimates of the overall extent of nuclear DNA diversity in both human and African ape populations. By comparing the nuclear and mitochondrial DNA diversities, it may be possible to find out whether a transient or prolonged



bottleneck in population size accompanied the origin of our species. Then a fuller interaction between palaeo-anthropology, archaeology and molecular biology will allow a deeper analysis of how our species arose.

- CP1:5: If this radical conjecture is correct, the kind of explicit, conscious reasoning that the mind's eye approach used as its model of the underlying architecture of thought is really just the icing on the cake. It is a piece of complex computational acrobatics that enables us to deal with a few recent problems. And it depends on cognitive resources formed in response to a different set of needs. To an evolutionary theorist, this would be no great surprise. To many cognitive scientists, it has come as a revelation.
- CL1:5: PDP or not PDP, it seems, is simply not the question. Cognitive science, if it seeks genuine psychological models of human thought, may need to recognise many kinds of virtual cognitive machine. Even if we restrict our interest to a single high-level task (e.g. past-tense acquisition) any full and satisfying account may require reference to a variety of architectures implicated in different aspects of the task. Recognition of this architectural multiplicity may be necessary if cognitive science is to avoid the costly and unproductive polarisation caricatured in the dramatic idiom of the title.
- CP2:6: It may be a few years before these particular methods of machine vision are applied to robots in factories or other places of work. But there is little doubt that machine vision will have a major impact on the ability of robots to perform tasks away from the structure of a production line. More primitive forms of computer vision are already in daily use in industry. Vision is the most important of the human senses and it will play a similarly important role for the computer in gathering information about its environment.
- CL2:6: The matching process presented in this paper is based upon a probabilistic analysis of the likelihood that each potential match is correct. This approach contrasts with the more traditional use of preset error thresholds during matching, which accept any match that is within a range that could be accounted for by noise or modelling inaccuracies. Individual probabilistic analysis of each match can be used to decrease ambiguity greatly and therefore leads to a much smaller search space than would otherwise need to be explored. It is likely that these same methods could be applied to many other components of the recognition problem.

I have given extensive quotations above because it is useful to see the modalised utterances in context. There is some evidence that learned examples do tend towards higher degrees of possibility, which supports their avoidance of face-threatening acts. BP2, which is not written by one of the authors of BL2, is very positive about the contribution of the original researchers ("The study of mitochondrial lineages will doubtless help..."). The researchers themselves make a more tentative claim: "This [ie more studies of mtDNA] may provide a more reliable time scale...". There is a strong prediction in BL2, but this expresses the view that interaction between disciplines will allow a deeper analysis. This is not a face-threatening act but rather a face-saving act: the authors are providing enhanced opportunities for the research community to pursue its activities. Again we see that the picture is not simply one of strong claims in the popular article versus weaker claims in the learned article. The consequences of the claim for the community (positive or negative) influence the strength of the claim in the learned article particularly. Assertiveness in the popular article is again countered by modesty in the learned article in CP1/CL1. An assertive modal adjunct is used in CP1 to state that "conscious reasoning...is really just the icing on the cake". CL1 balances its assertive modal adjunct with a tentative modal comment: "PDP or not PDP, it seems, is simply not the question." All other claims in this learned article are hedged with "may". The other example above, CP2/CL2, shows greater predictive certainty in the



popular article: "Vision...will play a similarly important role...". The learned counterpart is more cautious, the modal of possibility, "can", indicating that alternatives are possible, and the adjective "likely" being used to describe future applications of the method.

Modals expressing certainty/possibility/predictions/assertions are in the great majority in these concluding extracts. The only other modals are those expressing need in BP2/BL2: BP2 expresses a hypothetical situation in which the researchers would be required to revise their calculations; the learned article follows a common pattern of expressing a need for further research.

So far we have considered only the science texts. Let us now turn our attention to modality in the history texts.

HP1:6: Seaside resorts were peculiar but important places, and they need to be given due weight in any assessment of urban development in Victorian and Edwardian England. I have tried to explain the nature and significance of the rise of the solid, substantial crescents and terraces of the resorts of the steam age; and the basic pattern of resort development, as it remains with us, was firmly established by 1914. Not that the story should stop at that point. We need further work on the changing fortunes of seaside resorts in the inter-war and post-war years; and we also need to know more about the resorts of Scotland and Ireland, which have so far been neglected by serious historians. The rise of the bungalow, the chalet the caravan and the holiday camp in the age of the motor car and the charabanc, and the changing experience of seaside England in the age of the package tour and the aeroplane, the holiday flat and the nude bathing beach will provide stimulating material for many historians in



the future. In the meantime, the seaside resort should be granted the prominent place it deserves in general analyses of urbanisation and social change during the key decades of transition to industrial society in Victorian and Edwardian England.

HL1:6: In these areas of northern England, the working-class holiday became a mass experience, shared by almost every family which was not incapacitated by unemployment or the poverty cycle, at least twenty years before it gathered strength in other parts of the country. The reasons for this precocious development, and the pattern of change elsewhere, can be directly related to the speed and circumstances of town growth and industrial development in the hinterlands of the resorts, and above all to the relationship between family incomes, labour discipline, and the persistence of local holiday customs. There can be no doubt that it would be profitable to adopt a similar approach to the analysis of other aspects of working-class leisure in the nineteenth century.

HP2:5: In seeking desperately to find security for Scotland within Britain, the Covenanters overstretched themselves and in the end they so infuriated the English through their interference south of the border that Scotland was invaded and conquered in 1650-51. Thus within a decade the great Scots triumph of the Bishops' Wars was converted to the ultimate disaster. The never-conquered country was conquered, and the consequences of the Covenanters' early triumphs in the Bishops' Wars can be seen as leading directly to this disaster.

HL2:5: It seemed briefly that the the royalist plot to help the king and the native Irish plots to protect themselves could be combined. The native Irish would help the king, and be rewarded and protected by the king for doing so. But in the end the native Irish, 'the fools' as Antrim later called them, decided to act on their own, without reference to the king, believing that once they rose in arms, the king would support them. Like Ormond and Antrim, they planned to seize Dublin, hoping for a bloodless coup d'etat. This part of the plot was betrayed to the authorities on 22 October 1641, the day before it was to have been carried out. But a simultaneous rising in Ulster went ahead as planned. Sir Phelim O'Neill occupied the important strong-points of Charlemont and Dungannon, and within a few days virtually all Ulster except for the north of counties Down and Londonderry and County Antrim were in the hands of the Irish. The main threat to Scottish interests in Ireland now came not from the regime in Dublin but from the Catholic Irish.

HP3:8: The search for predisposing factors in the genesis of delinquent behaviour will continue. What other avenues



should future research go down?

More attention should be given to the times (particularly between 1946 and 1955) when the rise in crime slackened or was reversed. More work is needed on groups amongst groups amongst whom crime has remained comparatively rare like females, and on groups who have been relatively overlooked, like white-collar criminals. The search for the effect on delinquency of increases in affluence or of movements in the unemployment level in previous decades should continue, although improved research strategies are probably required. And, lastly, the essentially historical questions posed by the 'new criminologists' including the processes by which criminal laws and policies are enacted, and the contrasts in the criminal codes of different socioeconomic systems, must be confronted in order to uncover the structural forces in the creation of crime.

HL3:8: Little is yet known about distinct categories of offenders, including juvenile, 'white collar' and persistent criminals. The efficiency and routinization of the judicial process would be easier to gauge if we knew more about the changing ratios between known crime, arrests, committals to trial and convictions. And finally more is needed on the principles and practices of sentencing and on the changing rates of punishment. Even so, the state of the subject has developed sufficiently in the last decade to allow valuable exchanges to take place between historians working in different centuries (as witness the conference of the Social History Society 'Crime, Violence and Social Protest') and in different countries (as witness the conference organized by the Dutch group for the Study of the History of Crime and the Criminal Law). A comparative approach to the assessment of past patterns of criminality will advance the subject enormously, as long as scrupulous attention is paid to the uniqueness of historical detail and context. For if there is one precept to which the historian should cleave it is that the definition and development of crime are formations of distinct economic and cultural formations.

The concluding section of HP1 follows the conventional formula of calling for more work in certain areas, here specifically the tourist resorts of Scotland and Ireland. There is the confident prediction that further study will be "stimulating" and a recommendation that the seaside resort (and so presumably



the author's research) should to be "granted the prominent place it deserves" in the relevant area of historical study.

HL1 also concludes with a call for further research. The link between working-class holidays and industrial development is hedged with "can"; and we have the strong assertion ("There can be no doubt...") that further research would be "profitable". The two articles, then, conform to a roughly similar pattern, although details vary, presumably according to the audience. The further research predicted by the popular article includes studies of more modern leisure activities, in the age of the "package tour...and the nude bathing beach". The learned article restricts its recommendations to "aspects of working-class leisure in the nineteenth century". Here we may be seeing the popular article stating the relevance of the present study to the experiences of a wider lay readership, whose interests may not naturally extend to century-old vacations, but who may be interested in thinking anew about their own holidays as a sociological phenomenon, and who, in good tabloid style, may be titillated by the thought of studying nude bathing beaches. The popular article's tendency to state the relevance of the research to the wider community, and sometimes to "sensationalize" the subject, is evident in many of our samples: for example, BP1 presents the near extinction of ophiuroids as a "murder mystery", BP2 dramatises the genetic technique as the "Mother Eve hypothesis", while CP2 states the relevance of the viewpoint consistency constraint to robot

vision -- a connection that the learned article neglects to mention explicitly. HP1 is therefore conforming to two standard strategies: stating the need for further research, and describing the required research in a way that will appeal to a wider readership. HL1 can afford the luxury of assuming that its plea for more research in what may seem an exotic subject will fall on the sympathetic ears of a like-minded peer-group. It is also worth noting that research that might "stimulate" the wider readership will be "profitable" to those working in the field.

HP2 and HL2 have considerably fewer modalised utterances. The popular and learned articles both conclude largely with a sequence of statements driven by remote finites expressing narrative action in the past. The only modalised utterance in the conclusion of HP2 is in fact the final sentence, where a causal connection is made between Scotland's early successes in the Bishops' Wars and its ultimate defeat. The historian's task, here, is to narrate the events of history in such a way as to lay bare the causes and effects. Explicit knowledge claims about causal connections, then, are likely candidates for modalisation.

It is interesting that the learned article, HL2, has no similar explicit knowledge claim in its conclusion: its utterances express only the narrative of events, ending on a statement of situation. There is one modalised utterance in the conclusion,



but this simply expresses a hypothetical process in the past (ie an "unreal" process), not a knowledge claim. That the popular article exhibits little hedging -- but, even so, more than its learned counterpart -- suggests that history articles admit less uncertainty than science articles. Here the question of the authority of the author arises: scientists have more direct access to empirical support for their knowledge claims than do historians. In crude terms, scientists can point to the results of experiments when making reports; historians may point to assembled data, but the interpretation of that data as causes and effects is a comparatively subjective one. The historian, more than the scientist, needs to use the language of the learned article to persuade the research community; consensus is reached by persuasion as much as presentation of empirical evidence. The historian, then, can admit less uncertainty than the scientist.

This is not to say that history articles need necessarily display less modality, as HP1/HL1 and HP3/HL3 all show. Like HP1, HP3 uses the modals "should" and "must" to map out recommended and necessary research avenues. And, as in the conclusion of popular science article BP2, there is the confident prediction that research -- again other people's -- will continue. The learned article, HL3, has a parallel prediction, that "a comparative approach to the assessment of past patterns of criminality will advance the subject enormously", although a condition is attached to this



prediction. The learned article does not frame its recommendations as explicitly as the popular article: we are simply told about a hypothetical better scenario which would be the case if more research were completed.

It is clear from the above that the concluding sections of the history articles place less emphasis than the science articles on muting the knowledge claim. The knowledge claims of scientists are usually supported by empirical evidence -- although the scientific procedure can of course be disputed. Scientists then can afford a "rhetoric of modesty" when presenting their claims. Historians on the other hand are more concerned with presenting narratives in such a way that it is "clear" or "obvious" that their interpretation of causes and effects is accurate. The perceptiveness of the historian is more at issue than the procedure, and the writers therefore are more concerned to present themselves as authorities. Modals in the history extracts tend therefore towards recommendations and confident predictions.

Modality, then, is one of a number of ways (including the use of verbs expressing "subjective" mental processes, concessive circumstances, and certain attributes such as "plausible", and "reasonable", etc) in which the writer can "hedge", that is, show his uncertainty about the content expressed and/or employ

politeness strategies. As such, modality is only one index of the writer's attitude to both the text and the readership.

An analysis of the texts suggests that popular science articles may express a greater certainty about the claims to knowledge expressed and the course of scientific investigation, but comparatively less certainty about the scientific procedure employed. Learned science articles will express a greater certainty about the scientific procedure, and qualified certainty about the consequent claims ("negative politeness"). Learned science articles will be more cautious than their popular counterparts about the consequences of research. In summary, the strength of the claim depends to a large extent on the perceived positive or negative effect on the assumed readership.

The history articles in comparison show less concern for "negative politeness", although some hedging is evident. Modals here tend to emphasise the authority of the writer, which is more important in validating the necessarily partly subjective claims of historical research. Thus in the concluding sections we find more concern with recommending and/or predicting future research -- which in all texts is slanted towards the concerns of the assumed readership.

These generalisations should themselves be treated with caution: I am not suggesting a hard and fast distinction

between "objective" science and "subjective" history -- both scientists and historians depend on the writer's establishing an authoritative persona, and both will depend to a certain extent on empirical data and the interpretation of that data. But the scientists are normally able to point to empirical validation of their knowledge claims, whereas historians, for example, cannot offer direct access to the minds or motives of historical figures. Their reliance on circumstantial evidence is greater, and so the construction of an authoritative persona is relatively more important. Again it is more helpful to think of science and history occupying space on a continuum stretching from "writer as authority" to "empirical data as authority". Individual scientists and historians can move up and down this continuum, and modality is a marker of where on this continuum an article can be placed.

