EVALUATION IN EXPERIMENTAL RESEARCH ARTICLES

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SYNOPSIS

This thesis examines evaluation in experimental research articles in terms of the meanings made and their contribution to the organisation of the articles. After an introduction to the phenomenon of evaluation in Chapter 1, Chapter 2 surveys recent work concerning the process of scientific discovery and the writing of research articles. Chapter 3 returns to evaluation and its place in various theories of discourse, mainly those of Sinclair and of Halliday. The model of evaluation proposed in this thesis is set out in the next three chapters, dealing in turn with the Status, Value and Relevance functions of evaluation. Status is the function of evaluation which bestows entity, assessing along a certain-uncertain parameter. Value bestows quality and assesses along a good-bad parameter. Evaluation of Relevance is meta-discoursal and marks significance. Relevance Markers are identified, which progressively chunk and organise the text. Comparisons between texts analysed for Status, Value and Relevance demonstrate a movement towards the theoretical and an increase in complexity of argument as the sub-discipline under discussion progresses. Chapter 7 investigates the contribution of evaluation towards text structure and notes a number of ways in which discourse units in experimental research articles may be organised. The concluding chapter, Chapter 8, discusses some of the practical and theoretical implications of the work described in the thesis. The Appendix contains the research articles which comprise the corpus.

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CHAPTER 1

Introduction

1.1 Introduction

The aim of this thesis is to investigate the linguistic phenomenon known as evaluation. It is set within the context of the study of discourse. Several theories of discourse are relevant to the study of evaluation, mainly those of Sinclair and of Halliday. Because, however, these fail to deal adequately with the complexities of evaluation, in my opinion, I propose an alternative approach to the phenomenon. This does not arise directly from either of the theories but from observation of how evaluation works and contributes to the meaning and organisation of a small set of texts. The texts are experimental research articles dealing with a particular area of biochemistry. They thus form a non-random, motivated corpus. Although the data for this thesis are all taken from these texts, my aim is to use experimental research articles as examples of written discourse and so suggest how evaluation may contribute to discourse in a more general sense. I shall then re-examine the theories of discourse mentioned in the light of this investigation.

My aims may be summarised as follows:

To investigate and characterise the role of evaluation in written discourse.

To apply that characterisation to experimental research articles.

To set the study of evaluation within the context of systemic approaches to language, specifically, those of Halliday and of Sinclair.

In the following sections, this chapter will attempt to justify these aims by answering the following questions: Why study evaluation? Why study it in relation to experimental research articles? Why approach the topic from these theoretical standpoints?

1.2 Rationale: The Study of Evaluation

A category of discourse meaning labelled *evaluation* is central to some theories of discourse (e.g. Sinclair) and yet does not appear to exist as a category in others (e.g. Halliday). The difficulty of its study is compounded by the fact that, even amongst those who use the term, there is no agreed definition of evaluation or the role it plays in discourse, although there is a large amount of consensus about what constitutes evaluation in individual texts. It is because of, rather than in spite of, this dubious theoretical status that the study of evaluation is of interest to discourse analysts.

Another reason for the importance of evaluation to linguists is that ts use is a crucial component of other discourse features and functions, ch as point of view, attitude, persuasion, the monitoring of interaction. Investigations into writer point of view or attitude, for example, must take into account the value system of the writer, as revealed by evaluation. The strategic use of evaluation is a key tactic of persuasion, as studies of persuasive genres must recognise. Finally, it is suggested by Sinclair (1986) that speakers constantly monitor the success of their interaction by the use of evaluation.

The term *evaluation* is commonly used in two distinct ways, with sub-divisions within each usage. The first is its use to refer to a particular

type of meaning found in individual lexical items. When one describes the words *excellent* or *terrible* as evaluative, for example, this is the usage involved. The second is its use to refer to a function of a text or part of a text. This usage is paramount when one describes the final paragraph of a report, for example, as comprising an evaluation of the contents of the report.

When referring to lexical items as *evaluative*, two uses of the word may be identified. These uses emphasise the personal nature of evaluation and its relevance to a system of values respectively.