#### 4.6.2.4 Authorial Persona

We have argued that modal expressions in the articles reveal the writers' establishment of themselves as authorities.

Another marker of the writer-as-authority should be the references to themselves in the articles, and we shall look briefly at this aspect of the texts now. Appendix H Table 1 shows all first-person subjects and verbs in the extracts considered.



In an analysis of Watson and Crick's famous article on the DNA double helix, Bazerman (1988: 31) comments on their use of the first person:

It is also worth noting that all the uses of the first person are to indicate intellectual activities ... None of the first person uses imply inconstancy in the object studied, but only changes or developments of the authors' beliefs of what the appropriate claims about the object should be. The object is taken as given, independent of perception and knowing; all the human action is only in process of coming to know the object -- that is, in constructing, criticizing and manipulating claims.

A glance at the learned science articles confirms that this tendency is widespread: typical first-person activities include mental processes ("suspect", "know", "see", "view", "infer", "calculate", "consider" and so on), verbal processes ("suggest", "sketch", "argue", "describe" and so on), and processes referring to intention and textual construction ("hope", "aim" and "intend"; "summarise", "review", "conclude" and so on). There are few material processes, although CL3:4 has a cluster of material processes concerned with the application of the viewpoint consistency constraint ("implement", "transfer" and "update"). Computing, unlike the biology texts under scrutiny here, is of course not only concerned with knowing but applying knowledge; material processes of application are therefore expected.

The popular science texts share a considerable proportion of these intellectual activities, but BP1 also shows the author as a "doer" as well as a "thinker", with clusters of material

processes such as "rounded", "rolled", "floated" and so on. These set the scene in a narrative introduction and show the writer as principal actor in the narrative of the experiment. Unfortunately the other two popular biology texts, though based on the learned articles, do not share the same writers, and the authors here are conspicuous by their absence. The popular computing texts concentrate on intellectual activities, so the suggestion that popular science texts represent the author as more "active" in the physical world remains tentative.

The use of the singular or plural first-person pronoun to indicate the author(s) is noteworthy: there seem to be three obvious strategies at work in all the texts. The first is the fact that the author(s) may be alone (as in CL1) or one of a team (as in CL3). However, learned articles tend to favour plural reference even when there is a single author, although there are exceptions: "I shall suggest" (CL1:1, Andy Clark) contrasts with "we will argue" (CL2:2, David G. Lowe). Lowe's strategy here is to invoke the sense of community; the author is not an individual involved in a lone scientific quest. It is interesting that this sense of community is maintained in Lowe's popular article too. Clark in contrast does use a number of singular first-person pronouns. Possibly this is because his article is an unpublished manuscript: such rogue individualism might be edited out for publication (see Myers 1985a for an example of this). But there may be another reason: the processes "suggest", "sketch" and "propose"



indicate a high degree of tentativeness, and the author in focusing on self here, in a highly speculative article on the essence of artificial and human intelligence, may be absolving the research community of responsibility for his more contentious claims. As the article progresses to more solidly founded claims and recommendations, the pronoun does shift to first-person plural. And the plural pronoun dominates in Clark's popular article.

The third possible strategy in using the first-person pronoun is the well-known "solidarity" usage: the writers assume that the readers will join them in the process expressed. This use of "we" is evident in both learned and popular texts:

CP2:5: If the object is truly present at that position, then we can expect a large number of matches.

CL1:5: Since only about three segments are needed to determine viewpoint, all the remaining matches provide confirmation for the presence of the object at that location. Therefore, we can have very reliable identification in spite of partial occlusion and other forms of low-level information predicted by the model.

In both these examples, the "we" is not restricted to the writer and the immediate research community, but extends to the wider readership.

To sum up with respect to the science articles: the authorial persona in the learned article tends towards intellectual rather than physical activities, and tends to be represented as part of a wider research community. Physical activities are



found when the knowledge is applied, and individualism is identified with a high degree of speculation. In the popular articles, the authorial persona is again largely a thinker, and part of a research community, although there is also more scope for presenting the scientist as individual actor, especially in narrative passages describing the main experiment.

The history articles again show a slightly different pattern. In the thirty-eight extracts from the six articles under consideration, there is only a total of five instances of first-person usage. Four of these are from the popular article, three of these being from HP1:6. Two of these three express a need and represent the "solidarity" use of the first-person plural pronoun. The third is singular and expresses the intention of the author. There are other uses of the solidarity pronoun in HP3:6, expressing a mental process ("conclude"), and again in HL3:6, where a relational process is expressed ("we are still in need of a study...").

The difference in the history articles lies not so much in the activities in which the author indulges, as in the frequency, or rather infrequency, of the realisations. As in the science articles we see mental processes, intention and expression of need. These are however very few and far between -- HP2 and HL2, for example, have no first-person realisations at all.

Furthermore, we do not find any verbal processes (for example, of description or suggestion), or material processes.

The data indicates that, perhaps surprisingly for a field noted for its "impersonality", the science articles (learned and popular) show a consistently higher authorial "intervention" than the history articles. This apparent paradox may again be explained by referring to the relation of the knowledge claims of each field to empirical data. Scientists represent themselves as mediators between readers and the reality they seek to describe, though this role may be conventionally cloaked in the polite plural pronoun of solidarity with the readers or with the research community. As we have seen, in the cases of "Aronson and Harms (1985)" and "Corbett (1978, 1979)", the authors in learned articles may even refer to themselves in the third person, therefore becoming indistinguishable from other members of the research community.

On this evidence, historians place much less emphasis on their mediation between the historical data and the historical narrative they construct from it. Reinforced with modal adjuncts such as "clearly" and "obviously", which are often thematic (see Chapter Two), learned and popular history articles seek to present the data as self-evidently creating a narrative. Since they do not have such strong support from empirical evidence for their knowledge claims, their standard rhetorical strategy is to structure their narratives so that



they appear to "speak for themselves" (cf Megill and McCloskey, 1987: 227). Mediation, since it implies interpretation, is avoided in history narratives. Authorial intervention is most commonly used to identify a need for further research, usually, of course, in the author's own field.

#### 4.6.2.5 Polarity in the texts

The discussion of polarity in the texts need only be brief: the main point is that practically all the assertions in all texts are positive in polarity: the negative examples are few enough to be listed in Table 2, Appendix H.

One may deduce from the texts the unsurprising conclusion that it is overwhelmingly the job of learned and popular science and history texts to make positive assertions. Some negative relational processes simply state facts about the non-existence of a state (eg HL2:3: "...the king was not ready to invade Scotland"). Other negative relational processes are anticipatory: they deny states which the reader (and/or another researcher) might mistakenly presume to exist (as in BL1:1: "...these dense assemblages of ophiuroids are not examples of 'explosive opportunism' (sensu Levinton 1970)" cf. BP3:1, BL3:2, HL2:5, HL3:1, and HP3:5). This latter function of the negative relational process is related to negative mental and verbal processes (eg HP3:6: "Urbanisation...can hardly account for the post-war rise in crime"; cf. the metaphorical material process in CL1:5). These negative

processes deny an anticipated conclusion or verbalisation on the reader's part. Other negative processes have more of an emphatic function, reinforcing the positive meaning through the use of rhetorical questions or double negatives (eg HP3:6: "...must we not conclude that poverty does not predispose to crime?"; BL1:6: "It is not unreasonable to imagine..."; cf. CL2:2.)

Many negative processes, often material ones, are coupled with modal verbs. Negatives with "can/may" deny either the possibility of an action (eg BP1:4: "If silt clogs up their tube feet, the brittlestars cannot feed"; cf. BL2:4, CP3:1 and HP2:4) or assert the possibility that an action or state is not necessary (eg CP2:4: "...an object may not have exactly the same measurements...as any previously encountered"; cf. CL3:5).

Modals with "need" act in a similar way to the anticipatory denials above, refuting possible requirements (eg. CP1:2 and CL1:5); modals with "seem" either deny an anticipated presumption (eg HL2:5), or presume that some process was not so (eg HL3:6), depending on the position of the negator "not".

Such negative processes are, however, very much in the minority in all the extracts analysed. It may well be that in most discursive texts the negative element in a clause will be shifted to another part of the clause, so that the writer can make a positive assertion, thus the already quoted:



BL1:5: No significant ophiuroid mortality occurred in similar arenas in the lake

BP1:5: Nothing much happened at Bay Stacka

--rather than --

\*Significant ophiuroid mortality did not occur in similar arenas in the lake

\*Something didn't happen at Bay Stacka.

Certainly the high incidence of positive polarity in the extracts was to be expected and the expectation is fulfilled. As we have seen, negative polarity does occasionally express the absence of a state, or it may even emphasise positive polarity as part of a rhetorical question or a double negative, but the function of this seems often to be anticipatory: the writers deny a state or action which they anticipate the reader might expect.

#### 4.7 Conclusion

In this chapter we have re-examined Halliday's concept of mood and residue and applied these partially redefined concepts to the analysis of learned and popular texts. Our main findings are, in brief, as follows:

a) The subjects in popular articles tend towards concrete items, expressed as relatively simple nominal groups; in learned articles the subjects have a greater tendency to be abstract, complex and therefore information-rich. The reference-point for propositions is then partly governed by the perception of the reader's shared knowledge and interests.

b) The majority of finites in science texts are immediate, expressing timeless facts (when fused with the predicator) or current relevance (when part of perfect aspect); remote forms tend to express secondary information and/or past narratives. As one would expect, past narratives (and so remote forms) predominate in the history texts.

c) The use of modal verbs and adjuncts are one way of "hedging", although some ideational components (eg presenting some events and states as subjective via "framing" mental processes) can also perform this function. I suggest that the range of modal options is greater in popular articles than in learned articles, and that whereas science articles employ modals as part of their "pragmatics of politeness", history articles avoid them as part of their "pragmatics of authority".

d) We found that in science articles the authors are visible in the text: in popular texts as active lone investigators, and in learned articles as members of a research community. Both types of persona mediate between man and nature. In history texts the author is less visible: the facts are presented as being self-evident and their manipulation is less explicit.

e) Most statements in all the texts are positive assertions, a not unsurprising fact given that we are studying discursive texts. Negative statements tend to anticipate and deny conclusions that the reader may mistakenly jump to.



## Chapter Five

### Discourse Patterns and Genre

#### 5.0 Introduction

In this chapter I wish to examine the organisation of discourse beyond the clause. Functional grammar is, of course, closely bound up with considerations of discourse: thematic development gives direction to the discourse, ideational components give a representation of the universe of discourse, and interpersonal elements indicate the relationships between the discourse producer, the receiver, and the discourse itself. But these systems of organisation are all at clause level; thus far we have not discussed at length patterns of organisation in which the clauses themselves are constituents. This chapter will go some way towards filling that gap.

There are many approaches to the analysis of discourse (which I have taken to signify any organised sequence of clauses, spoken or written). It is not my intention here to provide a comprehensive overview of discourse analysis; Brown and Yule (1983) summarise the major trends, and Butler (1989) offers a more recent review of the main approaches within the functional-systemic tradition. As both surveys state, Halliday's analysis of discourse has focused on the study of cohesion and coherence, a study which still finds its most detailed expression in Halliday and Hasan (1976). Cohesion in their view is what gives a discourse "texture" by binding it together (Halliday and Hasan 1976: 1-30; Halliday 1985: 287-

289). The "ties" that bind the discourse into a textual unity are reference, substitution, ellipsis, conjunction and lexical cohesion (the last of which is the subject of a major new exploration in Hoey 1991). All these cohesive devices are related to the textual metafunction at clause level: their role, like that of theme, is to organise the discourse as message.

Several studies of cohesion across genres have been conducted (eg Frawley and Smith 1983a and 1983b). These studies have employed the Brown computerised corpus of American English and so used the broad classification of genres established in that corpus -- fiction, journalism, religion and science.

Conclusions are drawn from statistical counts of syntactic cohesive devices: Frawley and Smith (1983b) study instances of conjunctive cohesion and find that journalism, in the relatively few instances that it uses conjunctive cohesion, favours adversatives like "but", followed by temporals like "while". Science, like journalism, seems to avoid conjunctive cohesion, the few instances favouring the additive conjunction "and", followed by the hypothetical "if". Frawley and Smith conclude that:

...journalism coheres adversatively through the contrast of conditions in actual worlds, and not by expressing the violation of expectations or undesired events in possible worlds. That is, the dominance of the unmarked 'but' is related to the function of journalism of describing sequences of events in the world, not the violation of expectations, which, furthermore, accounts for the lack of hypotheticals in journalism, since hypotheticals would



entail reasoning about possible worlds.

...it appears that science connects its arguments through a different type of causality, logical, which makes it appear to be non-causal. The predominance of hypotheticals is, furthermore, connected to this. Science is a discourse which postulates possible worlds: the texts reflect this tendency to possible causes, not actual ones. Thus, science is not such a strictly referential discourse, as is often assumed, but one which constructs arguments in a hypothetical manner and favors logical and necessary succession over physical necessary succession.

(Frawley and Smith, 1983b: 367; 371)

To a certain degree these conclusions support our analysis of science texts: in Chapter Two we noted the high incidence in popular and learned science texts of verifactive modal themes such as "in fact". However, whereas Frawley and Smith argue that science focuses on "possible worlds", I would support Myers' view that the focus is on scientific procedure itself. These views are not incompatible: concern with procedure may generate hypotheses about possible worlds. Science texts are concerned with validating or verifying such hypotheses.

A problem in incorporating Frawley and Smith's findings into the present study lies in the classification of genres in the Brown corpus. Whereas learned articles might fit into the "science" genre, New Scientist falls between two stools, namely science and journalism. The Brown corpus takes the field of discourse as the main criterion for genre classification; here we also include the tenor of discourse, and the idea of a discourse community (cf Swales 1990) to give two

classifications -- popular and learned science -- as distinct genres. Therefore Frawley and Smith's results can only be applied to our data with some caution.

One response to this problem would be to repeat Frawley and Smith's investigation on the present data; however, several factors have deterred me from doing this. First, the corpus on which the present study is based is much smaller than the Brown English corpus. As I have rehearsed (eg in Chapter One), detailed analysis of a large-scale corpus is simply beyond the scope, indeed the life-span, of the individual researcher. Even Frawley and Smith (1983b) confine themselves to a 16000-word sample from the Brown corpus, which is in fact roughly similar in size to our extracts. The result is that in the case of journalism and science, Frawley and Smith are basing their assumptions on very few instances of conjunctive cohesion. It may be fairly asked whether cases of great weight can be argued from statistics deriving from such limited samples.

There is another argument against the bare use of statistics to justify claims about the nature of texts. Tarone (1981), in an investigation of the use of the passive in astrophysics papers, found "rhetorical analysis" to be more revealing than a simple count of actives and passives in those texts. While frequency counts of active and passive verb forms show which is more common in learned astrophysics texts (namely, the active), an



examination of the rhetorical functions of the verb forms, in consultation with an informant in astrophysics, was necessary to determine why each form was used in various contexts.

Following Tarone, then, a more productive approach to the analysis of the discourse patterns of the texts might be based not on cohesion and coherence, or a statistical analysis of various syntactic markers, but on an investigation of rhetorical functions in the texts. One way of conducting such an investigation (not utilised by Tarone 1981) is to relate our articles to generalised plots; that is, to assign stretches of text to supra-clausal categories on the basis of the function that each stretch of text performs in relation to the others. There are various ways of so classifying texts: categories may be based on supposed mental structures of expectation ("schemata"), or on linguistic signals which may indicate the status of a particular clause or sequence of clauses (see for example, Sinclair and Coulthard, 1975; Winter, 1982; Brown and Yule, 1983). We shall give a brief overview of relevant approaches before giving a more detailed description of the procedure adopted here.

### 5.1 Discourse Patterns

Sinclair and Coulthard's (1975) study of discourse patterns in lessons is firmly based on Hallidayan linguistics. Scale and category grammar is taken as a model for the analysis of the

spoken interactions which occur in classrooms. Sinclair and Coulthard propose a series of discourse "ranks" ranging from the highest ("lesson") to the lowest ("act"). The criterion for classification of a stretch of discourse in this early approach is a form of immediate constituent analysis: lessons are broken down into components and subcomponents until a final, indivisible, component is reached. Although full of insights for teaching, this coding procedure cannot be generalised beyond the most structured interactions. The type of situation most amenable to this kind of analysis has been that which generates highly-predictable dialogues, for example doctor-patient and interviewer-interviewee discourse. Written monologues, such as learned and popular articles, although in some cases highly ritualised, do not submit easily to this kind of analysis. Another problem with the Sinclair and Coulthard model is that the upper rank is simply a statement of the situation ("lesson"), a non-linguistic category, which again is difficult to transfer to the written articles in our study. Therefore, an adaptation of the Sinclair and Coulthard model, although it has close links to the Hallidayan grammar used elsewhere in this study, would nevertheless be inappropriate for our data.

Some of Sinclair and Coulthard's terminology finds echoes in a more promising approach to the analysis of scientific and academic texts. Swales (1981; 1990) identifies a small number of "moves" (originally four, but later streamlined to three) in



the introductions of learned articles. The overall function of these moves is to "create a research space" (1990: 140-41), for example by (i) claiming centrality for one's research topic, (ii) indicating a gap in previous research on the topic, and (iii) summarising the research undertaken in the present article. Other realisations of the three moves are possible. Although Swales shares the term "move" with Sinclair and Coulthard, the notion of rank is not part of his model. Rather the moves are linguistic realisations of a schema; stretches of discourse are classified according to their relationship with each other, rather than by the way they combine to form another component at a higher rank.

Schemata are not themselves linguistic; they are supposed mental structures of expectation and therefore difficult to gain direct access to. Their relationship to discourse is succinctly stated by Brown and Yule (1983: 248):

Rather than deterministic constraints on how we must interpret discourse, schemata can be seen as the organised background knowledge which leads us to expect or predict aspects in our interpretation of discourse.

In Swales' view, presumably, the reader and writer of journal articles share a subconscious expectation that they will perform certain functions, and, given the highly conservative, indeed almost ritualistic, nature of the genre, such articles normally fulfil those expectations. These expectations

generate the small number of recurrent moves that Swales describes.

At first glance Swales' moves are as inapplicable as Sinclair and Coulthard's discourse categories to genres beyond the specific discourse type which they seek to describe (ie the introductions to learned articles). Swales (1990: 170-173) summarises research on recurrent moves in Results, Discussion and Conclusions sections of learned articles, but admits that "we know little about disciplinary variation and little about the linguistic exponents of the moves" (173). The main weakness of this approach is that it is still highly discourse-specific. However, although Swales would resist the comparison (Swales 1981: 81-84), his moves bear close resemblance to the "generalised plots" which have been described by various discourse analysts (eg Winter 1982; Hoey 1983; Jordan 1984). Since these plots offer rich possibilities for a more general description of a range of genres, combining elements of schema theory and linguistics, we shall examine this approach to discourse analysis in some detail.

The "generalised plot" approach to discourse analysis has its origins in the work of Winter (particularly Winter 1977; 1982). Winter acknowledges a debt to Fries (1952; 1957) in proposing "a signalling approach towards structural and lexical meaning" (Winter 1982: 1). Winter's innovation is to identify a third class of word, in addition to the conventional categories of



lexical and grammatical item, which he labels "Vocabulary 3" (Winter 1977). Vocabulary 3 items share structural features with lexical items (eg they are part of an open set of items), but their semantic function is related to grammatical items in that they signal textual relationships. Two examples of Vocabulary 3 items from Winter (1977: 75) are cause and result in the following extract:

But strikes, like wars, are not always the result of deliberate planning or calculated malevolence. The cause often lies in stupidity or muddle.

Result refers back to "strikes" and forward to "deliberate planning" and "malevolence" and expresses a cause-effect relationship within the clause. Cause refers back to "strikes", and forwards to "stupidity or muddle", and expresses a cause-effect relationship between clauses.

Winter's work focuses, as here, mainly on adjoining clauses, related by grammatical and Vocabulary 3 items into larger units of information which Winter defines as "sentences" (Winter 1982). Later work in the same tradition, such as Hoey (1983), broadens the field of study:

...the clause relation is not so called because it relates only clauses. Rather it is so described because all systems for signalling relations are rooted in the grammar of the clause. In this sense there is no contradiction in terms in referring to the relation between two "paragraphs" as a larger clause relation.

(Hoey 1983: 18)

Hoey and those who follow him in identifying wider clause relations have proposed a variety of types of relation to account for the patterning of (usually quite short) texts. Hoey (1983), following Winter, proposes two main classes of relation, Matching and Logical Sequence. A Matching sequence would be an expanded form of the example from Winter above, where a Denial is matched to a Correction. The most frequent Logical Sequence pattern is Problem-Solution, which we shall summarise shortly. This clause-relation approach to discourse analysis has appealed to a number to specialists in learned articles (eg Dudley-Evans, ed. 1987; Dudley-Evans and Henderson, eds., 1990) as well as those who study patterns in everyday texts (Jordan 1984). The approach therefore seems to satisfy the demand for a generally-applicable form of analysis. However, a number of objections have been raised to the application of generalised plots such as Problem-Solution patterns.

To summarise the Problem-Solution pattern briefly, many texts, including most learned and popular articles, are structured as problems to be solved, and thus may be broken into the following constituents:

- a) Situation incorporating a
- b) Problem to be solved. Next comes a
- c) Response to the problem, which leads to some kind of
- d) Result. This is accompanied by an



- e) Evaluation of the Result. If the Evaluation is positive the discourse ends; if it is negative, we return to the Problem stage and expect an alternative Response.

(based on Hoey 1983)

Hoey also divides the Evaluation into two subcategories: Assessment of Results, and the Basis for this Assessment. These categories bear an obvious resemblance to Swales' moves, described above. My diagram below points out some correspondences between Hoey's Logical Sequence and a possible realisation of Swales' moves (1990 version):

<u>Hoey</u>	<u>Swales</u>
Situation and Problem..... and others' Responses and Results	Move 1: Establish a territory and summarise previous research
Negative Evaluation.....	Move 2: Indicate a gap or Counter-claim or Raise a question
Own Response, Results..... and/or Evaluation	Move 3: Announce and/or summarise present research

The Problem-Solution pattern would seem to be preferable to Swales' moves, since it is also applicable to learned article introductions and could equally be extended to other text-types. However, Swales (1981: 83-4) rejects the Problem-Solution pattern in favour of his (then) four moves, for a number of reasons. First of all, he regards the Solution stage (which consists of Response, Results and Evaluation) as

"atrophied" in article introductions (1981:3). In other words, if we refer to the diagram above, Move 3, which outlines present research, requires a very brief combination of no less than three stages in the Hoey model. Swales dislikes the "imbalance" of such an interpretation.

More seriously, Swales points to the apparent requirement of clause relations to be signalled explicitly, either by grammatical or Vocabulary 3 items. Swales (1981:83) argues with justification that in many cases such explicit signals are absent.

Finally, Swales objects most strongly to the supposed implications that the Problem-Solution pattern has for text creation: Swales (1981:84) writes, "I think it not unreasonable to suppose that such an interpretation expects of writers of such text-types a certain objectivity and coolness and a definite appeal to the procedures of reason and logic..." Swales argues that his moves are better able to indicate any rhetorical highlighting or downgrading which may contribute to the persuasive quality of the article introduction.

Swales' first and third objections may be dealt with most easily. It seems unreasonable to object to the Response-Results-Evaluation stages in the introduction simply because they are "atrophied", by which Swales appears simply to mean summarised. It is more useful to ask why these three stages



should be so brief. Answers to this question most likely lie in the relation between these three stages (which usually outline the present research), and their elaboration in the article as a whole. In Winter's terms there is a Matching relationship (probably best expressed as Preview-Detail) between the outline of the present research found in the introduction, and the full-blown Response-Results-Evaluation found in the subsequent Materials and Methods, Results, and Discussion sections of the standard experimental article. Isolating the introduction from the rest of the article, and analysing different sections in terms of different moves, as Swales appears to wish, would obscure such relationships across sections.

Swales' third objection may be dealt with by allowing that the Problem-Solution pattern may certainly suggest, but does not necessarily ensure, objectivity and coolness. Hoey's tag, "Logical Sequence" may be unfortunate in that it suggests that problems are solved in a logical, objective fashion. (However, it is fair to say that much academic writing also strives to give this impression, however misleading.) Problem-solving is, to a certain extent, necessarily subjective: one person's attempted solution to a problem may cause greater problems for another. Therefore there is a continual striving to reach consensus about the relative status of problems, the appropriate responses to them, and the validity of the results.

Evaluations are obviously key areas in this rhetorical struggle.

The most difficult objection is Swales' second. The study of generalised plots has evolved from Winter's study of clause relations, which in turn is founded on the assumption that such relations are explicitly signalled. The absence of explicit signals threatens to invalidate the whole approach.

More recent work by Hoey (1986) has recognised the difficulty in identifying comprehensive criteria for labelling clause relations beyond limited clause pairings which are lexically signalled, and written down. His attempt to extend the concept of clause relations to explain spoken exchanges such as those found in Sinclair and Coulthard (1975) founders on this specific problem: how, if not lexically, are stages in discourse relations to be identified? Hoey finds that certain sequences are susceptible to parallel interpretations, and he concludes that "caution is necessary in positing distinct patterns. Further research into the relationships holding between patterns is certainly required" (Hoey 1986: 206). Hoey (1986) concludes by reasserting the value of the study of clause relations, while recognising that their theoretical basis is as yet unclear and so at least some interpretations of discourse patterns are open to alternative interpretation. In his latest work, Hoey (1991) moves away from the study of clause relations per se in favour of an original analysis of



lexical relations in texts, drawing, nevertheless, on Halliday and Hasan's work on cohesion as well as Winter's work on clause relations. Although stimulating, this approach is of less relevance to the present study than Hoey's earlier work. Neither does Hoey (1991) elaborate further on the criteria for labelling clause relations.

The theoretical foundation of the Winter-Hoey approach to text organisation is probably better based on schema theory than on a purely signalling approach. We may make similar objections to and appraisals of the signalling approach to discourse analysis as Brown and Yule (1983) make to Halliday and Hasan's (1976) implication that "texture" is guaranteed by cohesion. An explicit statement in a text of a cohesive relationship, or indeed a signal of a particular clause relation, is not sufficient to explain the process of text decoding, and the study of cohesion/clause relations should not be made to carry this burden. As Brown and Yule (1983:224) argue:

We might say that, in addition to our knowledge of sentential structure, we also have a knowledge of other standard formats in which information is conveyed. We also rely on some principle that, although there may be no formal linguistic links connecting contiguous linguistic strings, the fact of their contiguity leads us to interpret them as connected. We readily fill in any connections which are required.

It is outwith the scope of this study to investigate the nature of schemata, which I take to include the "knowledge of other standard formats in which information is conveyed"; rather, I

shall take it as given that there are, for competent users of academic English at least, certain expectations or even "mental structures" corresponding to generalised plots, and these may be represented explicitly in texts by certain signals.

However, the presence of linguistic signals is not necessary for the assumption that the plots exist. In this respect the account of clause relations given here differs from that given in Winter (1982) and Hoey (1983).

Otherwise, I shall closely follow Hoey's (1983) development of clause relations. These are of various kinds, falling into two main categories: matching and logical sequence (Hoey 1983:19). Matching patterns involve passages which are interpreted as being in relations such as contrast or similarity (Hoey 1983: 112ff). An example of stretches of discourse which are linked by similarity, or, in Hoey's terms, "compatibility", is found in the following extract from HL1:4:

By the mid-century, Burnley had two free days beyond the weekend at the July fair. Most people in the town had achieved an extra day by 1870; in 1899 the fair holiday was extended to a full week for the textile workers; and an additional long week-end in September had already been secured in 1890. The other textile towns showed a similar pattern. Oldham and Darwen each acquired a full week in the summer as early as 1889, although in the former case, at least, the actual agreement merely legitimised a long-established practice.

(Emphasis added)

This short passage explicitly signals Matching Compatibility between the first two sentences and the fourth, partly by means



of the Vocabulary 3 item "similar" in the third sentence. Other signals of the Matching relation are the lexical repetitions, whether exact ("a full week") or less so (eg the names of towns, the dates, and items with similar semantic content: "achieved", "secured" and "acquired"). Explicit signals of Matching relations take various forms: "In the course of our discussion of Matching we will find examples of signalling by conjuncts, syntactic and semantic parallelism, lexical signals and parallelism of questions answered" (Hoey 1983:113). Similarity and contrast can of course take various forms: similarity underlies the Preview-Detail relation (such as that found between introductory summaries of learned articles and their subsequent elaboration), and contrast underlies the Denial-Correction example from Winter (1982), quoted earlier.

Logical sequences involve passages which are interpreted as being in a more complex schematic relation to each other. As we have intimated above, the five-stage Problem-Solution pattern has been the subject of most attention, involving either Hoey's (1983) model, used also in Jordan (1984), or an adapted form (eg Adams-Smith's (1987) Unexplained-Explanation pattern). The attraction of the Problem-Solution pattern is that it is flexible enough to account for a wide variety of whole texts, as well as shorter extracts from those texts. I shall therefore follow previous research in this tradition by

concentrating mainly on the Problem-Solution pattern in the following sections of this chapter.

Let us now consider the Problem-Solution pattern in more detail. As we have stated above, it is a so-called "Logical Sequence" which is typically realised in five stages: Situation and Problem, Response and Results, Evaluation (Assessment and Basis). The labels given to the discrete stages should not be taken too literally: a Problem is only such because it elicits a Response. Problems are not necessarily "bad things"; they simply require some action to be taken, whether physical, verbal or mental. My definition of a Problem is therefore wide, and would encapsulate Adams-Smith's (1987) Unexplained. If something is unexplained, the required response is to explain it -- the basic relation is therefore identical to the Problem-Response relation.

Nor should it be assumed that every Problem-Solution pattern must contain every stage described above. Some discourses omit a stage: for example, if the Situation is obvious from the context, there may be no linguistic expression of it. Some learned articles assume that the article title and its inclusion in a particular special-interest journal or book will be sufficient Situation for the specialised readership, and the text will begin with a bald statement of the Problem. Popular articles will spend more time establishing the field (eg with the personal narrative which introduces BP1:1). Results of the



Response may also be omitted; the Evaluation then relates to the Response or in some cases to the Problem itself (eg "This problem should not be exaggerated"). Explicit Evaluations may be omitted if the Results are taken to be self-evidently positive or negative. And, finally, even if all the stages are present, the relations may not be identified by the linear sequence in which they occur. Anticipatory Evaluations, for example, may precede Responses and Results, a format which seems to be popular in brief journalistic reports on science. An elliptical and non-linear Problem-Solution pattern may be seen in the following extract from a report in New Scientist (8 October 1987):

ANTICIPATORY EVALUATION (NEGATIVE)	Scientists at the University of California are unhappy with a report into the relationship between the university and the two laboratories in the US -- Livermore and Los Alamos -- where nuclear weapons are designed. They have asked the president of the university, David Gardner, to reject the report.
SITUATION	The university manages the Laboratories for the Department of Energy. Livermore is near San Francisco and Los Alamos is in New Mexico.
[IMPLIED PROBLEM]	[To determine the relationship between the university and the weapons laboratories.]
RESPONSE	The university's Scientific and Academic Advisory Committee prepared the controversial report. The committee comprises 10 experts in science, engineering and R&D management.
RESULTS	The report, presented to university regents last month, concluded that the university was "adequately discharging its responsibilities" in its management of the two laboratories. It also found no evidence that senior managers of the laboratories were trying to thwart a future comprehensive test ban treaty by

presenting misleading information to Congress and by lobbying in Washington.

EVALUATION  
(NEGATIVE)

At least four scientists from three UC campuses have sent Gardner detailed criticisms of the report. Paul Craig, a physics professor at UC Davis, urged the committee to reconsider its findings...

The report then goes on to report the negative evaluations of the other three scientists. The reasons for the changes to the Problem-Solution pattern here are clear: the report itself is not news, but the controversy surrounding its evaluation is. Therefore an anticipatory Evaluation is foregrounded by being placed in the first paragraph. The expression of the Evaluation and the reader's presumed expectation of conflict between Californian academia and nuclear research mean that an explicit statement of the Problem is unnecessary. The rest of the report follows the standard pattern.

Another factor which complicates the Problem-Solution pattern (and also militates against a crude version of the "lexical signalling" theory which would entail that discourse status is solely determined by certain explicit language items) is that certain stretches of discourse may have multiple valency. A Problem, for example, may elicit a Response which in turn becomes a second Problem to be responded to. More commonly, perhaps, a negative Evaluation is interpreted as a Problem, requiring a Response, whether in the original text or a follow-up text. This pattern is seen in the first two sentences of the report quoted above: the first sentence reports the



scientists' negative assessment of the Results. This negative assessment comprises a Problem, and the second sentence expresses the Response that they urge the university president to take. Negative Evaluations, therefore, have dual status, and indeed Hoey (1983:81-106) devotes a chapter to the extension of the basic Problem-Solution pattern by negative Evaluations in what he terms "chained, progressive and spiral multi-layering".

Complete texts, beyond the short passages too often used as examples (albeit for obvious reasons of practicality), depend on the multiple valency of discourse stages. As we have seen, the Problem-Solution sequence (which corresponds to Swales' moves) in the Introduction to learned articles, functions in its entirety as the Situation and Problem stage of the articles as a whole. The relationship between the Introduction and the rest of a typical learned experimental article may be summarised by the following sketch:

<u>Introduction</u>	<u>Complete Text</u>
Situation.....	Situation
Problem.....	Problem
Responses of Previous Researchers	
Negative Evaluation of these Responses	
Outline of own Response & Results (=Preview)	
	(=Detail)...Own Response
	(=Detail)...Own Results
	Evaluation

The complexity of whole texts may be grasped from this sketch of a typical text. We have already noted that the outline of

one's own Responses and Results in the Logical Sequence of the introduction is also part of a Matching Relation (Preview) with the rest of the text. Certain stretches of text therefore may have different discourse values depending on whether they are related to micro or macro sequences.

The sketch above also illustrates yet again how closely typical learned articles follow a Problem-Solution pattern. Matching relations also occur, of course, but problem-solving is a central concern of academic research in many fields. We shall therefore limit ourselves here to an investigation of the Problem-Solution pattern. To my knowledge, little or no research has been published on how Logical Sequences vary according to genre. In the analysis which follows, I shall again consider some of those sequences which give similar information in the learned articles and the popular articles. However, instead of focusing on the linguistic features of the clauses in the extracts, I shall attempt to identify the discourse status of the clauses and so relate them to their broader co-text. To a certain extent, given the importance I assign to schemata, rather than to lexical signalling, in the identification of the Problem-Solution sequence, the status of certain passages of text may well be open to debate. I can only counter any anticipated objections to my labelling by being as explicit as possible in the analyses which follow, and allowing where appropriate for differences in interpretation by different readers.



## 5.2 Text Analysis

### 5.2.1 Problems and Solutions

To a great extent both the learned articles and the popular articles may be read as "strings" of topic-related logical sequences of the Problem-Solution type. However, these may be very different in kind. I would wish to draw a distinction, previously neglected, between texts which report a logical sequence and those which realise a logical sequence. Such a distinction probably did not seem worth remarking by earlier researchers; however, the present corpus would suggest that there are some systematic variations in reported/realised logical sequences according to genre. Some of the variation of course depends on whether or not the popular and learned articles are written by the same person or people. A report (such as the earlier example about the nuclear weapons labs at Livermore) is an example of a reported logical sequence. The reported problem is not one that the author will attempt to solve. The author is therefore "invisible" to the extent that he/she is not a part of the narrative. This is so in the popular biology articles BP2 and BP3: the authors of these texts do not contribute to the response or results stages of the text; they simply report the work carried out by the authors of the learned article. Where they do materialise (if at all) is at the evaluation stage, to endorse, qualify or reject the results presented by the original authors. However, as we shall see, history articles in particular tend to favour

reported rather than realised logical sequences -- a finding which supports Chapter Four's claim that in this field the author is less of a protagonist in the narrative of the text. Not surprisingly, scientific texts fall into a problem-solving structure which favours realised logical sequences, except of course when the work of others is reported.

### 5.2.2 Discontinuous sequences

As noted in Section 5.1, earlier in this chapter, sometimes a stage in the Problem-Solution sequence may be omitted or truncated: if the Situation is given, the sequence may begin with a statement of the Problem; alternatively, if the Problem is an unexplained fact or event, then the Solution may take the form of an explanation, which may be evaluated without recourse to separate Responses and Results. An example of further conflation of separate stages is the signalling of discourse status by a clause constituent, such as an adjunct or even an individual lexical item. A common example of this would be Results combined with Evaluation by means of a modal adjunct (eg "unfortunately") or modal verb (eg "seems"). An example of the conflation of Response, Results and Evaluation can be found in a short sequence from BP2:5:

SITUATION	The "mitochondrial clock hypothesis assumes a uniform rate of mutation over long evolutionary time.
PROBLEM	But researchers find it hard to see how this could be tested.



RESPONSE            However, should they discover that a significant  
(conditional)       proportion of supposedly neutral mitochondrial  
                     mutations affect genetic fitness...

RESULTS            ...researchers relying on the accumulation of  
(hypothesis)       of mutations as a clock to time evolution would  
                     need to think again.

Here the Situation and Problem are clear but an appropriate response is at present out of reach. The author therefore presents a speculative response ("discover...") in the form of a condition that would give a hypothetical Result. The modal verb ("would") signals that the Result is purely speculation, and so a separate Evaluation is also unnecessary. The following excerpt from BP1 gives an example of a logical sequence where one stage is omitted altogether, and gives a further illustration of the procedure followed:

SITUATION:        The top carnivores in Sweetings Pond are octopuses. They eat the small crustaceans and clams that live in the lake but leave brittlestars alone. Octopuses are relatives of the shelled cephalopods, Nautilus for example, that were important predators before the Mesozoic marine revolution. A cephalopod at the top of the food chain makes the analogy between Sweetings Pond and ancient communities of suspension feeders all the more plausible.

PROBLEM:          What happens to brittlestar beds if predation increases?

RESPONSE:        [IMPLICIT: Consider the situation in the English Channel.]

RESULTS:          Many beds in the the western English Channel have disappeared since 1970.

ASSESSMENT:      Norman Holme of the Marine Biological Association  
(1)               links this decline to recent increases in the population of a predatory starfish.

BASIS:            Like the brittlestar beds off the Isle of Man these populations had been doing quite nicely since the end of the 19th century.

ASSESSMENT: Predators tipped the balance, destroying the beds.  
(2)

(BP1:6)

The Situation here is an extensive General-Particular pattern, introducing the topic of octopuses and giving ancient and modern examples. We are presented with a Situation in which octopuses are the chief predators. The Problem is phrased as a question, which as Myers (1985c: 25) points out is "One of the most powerful syntactical patterns of popular science texts". The Response to the Problem is omitted, the Results providing enough information for the reader to infer it. The Evaluation reports a reported Assessment, followed by a Basis, which in turn is endorsed by a second, concluding Assessment.

An analogous passage from the corresponding learned article has the following structure:

SITUATION: Another aspect of the lake's anachronistic character is its high density of Octopus briareus, the Caribbean reef octopus. The population density of this cephalopod is also orders of magnitude greater in Sweetings Pond than off the coast.

PROBLEM: [IMPLICIT: To explain the existence of the community.]

SOLUTION: [EXPLANATION] Once again, the absence of predatory fishes appears to be responsible. The octopuses are limited by the availability of dens in Sweetings Pond (Aronson, in press).

SITUATION: It is perhaps more than coincidental that a slow-moving, epifaunal suspension-feeding echinoderm, which carpets portions of the lake substrate and gives the benthos a distinctly Paleozoic appearance is accompanied by a cephalopod (which does not feed upon ophiuroids; Aronson and Harms 1985).



PROBLEM: [To determine if this co-occurrence is simply coincidental.]

SOLUTION: [EXPLANATION] Ectocochliate cephalopod carnivores were common in Paleozoic and Mesozoic coastal benthic communities (see Discussion) and they may have exerted a relatively greater influence (in the absence of teleosts) than do present-day coleoids. Therefore the abundant octopuses in Sweetings Pond may be functional analogues of ammonoids and/or nautiloids in Paleozoic marine communities.

GENERAL EVALUATION: The observations in Sweetings Pond support the hypothesis that increased fish predation in the Mesozoic contributed to the demise of dense ophiuroid as well as crinoid communities in coastal habitats.

ASSESSMENT

BASIS Where predation pressure from fishes (and crustaceans) is weak or absent, as in Sweetings Pond and some temperate and boreal coastal communities, exposed ophiuroids still occur densely (Vevers 1952; Warner 1971; Wilson et al 1977; Aronson and Harms 1985). In fact, fluctuations in the occurrence of dense beds of Ophiothrix fragilis in the English Channel have been correlated with changes in predation pressure exerted by two species of the starfish Ludia (Holme 1984).

(BL1:6)

In this passage we see an example of how logical sequences combine in an extended text. Two Problem-Solution "strings" are embedded in a larger sequence dealing with the significance of the observations in Sweetings Pond, which the General Evaluation concludes. The two micro-sequences above share the topic of the Sweetings Pond octopuses. Unlike the popular article, the learned article does not phrase the Problems as questions, but leaves them implicit, or, at most, surmisable from the adjacent Situation and Solution stages. We shall return shortly and in more detail to the question of whether

popular articles allow for a higher degree of explicitness in phrasing Problems. However, for the moment the above examples illustrate the procedure by which the texts were analysed, showing examples of conflated, discontinuous and embedded sequences.

### 5.2.3 The Realisation of Problems

As stated in the first section of this chapter, "Problem" is a convenient label which is nevertheless unfortunate in its negative connotations. Problems simply trigger responses, and the fact that most Problems are negative -- gaps in knowledge, limits of machine performance, controversies, and so on -- does not necessarily mean that every Problem is negative. For example, BP2:1 contains the reported sequence:

SITUATION/ PROBLEM	Studies of evolution have become increasingly powerful and verifiable.
RESPONSE	Investigations of protein structure rapidly superseded simple morphological comparisons of species that looked at the form and structure of whole organisms.
RESULTS	For example, two proteins that apparently carry out the same role in two different types of organism may vary widely in their chemical composition: the detailed protein structure belies the superficial resemblance.
EVALUATION	This kind of data enables researchers to reconstruct the order in which species diverged during evolution. For example, the immunological properties of albumen, a protein found in blood plasma, suggest that humans are as closely related to chimpanzees and gorillas as these animals are to each other.



The stated Problem here may be construed as a positive aspect of the Situation: advances in technology have made hitherto impossible Responses (ie the "investigations") possible. It is also interesting to note that the Results in this sequence are introduced by "for example". Literally, the clauses which follow do not give an example of the investigations, but an example of the Results of the investigations. The lexical signal here, then, does not mark a fully-realised General-Detail relationship but rather simply signals relevance. It is revealing to compare the use of the lexical signal in the Results section with that in the Evaluation, which does give a detailed illustration of the conclusions which may be drawn from the Results. This example gives further support for a view of logical sequences which does not lay too much of a burden on the presence of lexical signals, or indeed a literal interpretation of them.

Problems, then, are aspects of the Situation which trigger Responses. To determine the types of Problem associated with each genre, we shall now consider those contained in the introductory sections of each article: the rough assumption is that the introductory sections will at some point state or imply the main Problem of the article. For convenience, the analysis of these introductory sections is given in Appendix I.

The three popular biology articles have introductory Situations and Problems which are set firmly in the general reader's

sphere of interest. BP1:1 spends a considerable amount of time establishing the existence of a rare and longstanding modern brittlestar community before implying the Problem by way of a mismatch between the present Situation (where brittlestar communities are far-flung) and the past Situation (where such communities were ubiquitous). In contrast BL1:1 posits a minimal Situation before directing attention to a research Problem, "understanding large-scale shifts in community composition over geological time". No attempts are made here to stimulate readers' interest by way of a vivid narrative: the reader's interest in the Problem is assumed.

BP2:1 appeals to the biblical character of Eve to stimulate general interest in a pseudo-Problem: validation of science's apparent claims to have established a way of dating the existence of a mythical woman. However, the pseudo-Problem simply acts as a "trailer" for the more mundane Response which arises from increasingly-powerful studies of evolution. Again the learned article does not attempt to appeal to general interest, avoiding any mention of an "Eve". The Problem concentrates again on a research question: the difficulty of basing claims relating to evolutionary history on information from nuclear genes.

BP3:1 and BL3:1 are perhaps the least alike, to the extent that the popular article almost misrepresents the learned study. The popular article concentrates on threats to the existence of



the Scottish wild cat: the Problem, in other words, is the wildcats', not the researchers'. The learned article concentrates on the researchers' problems of correctly identifying pure wildcats and hybrids. In fact, further reading of the learned article strongly implies that the Scottish wildcat as described in the popular article is not in danger of extinction -- it is in fact extinct. The popular article focuses on the threat presumably to dramatise the Situation and again raise the interest level for general readers.

A similar pattern is evident in the computing articles. CP1:1, like BP2:1, begins with a quotation: this time a rhetorical question, which effectively functions as a pseudo-Problem to obtain the interest and attention of the general reader. An extensive Situation-Problem section (which includes a Response which is swiftly given a negative Evaluation) gives a non-specific account of the research Problem of AI ("trying to construct computers and computer programs that do the sort of things that minds do"). In contrast the Problem expressed by the learned article is the mismatch of opinions as to the worth of parallel distributed processing. The learned article assumes familiarity with the subject, and probably a knowledge of the works of the rival researchers in the field.

At first sight CP2:1 and CL2:1 have different Problems: the popular article focuses on the difficulty in making industrial

robots more adaptable; the learned article focuses on the difficulty of transforming computers' ability to represent visual information into the actual ability to "see". The Problems are, of course, related insofar as the ability to create "seeing" computers should lead to more adaptable robots; however, this connection is not even hinted at in the learned article. Once again the popular article grounds the Problem in the general readers' sphere of interest, while the learned article makes no such concession.

Another rhetorical question poses an obvious pseudo-Problem which should both interest and amuse the reader of CP3:1. This again acts as a "trailer" for the more serious Problem of finding appropriate tasks for a new kind of computer. The learned counterpart this time has a similar (if more detailed) Problem: investigating a range of neural network models, and finding applications for parallel computing.

The popular science articles, therefore, share a concern to phrase the Situation in such a way as to link the Problem to the reader's concerns and general knowledge -- by quotation, rhetorical question, reference to a practical situation, or by dramatising the Problem. Learned articles home in on the research Problem, and no concessions are made to its obscurity. The Situation if elaborated at all tends to be what Swales (eg 1990) terms "field establishment": stating the centrality of the field or giving an account of present knowledge. Finally



-- and significantly -- all the learned science articles' initial Problems are realised rather than reported: in other words, they are represented as Problems for the writer (or at least the research community) to solve. Most of the popular science articles have similar Problems, the exception being BP2:1 where the initial Problems stated are those of the wildcat.

The history articles, as so often before, do not conform to the pattern established by the science articles. HP1:1, however, does fit the pattern: the Situation establishes the field of urban history and the Problem lies in the mismatch of researchers' opinions arising from the richness of sources. The learned article, on the other hand, reports a Situation which causes Problems, not for the researchers, but for the authorities of Victorian seaside resorts.

Both the learned and the popular articles, HP2:1 and HL2:1 report rather than realise Problems. HP2:1 reports a Problem for Charles I, while HL2:1 spends several pages of chronological description establishing a Situation before coming to its first (reported) Problem.

HP3:1 is rather more difficult to classify. At first sight it is a reported sequence: expressing the Problem (for society, rather than for researchers) of the apparent increase in crime in the recent past. However, the phrase "crime recorded by the

police" hints at an implicit Problem for researchers (ie the reliability of such records), a Problem which will later be made more explicit. The learned article again conforms to the pattern seen in the science articles: the centrality of the field (ie the law) is claimed, before expressing a Problem which must be tackled by the research community (ie the neglect of its study).

The types of Problem in science articles seem, on the evidence of our small sample, to be fairly constant, whereas history articles tend to be more variable. It is perhaps significant that the two extracts which do conform to the science pattern (HP1:1 and HL3:1) both attempt to justify new or neglected areas of study. It is possible that the "prestige form" of science is being appealed to in order to establish the credentials of young sub-disciplines. Otherwise the history articles fall less easily into a Problem-Solution pattern. The problems and solutions of others may be reported and evaluated, but the possibility of Problems for the researcher is unstated. As far as HP2:1 and HL1:1 are concerned, for example, there are no research Problems: the narrative is presented as an uncontroversial sequence of events. Such expressions of historical interpretation as historical fact accord with the claims made in Chapter Four in relation to the historian as invisible, omniscient authority.



#### 5.2.4 The Realisation of Solutions

A comparison of later passages from the popular and learned articles containing similar information shows other recurring patterns in the realisation of Solutions. The overall logical sequence of BP1 and BL1 may be summarised as follows:

- SITUATION: Millions of years ago ophiuroids blanketed the ocean floor. Today assemblages are rare, except in a few places.
- PROBLEM: To determine the cause of their virtual extinction.
- RESPONSE: To study anachronistic modern communities and to compare them to fossil assemblages. In particular to look for evidence of predation in each community, ancient and modern.
- RESULTS: There is little evidence of predation in ancient and modern communities.
- EVALUATION: Ophiuroids flourish(ed) where predation was low; an increase in fish predation was probably a major factor in their extinction.

(Combined paraphrase of BP1 and BL1)

In both articles predation is the key to the mystery. But in comparison with the popular article, there is a marked reluctance in the learned article to acknowledge in earlier passages of the text that predation might be the Solution. This is particularly apparent in the phrasing of the Problem in analogous sections of the texts. Compare three analogous stretches of text: the first dealing with the researchers' experiments in modern communities; the second (as above) dealing with the importance of octopuses; and finally, passages dealing with injuries to fossil populations.

The following two passages deal with experiments on modern communities:

Cod, flatfish, wrasses, dragonets and crabs eat ophiuroids on rocky reefs. These modern predators -- modern, geologically speaking -- are rarely seen off Spanish Head and Bay Stacka. There, slow-moving starfish are the biggest threat to brittlestars. Like their brittlestar cousins, starfish appeared early in the Paleozoic. They might have been the chief predators in ancient brittlestar communities.

To measure predation directly, I tied *Ophiothrix* to small weights and set them out as "bait" at Bay Stacka. For comparison, I did the same experiment on a rocky reef just outside Port Erin Bay. Here brittlestars are much more sparse and we find them only under rocks and in crevices.

Nothing much happened at Bay Stacka. Starfish consumed bits of a few tethered brittlestars, but most of them survived. At Port Erin, on the other hand, ballan wrasses and flatfish ate most of the experimental animals. I repeated the experiment at the Millport Marine Station, on the Isle of Cumbrae. *Ophiocomina nigra* forms a dense bed in 10 metres of water, just offshore of the laboratory. The results were identical: predation pressure is low in brittlestar beds.

(BP1:5)

Sweetings Pond, an isolated saltwater lake on Eleuthera Island, Bahamas, contains another type of anachronistic community. This lake supports a persistent, high density population of the epifaunal, suspension-feeding ophiuroid *Ophiothrix oerstedii*. The ophiuroid density, which sometimes exceeds 400 individuals per square meter (figs 231A and 23.2) is two orders of magnitude higher than that found in nearby coastal habitats and occurs because predatory fishes are virtually absent from the lake (Aronson and Harms 1985). When assemblages of ophiuroids comparable in density to those in Sweetings Pond were exposed in open arenas (from which they could not escape) at a coastal site off Eleuthera, the brittlestars were completely consumed within 48 hours. No significant ophiuroid mortality occurred in similar arenas in the lake. Gut content and fecal analyses of all possible Sweetings Pond predators of *Ophiothrix*, including the large majid crab *Mithrax spinosissimus*, confirmed the virtual absence of predation.

(BL1:5)



The stages of the logical sequence in the popular article (BP1:5) are easier to identify, partly because the paragraphing tends to follow stages in the sequence rather than the sequence in its entirety, and partly because the stages have more explicit lexical signalling. In the extract from the popular article, the first paragraph establishes the Situation: one in which starfish are the main predators. The Problem ("To measure predation directly") and the Response -- the experiments -- are expressed in the following paragraph. The Results are given in the third paragraph, where again lexical signalling is highly evident ("The results were identical").

The learned article relates a very similar experiment in a different location (the Sweetings Pond experiment is also briefly mentioned in BP1, without repeating details of the experimental procedure). The Situation is established: one in which there is an anachronistic community of ophiuroids. No link to predation is mentioned. The apparent Problem is in the surprising density , and the Solution ("because predatory fishes are virtually absent") is immediately stated. The experiment is then related as evidence for the anticipatory Evaluation.

The difference that I wish to point out is that whereas the popular article, in a micro sequence, explicitly states a Problem directly related to the overall Solution, the learned

article does not. Predation here is only mentioned as part of the Solution. The sequences may be summarised as follows:

	BP1	BL1
SIT:	Location where starfish are main predators	Location of anachronistic ophiuroid community
PROB:	To determine level of predation in different locations	To determine reason for high density of ophiuroids
RESP:	Experiments with ophiuroid bait	Experiments with ophiuroid bait
RESU:	Predation pressure low in brittlestar beds	Predation pressure low in brittlestar beds
EVAL:	[IMPLICIT] Predation linked to ophiuroid density	Predation linked to ophiuroid density

(Paraphrases)

This anticipation of the Solution within the Situation and Problem is repeated in other sequences of BP1. Consider the passages dealing with octopuses, analysed fully above. A summary of each sequence is given below:

	BP1:6	BL1:6
SIT:	Octopus at the top of the food chain in modern brittlestar communities.	Sweetings Pond has high density of octopuses.
PROB:	What happens if predation increases?	[IMPLICIT] To explain why density is so high.
RESP:	[IMPLICIT] Consider the English Channel.	[EXPLANATION] The absence of predatory fishes
RESU:	Many beds there have disappeared.	Octopuses limited only by den availability



EVAL: Predation linked to  
decline in population.

[IMPLICIT in use of  
modal verb] Explanation  
is plausible.

(Paraphrases)

The passages are in many ways parallel to the previous ones: in both sets the Situation deals with an anachronistic predator; each learned article uses the key concept of predation to solve the Problem of explaining the density of a community member; each popular article makes the key concept of predation an explicit part of the Problem.

There are two other passages in the learned article, BL1, which deal with octopuses, and which may also be taken to be at least partly analogous to paragraphs BP1:6, summarised immediately above. These other passages are summarised below:

BL1:6	BL1:6
SIT: Shelled cephalopods were common predators in ancient times. <u>Nautilus</u> is the only living analogue.	Shelled cephalopods were common predators in ancient times (Kuhn 1963)
PROB: To explain increased ornamentation on ammonoid shells.	[IMPLICIT] To determine role of cephalopods in ancient times.
RESP: [EXPLANATION: Ward 1981] Increase in activity of predators led to the development of coarse ornamentation	Consider data from Sweetings Pond and that of O'Dor and Macalester (1981).
RESU: [NOT APPLICABLE]	Only one cephalopod is known to eat ophiuroids.
EVALU: Plausible that predation and global disruptions	Brittlestars could have thrived in absence of

contributed to the decline in ammonoids.                      other predators.

(Paraphrases)

Both these passages follow the pattern seen in the previous BL1:6 sequence: the concept of predation is apparently avoided in the Problem stage, and introduced (or reintroduced) as a Solution.

I have focused at some length on the sequences found in BP1 and BL1 because it uses a clearly-defined experiment as the basis for its knowledge claim. But is this pattern reproduced in other articles which have an experimental basis? Crucial experimental sequences from different articles are summarised below, beginning with Problem-Solution patterns from BP2 and BL2 which detail how the "evolutionary clock" is analysed. (In some cases the summary is "extended", that is, the passage extends beyond the extracts selected and quoted in Appendix B.)

	BP2:3-4 (Extended)	BL2: 3-4 (Extended)
SIT/ PROB	MtDNA is helpful in studying evolution.	MtDNA provides new perspectives on how, where and when the human gene pool arose and grew.
RESP	Samples of mtDNA were extracted and digested with restriction enzymes.	MtDNA was purified and then subjected to high resolution mapping with restriction enzymes.
RESU	A "tree of lineages" constructed.	An "evolutionary tree" was constructed.



EVAL From these results, three hypotheses are advanced regarding the place of origin of humanity, the number of lineages per race, and the date of the common ancestor.

From these results, three hypotheses are advanced regarding the place of origin of humanity, the number of lineages per race, and the date of the common ancestor.

(Paraphrases)

These two sequences are much more similar than those analysed in BP1 and BL1, probably because the popular article is in this case someone else's summary of a learned article. The popular article in fact follows the learned article very closely, omitting only a considerable amount of technical detail. One difference between the articles comes after the Evaluation stage paraphrased above. Where the learned article compares its hypotheses with those deriving from other studies (mtDNA and fossil studies), the popular article turns back to the reported sequence and asks the explicit question: "What does this mean?" The procedure then is re-evaluated from the perspective of the reporter, anticipating and correcting the possible misconceptions of the lay reader. However, here the experimental sequences in the popular and learned articles are similar in structure.

BP3 and BL3 are also written by different authors, and the popular article summarises the learned article. However, the conclusion of the learned article also offers a summary. Both are quoted verbatim below:

PROB It is not always easy to tell whether an animal which looks like a Scottish wild cat is tainted with domestic cat blood.

RESP However, a careful analysis of several skull measurements can reveal not only whether the cat is wild or domestic, but also if there has been any significant hybridisation.

RESU French and his co-workers discovered that wild cats had indeed hybridised extensively with domestic cats as they spread from their last stronghold in the western Highlands more than 70 years ago. As wild cats moved into new areas they would have had few opportunities to mate with their own kind and instead would have resorted to mating with their distant domestic relatives.

1. This paper aimed at identifying populations of wildcats (Felis silvestris), domestic cats (F. catus) and their hybrids by skull morphometrics.

Wildcat samples were classified as 'old' (collected 1901-1941), 'recent' (1953-1963) and 'modern' (1975-1978) and skull measurements of these three groups together with samples of hybrid and domestic cats were compared using Fisher Linear Discriminant Functions (FLDF), Principal Component Analysis (PCA) and Canonical Variates (CVA).

2. All analyses showed that 'old' wildcats were different from all other groups. 3. There was little or no difference between 'recent' and 'modern' wildcats. Both groups were separated not only from domestic cats but also from 'old' wildcats. 4. The hybrid group was the most variable. In PCA, and particularly in CVA, it overlapped extensively with both 'recent' and 'modern' wildcats, and FLDF produced most misclassifications between hybrids and other groups. 5. Wildcats had larger, more robust skulls than domestic cats, and all the distinguishing variables were characters related to stalking



catching and killing of prey. 6. Sexes were most distinct in 'old' wildcats, less so in domestic cats and 'recent/modern' wildcats, and least in hybrids, where the pattern of variation was also different from all other groups.

EVAL The Scottish wild cat does seem to be threatened by hybridisation, but there may be some hope for our only wild feline.

We concluded that 'old' wildcats were probably a (relatively) 'pure' population of F. silvestris, but that 'recent/modern' wildcat populations contained a (relatively) high proportion of hybrids.

Again it is evident that the learned article gives a more technically detailed summary than the popular article, and different aspects of the information are emphasised. The popular article again dramatises the Problem by using the word "tainted" whereas the learned article is more concerned with validating a procedure for identifying different strains of cat. The popular article is more concerned with establishing the "purity" of the older strain. Different aspects of the Results are also emphasised: the popular article focuses on the Result that many wildcats had hybridised; the learned article focuses on differences and similarities among the three classifications of wildcat. The popular article concludes that the wildcat is "threatened" (again a dramatic term); the learned article simply concludes that hybridisation has been extensive, without making a value judgement about the fact.

The biology articles, then, show a variety of differences between learned and popular articles in the working out of the solutions: the anticipation of solution and the intrusion of value judgements in the popular articles are evident. However, there is little evidence here of strongly-recurring patterns between texts. It is yet to be seen whether such patterns are replicated in other fields. The experimental procedures that are used in biology to discover facts about the natural world do not find exact parallels in the computing articles. However, they too apply problem-solving techniques to technical problems, as the following passages show:

	CP1:4 (Extended)	CL1:4 (Extended)
SIT/ PROB	If the human mind is like a connectionist machine, it still looks at times like a serial computer.	Although connectionist models of the mind seem to provide an alternative to classical models, some psychologically realistic models of our performance of some tasks can only be obtained by positing a classical mechanism.
RESP	Rumelhart and McClelland suggest that evolution has led the human mind to simulate a serial computer, by using external symbols located in the world to augment its internal capacity to process symbols.	Review Pinker and Prince's critique of Rumelhart and McClelland's famous connectionist model.
RESU	[Stage omitted]	There is an argument for a mixed model of human reasoning.
EVAL	If this view is correct, then the model of the mind as a serial computer	Cognitive science needs to recognise mixed models if it wants a genuine



is based on a recent  
evolutionary innovation.

psychological model of  
human thought.

(Paraphrases)

The summaries given above disguise the fact that the sequence in the learned article is much longer: four paragraphs in the popular article are extended to twenty-seven in the learned article, the majority being devoted to a detailed review of Pinker and Prince. Nevertheless, there are clear similarities between the sequences, both of which are responding to the same basic Problem. The popular article describes the author's preferred Response, the Rumelhart and McClelland model. It does not mention any serious criticism of the model, and moves straight from Response to a tentative, positive Evaluation of the Response. The learned article in contrast approaches the "famous" (ie to specialists) Rumelhart and McClelland model through a serious criticism of it, given in great detail. Whereas the popular article is satisfied with a reported logical sequence, the learned article moves to a realised logical sequence with an original contribution to the research: a mixed model of human reasoning, deriving from both Pinker and Prince and Rumelhart and McClelland. This Result is given an enthusiastically positive Evaluation by the author.

These sequences do not replicate (or contradict) many of the tendencies so far noticed in popular and learned sequences: there is no anticipation of the Solution in the Problem, or dramatising of the popular sequence. The main tendency which

is echoed here is simplification: much technical detail is omitted in the popular article, and contradictory points of view are neglected. The learned article has to consider awkward contradictory Responses and find ways of resolving them, either by selection or synthesis. The synthesis of different Responses, as in CL1, is one way of moving from a reported to a realised logical sequence.

A form of "dramatisation" is, however, evident in parallel sequences from CP2 and CL2:

CP2:4	CL2:4
<p>PROB A single rigid model does not capture the variations in appearance of many common objects. In addition, certain objects are recognised because they belong to a generic class of objects.</p>	<p>Precise spatial correspondence cannot deal with the fact that many objects are nonrigid.</p>
<p>RESP Some vision systems can manipulate such models. Mature computer vision will be able to recognise objects by various surface properties.</p>	<p>1. The possible degrees of freedom in an object will have to be explicitly represented. 2. It is possible simply to discard much information about the visual shape of objects because it is not fully constrained.</p>
<p>RESU These more complex visual properties will require the more sophisticated modelling techniques of computer graphics, if robots are to utilize them.</p>	<p>The result of the second response would be the loss of a large portion of our most useful visual knowledge. [The first response is implicitly favoured].</p> <p>(Paraphrases)</p>



The Response to the Problem in the popular sequence is a general statement about the required qualities of future machine vision. The learned sequence keeps a tighter focus on the shape of objects. The Results are therefore also more specific in the learned article: discarding information about possible variation in the shape of objects is an obviously poor Result. The popular version branches off in a different direction entirely, relating the consequences of mature computer vision for the emerging robot industry. As we have seen in previous sections, the dramatisation here is in the linking of the Solution to a technical problem with the concerns of a general readership.

The final pair of computing articles confirm the popular articles' concern for more general, practical applications of the Solutions to technical problems, as the following summaries suggest:

CP3:4		CL3:4	
SIT/ PROB	Transputers are recent innovations but they already have many uses.	SIT/ PROB	[IMPLICIT: What is the result of applying the Geman & Geman algorithm on the DAP?]
RESP	One application is "ray tracing", which is used to make graphic images in interior design..	RESP	Apply the algorithm to square images.
RESU	2. Each transputer can work at full speed, until the image is completed, without slowing down its neighbour.	RESU	For 64 x 64 images the rate of updating on the DAP was more than 100 sweeps per second.
	2. An added advantage	EVAL	Compared to two

	is that work is distributed more or less evenly among available processors.	other image restoration methods this analogue neural network method
NEG. EVAL	This sort of calculation is not well suited to the DAP, which can only go as fast as its slowest processor.	consistently finds lower-cost solutions.
RESP	Include a high bandwidth bus to get data to and from the processors quickly.	
RESU	The DAP can carry out some of the more concentrated algorithms for graphics quickly, but the images are less "nice".	
EVA	Good ray tracing on the DAP is slow.	

(Paraphrases)

Possibly it might be argued that these two passages are less convincingly matched because they are not so obviously parallel. However, they do both deal with different types of computer graphics on a neural network called the DAP, and both are concerned with finding appropriate applications for this new technology. And the divergences lie in the constraints on a popular article -- it must find ways of making the Problems and Solutions accessible to a wider readership, here by relating the applications to a working context, interior design. The learned article works on the assumption that the Situation and Problem do not need much of an introduction: the specialist reader is expected to have an automatic interest in the Response. The Solution here concerns only the speed and



economy of image restoration -- not what the image restoration will be used for. To the non-specialist the Solution exists in a vacuum -- the logical sequence is irrelevant and opaque. The difficulty of the technical language is compounded by the mystery of why anyone should be interested in the procedure at all. To the specialist any details of general applications would be trivial and irrelevant: interest in the technical problems is given, and the procedure fits into acquired background knowledge.

Again, the history articles do not fit neatly into the emerging patterns evident in the science articles. This is partly because, as we saw in the previous section, the procedural assumptions in history articles are more often implicit. This is most obvious in HP2 and HL2, which are presented as narratives, albeit with reported Problem-Solution sequences dealing with difficulties faced by various protagonists in the Bishops' Wars. The Problems and Solutions which the writer faced in determining the "true" picture of events are unstated. Only in the newer -- and perhaps more contentious -- field of social history are procedural assumptions sometimes made explicit in realised Problem-Solution sequences. These differences between genres are seen in the following summarised extracts of sequences from HP1/HL1 and HP3/HL3:

SIT/  
PROB Leisure towns are an attractive focus for research. This is particularly true of the seaside towns.

Victorian seaside resorts were among the fastest-growing English towns in a period of rapid urbanisation. Rapid expansion posed problems of public order and marketing strategies.

RESP Social historians have recently been busy at the seaside.

[SEQUENCE DISCONTINUED]

RESU Local case studies have multiplied, and attempts at comparative analysis and general synthesis have begun.

?EVAL Why have historians found these centres of frivolity so interesting, and what can they contribute to our understanding of Victorian life?

(Paraphrases)

Here the popular article needs to justify its apparently frivolous subject to the general reader, whose surprise and perhaps scepticism is anticipated. The opening logical sequence establishes the field as one of widespread interest, attraction and value, where numerous case studies are about to bring forth Results. Instead of evaluating these Results, however, the author returns to the topic-opening question of the value of the subject. The remainder of the article serves as an answer to this question. The whole initial sequence, then, serves as an introduction to the research area, which



anticipates and offsets potential criticism from the general reader that the subject is trivial.

The learned article begins with no such apology. As we saw in the previous section, the Situation is established and a (reported) Problem is stated -- that is, a Problem for the resorts rather than the author. However, at this point the sequence is discontinued, and the article goes on to detail (at considerable length) developments previewed in the Situation. At various points in the article the Responses of the resorts to the developing holiday markets are reported; however, it is the demand rather than the supply which is the substance of the article. Here the introductory Problem seems designed mainly to raise the reader's level of interest.

The other explicit realisation of a research Problem in a history article comes in HL3:1, which is summarised below:

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HL3:1

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SIT/PROB	The law occupies a central position in pre- and modern English society; however its study was relatively neglected until recently.
RESPONSE	In the last decade it has received serious and systematic research by social historians.
RESULTS	This diverse research has resulted in a tension in the use of the records of criminal justice: should criminal indictments be taken as a measure of changes in criminal behaviour over time, or as an indicator of the contours of criminal justice?
EVALU	These two approaches have neither been nor need be mutually exclusive.

(Paraphrase)

No equivalent sequence is to be found in HP3:1. Here the subject (crime) is not obviously frivolous to the general reader, but the specialist will be aware of a controversy among historians about the interpretation of records of indictments. It is this disagreement about procedure which (certainly in a bibliographical essay) drives procedural questions out of the closet. In this attempted synthesis of two apparently contradictory approaches, HL3 shows some similarity with CL1, analysed above. HL3 is, however, atypical of the history articles.

To summarise this section, I suggest that various tendencies in the realisation of Solutions are evident in the popular and learned articles, and between fields. First of all, the popular articles tend to find a way of relating the Solutions to the general reader's perceived interests, either by dramatising the sequence (eg by exaggeration of the Problem and therefore the need for a Solution), or by stressing practical applications. The learned articles may do this too, but it is less common. It follows that the learned articles may neglect explicit expression of practical applications, and concentrate instead on technical details. Learned articles are also more complex than popular articles in that they may offer more (perhaps contradictory) Responses for the reader's consideration; popular articles may offer a single simple Solution to the Problem. There is the suggestion, in various sequences within one article at least, that popular accounts



may on occasion anticipate a Solution, whereas the learned article avoids such anticipation.

Problem-Solution sequences fit the science texts more naturally than the history texts, although certain history passages can be read as reported logical sequences (which in science texts are associated mainly with a popular re-telling of a learned article by a different author). The problem-solving academic activity is more likely to be "invisible" in history articles, surfacing only when the activity demands justification or a dispute in procedure puts the activity under question. As Megill and McCloskey (1987: 221) state of historical writing: "Denying as Descartes did the human and rhetorical character of one's performance is commonly an effective rhetoric". Historians thus tend to present themselves as neutral conduits for "the voice of history". Therefore a narrative discourse pattern would seem to be more appropriate for the analysis of our history articles.

#### 5.2.5 Explicitness of Sequences

A feature of the popular and learned logical sequences, mentioned briefly in the previous section, demands some fuller analysis: the explicitness of the stages of the logical sequences, especially the Situation and Problem stages. A systematic difference between popular and learned genres is illustrated by the following examples from BP1 and BL1. The first extracts discuss brittlestar injuries in fossil

communities. I quote the extract from the popular article in full:

PROBLEM: Has predation on brittlestars really increased since the Jurassic?

RESPONSE: (1) It would be simple to answer this question if we could count the predators and prey in different fossil communities to see if the proportion of predators increased.

NEG. EVAL OF RESP. The problem is that some animals fossilise more easily than others. A simple census would not give us an accurate picture of changing levels of predation.

RESPONSE: (2) Luckily, we do have an indirect way of measuring predation. We can look at the proportion of brittlestars that are regenerating arms in fossil and modern communities. An arm that is growing back tells us that a predator probably attacked its owner.

I compared injuries in two populations of brittlestar that lived in warm seas more than 190 million years apart.

RESULTS: Not one brittlestar in a Jurassic population from Dorset was regenerating an arm. In contrast, 70 per cent of a closely-related living species from Belize had at least one injured arm.

EVAL: This is a big difference and it certainly supports the notion that predation increased after the Jurassic.

(BP1:8, extended)

The analogous sequence in the learned article begins as follows:

RESPONSE: From the early Devonian Hunsrueck shales in southwestern Germany, Lehmann studied more than 1000 well-preserved ophiuroids, referable to 15 genera and 22 species.

RESULTS: Only 23 specimens showed regeneration of arms or of arm tips in this large sample (Lehmann 1951).



EVAL: This is consistent with the hypothesis that predation pressures on Paleozoic ophiuroid populations were low.

(BL1:6)

This pattern of Response-Results-Evaluation is repeated several times in the learned article in order to confirm and re-confirm the hypothesis. However, the beginning of the passage is enough to point out that the Situation and Problem are implicit in this sequence. The preceding sequence in the learned article (analysed earlier) has dealt with the local Problem of ascertaining whether the presence of ophiuroids beside octopuses is coincidental. The local Evaluation, that present day octopuses may well be analogous to ancient cephalopod carnivores, led to a general Evaluation that where fish predation is weak, ophiuroids occur densely.

The sequence in the learned article above obviously does not share the same Problem as the sequence which precedes it. The implicit Situation and Problem above may be paraphrased as "Fossil assemblages of dense ophiuroid communities exist. How can we determine the level of predation in these communities?" In other words, the Situation and Problem are almost identical to the popular article, but are implicit or given in the learned article.

The givenness of the Situation and Problem cannot be explained by reference to context in which the sequence is embedded: the topic of examining fossil communities for limb regeneration is

as new here as it is in the popular article. The demands on the reader's capacity to infer is therefore greater in the learned article.

Another marked difference in the texts is the micro-sequence in the popular article which offers and then rejects the Response of simply counting fossils of predators and prey. Although the above description is not elegant enough to show it clearly, there is an element of Evaluation in both Responses: Response (2) is of course marked by the modal adjunct "Luckily". This Evaluation of Responses is not evident in the learned article. Presumably, again, the substance of the Responses in learned articles will normally be accepted and therefore given scientific procedure.

A second look at the initial Situations and Problems (covered earlier, in Section 3.1, and shown in Appendix I) will confirm the tendency of learned articles to treat Situation and Problem as largely given. Of the learned science articles, the Situations in BL1, CL1 and CL3 (ie half of the total) are considerably shorter and less rich in content than their popular counterparts. In some cases, the Situation is established in a highly cursory manner:

During the last few years (BL1:1)

PDP (Parallel Distributed Processing, a.k.a. Connectionism is a hot topic in cognitive science. (CL1:1)

In this paper we describe recent work at Edinburgh (CL3:1)



Comparison of learned and popular articles shows that the latter group of texts takes much greater care to establish the situation, by telling a personal narrative (BP1:1), allusion to a Chinese philosopher (CP1:1), and an amusing rhetorical question which illustrates the problem (CP3:1). The history articles provide less evidence for the pattern, since, as we have seen, the Problem-Solution pattern is not so appropriate; however, these examples from the science texts suggest that, in this field at least, popular articles tend to be more explicit, or elaborate, when realising logical sequences.

### 5.3 Summary

This chapter aimed to consider differences between genres at a level beyond or above the clause, and used a general plot or logical sequence as an analytical tool. The findings of the chapter can only be seen as provisional, for several reasons. First, while the extracts from the articles furnish us with a high number of clauses to analyse, there are fewer logical sequences. Such tendencies as emerge are therefore plotted with fewer instances as evidence. Secondly, the loose definition of a stage in a logical sequence (based less on lexical signalling than schema theory) allows some ambiguity in the interpretation of some sequences. Thirdly, we have found that while history articles may use logical sequences, both reported and realised, they are perhaps less appropriate than other uninvestigated patterns, such as simple chronological ordering of events.

However, the analyses that we have carried out do provide some evidence for systematic tendencies, of which the main ones are:

1. The above sets of sequences from the popular and the learned article suggest that there is a higher level of explicitness in the logical sequences of popular articles. To put it crudely, things are spelled out more in popular articles. This "spelling out" may take several forms.

In the simple matter of layout, paragraphs in popular articles tend to follow stages or combinations of related stages of the logical sequence. Paragraphs being notoriously difficult to define, this generalisation is far from prescriptive. However it is noticeable that in BL1 the paragraphing does tend to follow whole logical sequences rather than discrete stages. Popular articles seem therefore to be "parcelled" into smaller segments for ease of digestion.

Popular articles are more explicit in that they will explain the Situation and/or Problem when the sequence moves onto a topic or procedure that has not previously been prepared for in the text. Learned articles may expect their readers to be familiar with procedure and therefore leave the initial expression of Situation and Problem implicit. Moreover, the popular article might Evaluate not only the Results but also



the Responses, where a lay reader would ask a question that an expert would not.

2. Secondly and perhaps more tellingly, the evidence from two of the articles analysed suggests that learned articles may restrict the expression of the overall solution to the main sequence to the solution stages of the embedded micro sequences. This is done by producing the "key" solution in response to a wide variety of related problems, and also, as indicated immediately above, by treating the Problem as given and therefore omitting it. The popular article in contrast may approach aspects of the key Solution more directly by incorporating it into the Problem: for example by asking questions about it.
3. Thirdly, popular articles are more likely to dramatise the logical sequence, either by exaggerating the Problem or by relating the sequence to the general reader's interest and experience. Learned articles include more technical detail and need make fewer concessions to general interest. Learned articles should also take into consideration alternative responses to a Problem, where a popular article may select one key response and neglect rival Solutions.
4. The Problem-Solution pattern fits well with science articles especially those, like the biology texts, which are based on experimental data. The pattern is found in the history

texts, but only in reported sequences, except where the academic procedure needs to be justified for some reason.

This chapter brings to a close the main body of the study. In the conclusion the main findings will be brought together, and their validity, as well as their implications for theory and practice, will be considered.



## Chapter Six:

### Conclusion

#### 6.0 Introduction

The aim of this research was to investigate the influence on "academic" written English of (a) a change in perceived readership, and (b) a change in academic discipline.

Specifically, my main interest was in what happened to the language when the perceived readership switched from specialist to non-specialist, and when the academic discipline moved from biology to computing to history. Each of these configurations (eg popular or learned biology) is considered to be a genre, in a sense which is related to Swales' (1990) working definition.

Accordingly, I gathered a small corpus of nine pairs of articles, specialist and non-specialist, matched according to content. I then chose functional grammar as the main analytical framework, because its descriptive categories claim to link linguistic form with social function: it allies the "what" of language to the "why". In particular I followed the general structure of Halliday's (1985) introduction to functional grammar, although in various points I have altered the detail after some discussion. In this conclusion I shall once again follow Halliday in reviewing my main findings under headings linked to his three metafunctions: textual, interpersonal and ideational.

## 6.1 Textuality and Genre

In this work "theme" is identified as the left-most constituent of the clause. Its function is associated with but is not identical to that of "given": the topical theme establishes a "setting" or context for the interpretation of the rest of the clause. This functional definition may be criticised as vague; however, an analysis of themes across genres does indicate systematic variations which suggest thematic sensitivity to academic discipline and perceived readership.

The genres analysed, however, do not differ in the types of participant or circumstance found in thematic position in the clause: all disciplines, learned and popular, tend towards material and relational participants, and circumstances of location. This is not surprising: biology, computing and history articles, whether for specialists or laymen, describe events and states in the world, and also assign attributes and values to carriers and tokens. However, there are differences in the realisations of these functional categories, at least between the popular and learned science texts. Learned biology and computing texts are more likely than their popular counterparts to have as thematic participants nominalised processes, and highly modified noun phrases. Popular science texts prefer thematic participants with concrete referents, simpler noun phrases, and sometimes more colloquial vocabulary. Learned science articles again show a fair proportion of thematic "research-oriented" circumstances, where the popular



science articles will have thematic circumstances which place the process in geographical (as opposed to more abstract) space. These variations support Myers' (1985c) distinction between popular "narratives of nature", which seek to give the reader an unmediated representation of the world, and learned "narratives of science", which reify material processes and place them in the context of research, in order to focus on scientific procedure.

Popular and learned history articles, however, do not conform to this pattern: a variety of thematic participants are found in both sets of article, and no obvious trend is discernible. One conclusion might be that historians do not distinguish between audiences, although Megill and McCloskey (1987: 233) would dispute this theory:

With the rise in evidential standards [over the last twenty or thirty years] a growing split has developed between professional historians and the wider public. A work of history that satisfies the wider public is unlikely to satisfy a professional audience; and only a few works that satisfy a professional audience manage to have a wider appeal. In other words, divergent historiographic audiences now exist. Journalistic historians retain an epistemological naivete and a predilection for focusing on heroes and villains; they also retain a wide audience. Professional historians question their evidence and increasingly refuse to let the prominent men of an age stand for the age as a whole; their audience is small.

Even if perceived audiences vary in the history articles, there does not seem the same degree of variation that is found in the science articles, perhaps because (as Megill and McCloskey state) professional historiography is a comparatively new

development. As Bazerman (1988) and Halliday (1988) demonstrate, the language of professional science has been developing since the time of Isaac Newton. It is possible that our small sample has netted three conservative texts, or that the alleged divergence in audience has yet to impact upon all aspects of historiographical discourse. Whatever the reason, the similarities between ideational themes in learned and popular history articles is more striking than the differences.

Some thematic features are shared by all academic disciplines. Although the learned articles have the majority of "research-oriented" themes, placing the clauses in the universe of science, the popular articles have a higher proportion of textual themes, that is, cohesive devices and question-markers. This finding suggests that discourse signalling is more explicit in the popular texts than in the learned texts. That is, the popular texts have a more obvious structure and are perhaps easier for the non-specialists to find their way around.

Both popular and learned texts of all three disciplines have their share of modal themes -- and it is interesting to note that direct comments on the clauses are found in the supposedly objective learned science as well as learned history. Here once more the linguistic variation is across disciplinary lines rather than across audience lines. All texts sampled show modals expressing probability. Popular articles seem to allow



a wider range of thematic modals, extending to desiderative modals such as "unfortunately" or "luckily". But the main distinction here is the science articles' predilection for verifactive modals ("in fact"), redolent of hypothesis-testing, while the history articles prefer the presumptive ("of course"). Rather than test empirical evidence, the appeal of historians is (with perhaps a hint of an apology) to the obvious. Of course to state that something is obvious, apologetically or not, is part of the rhetoric of persuasion that the statement be considered a fact. More than the scientist, the historian appeals to the reader's subjective interpretation of the narrative presented; the scientist can always appeal to the empirical data provided by a carefully-detailed experiment.

Such variations cast light on the nature of academic writing, and, I would argue, simultaneously lend weight to Halliday's concept of theme as modified by Fries (1987). The nature of the setting for a message can be seen more clearly when the message remains reasonably constant but the audience for it changes. The thematic settings expected and accepted by the specialist discourse community are often different from those which are offered to the non-specialist, especially in scientific writing. And again, types of setting vary according to academic discipline. The second chapter of this thesis explored the nature of these differences.

## 6.2 Ideationality and Genre

Some of the findings of the second chapter were not unnaturally echoed in the third. Since the second chapter dealt partly with participant and circumstance types found in thematic position, and the third deals more generally with participants, processes and circumstances throughout the texts, it would be more surprising if the findings were markedly different.

The predominance of thematic participants in material and relational processes in all our sample texts proved to be an index of the predominance of material and relational processes throughout the texts. Again, the popular science extracts showed a greater tendency than the learned science extracts to represent events and states in the physical world, or the "universe of nature". The learned science extracts put a greater emphasis on events and states in the abstract "universe of science". And again the history articles do not conform to this trend: although there are differences between the popular and learned history articles, both genres are similar to that of learned science, insofar as they are argumentative rather than observational. The basis for this claim is that both popular and learned history share with learned science a predilection for nominalised processes, and participants from the world of research. The differences between popular and learned history lies more in the stated common ground between writer and reader: for example circumstances of place in the



popular article may refer to general literature on a topic (eg school textbooks) while the learned counterpart may refer to learned literature on a topic.

An analysis of participants, processes and circumstances throughout the clause, therefore, confirms the findings of the first chapter's thematic analysis. However, the practical demands of analysing several thousand participants, processes and circumstances in longer extracts of authentic expository prose do point out strains in Halliday's classificatory system.

The core of Halliday's representational classification is the process, since participants are largely labelled with reference to the process, and circumstances essentially provide extra information. Classifying processes is not, however, a clear-cut business, as Chapter Three made clear. The process "estimate" may be seen as a mental, verbal or even a material process, and other common processes also have to be forced into categories which increasingly seem too rigorous. Performative speech acts (eg "I promise..." or "I condemn...") may be interpreted as verbal processes; however, as they also fulfil social actions, there is an argument for classifying them as material or even behavioural processes. Halliday seems in such cases to favour multiple interpretations. Nevertheless, if a large number of processes demand multiple interpretations, some doubt must be cast on the claim that different processes have different grammars. This area of functional grammar is complex

and fascinating and obviously demands further research, more than could be achieved within the scope of this work. The analysis of authentic texts certainly does cast considerable light on the problems of establishing ideational categories; the utility of a classification system must ultimately be tested on such large sections of text as we have attempted to deal with here.

A related problem to which we shall shortly return is that of verbal modification, usually associated with modal auxiliaries. While grammatical classification isolates modal auxiliary verbs as a largely homogeneous group sharing certain syntactic properties, a functional classification, I would suggest, broadens the category to include verbs such as "aim", "intend" and perhaps "start" and "begin". Although this aspect of language is more interpersonal than ideational, the interpretation of such phrases as "aim to provide" as mental ("aim") or material ("provide") depends largely on the interpretation of the function of the verb "aim", as, respectively, primary verb or pseudo-modal.

There are therefore various unresolved problems in the ideational analysis of texts, and perhaps with semantic categories a certain degree of subjectivity is inevitable. It is heartening, then, that many of the findings summarised above are paralleled by Young's (1990) study of undergraduate textbooks and lectures in the fields of engineering, sociology



and economics. Young's written texts, like our samples of history, biology and computing texts, reveal a high proportion of relational and material processes (Young 1990: 199-200). This similarity between analyses of similar genres (academic writing) is to be expected, and contrasts interestingly with her analysis of lectures, where mental (which in Young would subsume verbal) processes are more prominent (Young 1990: 191-194).

Despite the flaws in the descriptive system, then, as we have seen, functional grammar can point out some valid and useful differences and similarities among genres in the representation of reality through language: here the differences between history writing and science writing are again particularly clear.

### 6.3 Interpersonality and Genre

The chapter on mood and modality began by examining and partially redefining the concept of finite, drawing less on the notion of time, which is central to Halliday's definition, and more on the notion of proximity, which extends immediacy and remoteness in time to immediacy and remoteness in factuality or reality. This partial redefinition strengthens and broadens the deictic nature of the mood, which is the primary function of the mood: to express something about which a proposition may be realised (ie the subject) and to "place" that proposition in time, factuality or reality (through the finite).

The analysis of mood across genres showed that in general popular science articles tend (more than learned articles) to root their subjects in concrete terms, realised by relatively simple nominal groups. Again this accords with the concern we have seen in Chapters Two and Three to have the participants of popular science articles as entities in the natural world. The simplicity of the nominal groups suggests that a general readership is given less information to process in this key constituent. Learned subjects in contrast tend to be more abstract and complex -- the demands they make on the readers' processing abilities would therefore be greater (cf Dubois 1982). Specialist readers, however, presumably have a greater store of given information than general readers, and simultaneously would demand a greater degree of specific, detailed information. Specialists therefore have a greater ability and incentive to cope with more demanding texts. History articles, however, again do not show these patterns so clearly: popular and learned articles in this field are again much more alike than in either of the science fields.

Both popular and learned science articles have a majority of immediate finites: these express the proposition as timeless facts, or as facts having current relevance. Remote forms of the finite are evident mainly in clusters when a past experiment or procedure is related, or, less frequently, when secondary information is given. Here there is a strong distinction between popular and learned science, and popular



and learned history: in the latter genres past narratives (and so the remote form of the finite) predominate.

The analysis of other aspects of the interpersonal nature of science and history texts highlights further clear generic distinctions. The use of modal verbs and adjuncts (as well as "subjective" mental processes) as "hedges" is much greater in science writing (especially learned science) than in history writing. It seems plausible that learned science (as at least a rhetoric of modesty) prefers to downplay the authority of the writer and to foreground empirical data as the primary source of evidence for its knowledge claims. Popular science tends to upgrade the status of the scientist and admit fewer alternatives to the claims being expressed, while historiography relies more on the writer-as-authority in claims about the interpretation of the past. Explicit hedging is less evident in the history articles.

Perhaps paradoxically, the greater the authority invested in the writer, the less evident he/she is in the text. In popular science articles, the scientists are nature's detectives, solving mysteries. In learned science, the scientists are present as members of a research community. In popular and learned history, except where there is obvious controversy or the subject matter might appear obscure or trivial, the research community and the writers are largely absent: the

rhetoric of authority demands that the story appear to tell itself.

Chapter Four also touched upon the question of polarity: obviously the great majority of the clauses in all our genres (which are all expository texts) have positive polarity, negative polarity functioning mainly to anticipate or deny possible misconceptions on the part of the reader.

The study of this aspect of the articles is perhaps the most interesting to linguists and general readers alike, probably since the question of interpersonal discoursal relationships in the supposedly objective field of academic writing has a strong fascination. Previous research on this topic, such as Myers (1989) has shown that politeness strategies utilise linguistic resources beyond those identified by Halliday as interpersonal: naming conventions, pronoun usage, and the realisation of some mental processes must be added to modal verbs and adjuncts as part of the full panoply of interpersonal features. The dual function of some mental processes, as quasi-interpersonal features, leads to the ambiguity of interpretation referred to in the previous section, and thus to difficulties in interpretation. As suggested above, further research is required into verb modification, and the whole question of the pragmatics of politeness within a functional grammar framework. The analysis given here demonstrates that the analyses can be complementary, but such work as Myers' poses indirect questions



for Halliday's grammar, which would separate the ideational and interpersonal metafunctions more rigorously.

### 5.0 Discourse Patterns and Genre

Halliday's functional grammar obviously affords great insights into discourse, but its focus is primarily on the various functional components of the clause complex. Functional grammar does not itself attempt to make claims about the organisation of text beyond the clause complex. Here the analysis of clause relations begun by Winter (eg Winter 1982) shows a promising framework for the analysis of longer stretches of text -- and a framework which has some parallels with Halliday and Hasan's work on cohesion (eg Halliday and Hasan 1976; see also the debt to both Winter and Halliday & Hasan in Hoey, 1991). The final chapter focused on one particular logical sequence which various writers find in expository prose in particular: the Problem-Solution pattern.

The analysis of this sequence in different genres suggests that texts written for non-specialists are segmented into more explicit stages. The Problem-Solution schema is more likely to be fulfilled in popular articles -- a finding which accords with Chapter Two's finding that popular articles have a higher proportion of cohesive devices (or, in Winter's terms, lexical signals). As I have argued (in relation to the simple structure of the nominal groups realising subject), the higher degree of lexical signalling and the fulfilment of a major

schematic pattern in the popular articles may all be part of a strategy to make these articles easier to process by a non-specialist readership.

There is also some evidence that popular articles will anticipate the Solution to the key Problem, perhaps by incorporating the concept into the form of the Problem: that is, a popular article might ask "What is the relationship of X to the problem of Y?" where X is the solution. A learned article is more likely to withhold the solution to the Solution stage, and simply ask "How do we solve the problem of Y?" There is an apparent reluctance, then, in learned articles to prejudge the Solutions to Problems.

Another distinction between corresponding learned and popular articles lies in the appeal to the interests of the readership: popular articles will relate their Problems and Solutions to the more general interests of their readers, while learned articles will take a high level of interest for granted. Therefore popular articles will seek to anchor the logical sequence to a practical or everyday Problem (eg the viewpoint consistency constraint is applied to robot vision), or even exaggerate the nature of the Problem (eg the difficulty of classifying wildcats is recast as the possibility of wildcat extinction). Learned articles are also more likely to consider alternative Solutions to any Problem.



Problem-Solution patterns fit science articles more easily than history articles, presumably because science is a more explicit problem-solving activity (as we saw in Chapter Four).

Therefore science articles (especially learned science articles) realise Problem-Solution sequences: the writer states a Problem and then attempts to find a Solution. Both popular and learned history articles (and popular science articles which relate others' findings) may report a Problem-Solution sequence, which might then receive a further authorial Evaluation. Realised Problem-Solution sequences are less common in history writing, though (as we also saw in our discussion of authorial intrusion in Chapter Four) they are found where there is controversy among the specialists, or where the content may seem trivial to general readers.

The findings of this chapter of the thesis are necessarily provisional, since the number of complete logical sequences in the extracts studies is quite small. Only further studies can confirm or deny the general applicability of the trends suggested here.

#### 6.5 Implications and Suggestions for Further Research

The findings of this work suggests that functional grammar can indicate clear similarities and differences in texts according to field and perceived readership. An analysis of the textual and ideational metafunctions shows that there are differences between popular and learned science; the field of history is

distinguished by showing fewer differences in this respect. However, an analysis of the interpersonal metafunction points out very distinct differences between the fields of history and science (as well as further differences between popular and learned science), and serves to give some substance to the character of history writing. These differences are supported by an investigation of the discourse patterns in the texts.

These findings would suggest that computing and biology are similar in nature, that there is a more general scientific discourse which has developed a specialist and a non-specialist strand. This scientific discourse is distinct in a number of important ways from historiographical discourse, which has not developed a popular and specialist strand of discourse to the same extent. If these findings are borne out by further studies, then there are important implications, for example, for the teaching of English as a Foreign Language, and, more specifically, for the teaching of English for Academic Purposes.

Many textbooks at present attempt to teach an "all-purpose" academic English, often relying on popular articles rather than learned articles (often because EAP teachers are themselves non-specialists in their students' disciplines). The findings of this work suggest that there should possibly be a science-humanities split in teaching materials, since, for example, the status of writer-as-authority is quite different in these two



general fields. And while I would not restrict teaching materials solely to learned academic discourse, even when teaching scientific English, I would suggest that giving students access to a range of popular and learned texts is important. Too great an emphasis on popular science may give students a false impression of both the level of detail and the weight accorded to procedure expected in learned scientific discourse. Such an emphasis would also give students little opportunity to see how scientists portray themselves as humble members of a wider scientific community.

However, a degree of modesty is necessary in the conclusion to this work. As noted in passing throughout, the sample of extracts from eighteen articles representing three fields, popular and learned, is necessarily small. I have used very rough percentages at times to give a flavour of trends in the extracts analysed, but I have not used any sophisticated procedure to investigate, for example, whether or not the differences noted are statistically significant: given the size of the corpus as a whole, such statistical rigour seems misplaced. Close linguistic analysis of text is a time-consuming activity which generates many more words than are contained in the corpus. At the moment the best we can hope for are studies such as those of Young (1990) and the present research, which analyse aspects of small corpora of academic English, refining as they do so the linguistic framework which can be used in this task. As computerised corpus research

increases, and as the descriptive framework becomes more sophisticated, the findings of these studies can be tested against more wide-ranging research.

I am confident that this research will continue: as Bazerman (1989: 317) claims: "The debate over how to talk about one's subject continues in all disciplines today, and cannot be separated from the fundamental practices of these disciplines." It is this that makes the study of academic English so exciting: an analysis of the language used to communicate knowledge in any sphere casts a searchlight on the very nature of academic procedure itself. I hope that the present work has made a small contribution to that study.