Firstly, the term *evaluative meaning* may be used to refer to that which is personal, unverifiable and non-defining, as opposed to the non-evaluative, which has a meaning which is independent of the speaker, verifiable and defining. For example, the sentence

Sam is a well-behaved boy.

is evaluative because one of the terms, the epithet *well-behaved*, has a meaning which is personal to the speaker, not verifiable in terms other than the speaker's own experience and scale of values (Hoey, personal communication) and which does not define or identify *Sam* (Halliday, 1985a, 163). In other words, the sentence is identifiable as an expression of personal opinion, the 'truth' of which, for the hearer, depends on one's respect for the speaker's judgement regarding good behaviour, and which fails to identify Sam to an objective observer. Halliday uses the term *attitudinal* to refer to epithets such as *well-behaved*. By contrast, the sentence

Sam is a seven-year-old boy.

is not evaluative because none of the terms in it has a meaning which is personal to the speaker. That *Sam* is a boy, and seven years old, is verifiable by appeal to criteria independent of the speaker, and the person *Sam* is at least partially defined and identified by the sentence, to anyone who understands the system of age being used.

The second use of *evaluation* as applied to lexical items emphasises its ideological basis. Evaluation in this sense is an indicator of social value. Taking the above examples, it may be noted that *well-behaved* belongs to a cultural goal or value concerning the demeanor of children, while *seven-year-old*, in most contexts, does not. In other words, the use of the term *well-behaved* places *Sam* along a scale of relative goodness and badness, whereas the term *seven-year-old* is not relevant to such a scale.

In many instances these two uses of the term *evaluation*, when applied to individual lexical items, will overlap, as in the above examples, where *well-behaved* and *seven-year-old* are distinguished by both criteria. In other, more marginal, cases, however, only one criterion may apply. In the following sentence, for example,

The two results are similar.

the term *similar* is evaluative only in the sense that it reflects a personal judgement on the part of the speaker or writer. It does not place the sentence, if taken out of context, within a system of cultural values. *Similar* results are those which are so deemed by the writer, but they are not necessarily good or bad results. Conversely, the sentence:

The bicycle was broken.

is evaluative in terms of social goals and values, particularly if someone wishes to ride the bicycle, but not in the sense of having personal meaning. A *broken* bicycle is identifiable on objective criteria, but is a bad thing from the point of view of a bicycle rider.

Turning to the study of texts, and the use of the term *evaluation* to refer to the function of all or part of a text, again the term is used in two ways: as contrast and as the function of a clause in relation to other clauses. The first is a concept used by Polanyi (1979), for example, to describe language which by its attitudinal nature, or degree of intensification, or by paralinguistic features, stands out as 'colour' against a background of 'non-colour'. Such evaluation is unidentifiable except with reference to a specific text, and serves a function of highlighting certain parts of the text and of indicating 'point' or relevance. The second is part of a theory of clause relations, in which a clause relational pattern of Situation and Evaluation has been proposed (Winter, 1982; Hoey, 1983). This pattern describes two clauses in which the state of affairs in the first clause, which may be an event or a fact, is evaluated in the second clause.

From the above discussion it is clear that the most difficult problem in a study of evaluation is the most basic: whether evaluation exists as a category and how to distinguish the evaluative from the non-evaluative. Because of the very intransigence of this problem, however, it may not be the most useful or productive starting-point. Rather than seeking to establish evaluation as a category among other categories, therefore, it is proposed to examine texts solely from the point of view of evaluation, and to examine the functions of that evaluation, without comparing evaluation

with non-evaluation. It is hoped that by this means a picture of the type of categorisation needed to accommodate evaluation will emerge.

1.3 Rationale: The Study of Experimental Research Articles

The choice of experimental research articles as the vehicle for an investigation into evaluation may seem a strange one. Research articles are frequently characterised as 'impersonal', and clearly do not contain much attitudinal language. I shall argue, however, that this sparsity of evaluation is only apparent. It derives, I believe, from the frequency in this type of text of the 'marginal' type of evaluation mentioned in Section 1.2 above, where the item is either personal or value-laden, but not both. This occurs, at least in part, because of the particular value system of scientific writers and readers, which is shared very closely, and which furthermore includes a prohibition against emotive or attitudinal language.

In one respect, at least, experimental research articles are particularly useful for a study of evaluation, in spite of their apparent strangeness. This is because in this kind of text, unlike many others, only certain entities are evaluated along certain, predictable parameters. This narrowness of the target of evaluation in experimental research articles makes them ideally suited to this study, as the scope of items to be explicated is restricted.

Furthermore, as Chapter 2 will show, there is currently a very keen interest in the way that science is not only expressed but indeed shaped by language. It is no longer widely accepted that the scientist uses language to reflect objectively phenomena observed in the outside world. Rather, sociological approaches to the study of the scientific process suggest that

the scientist's use of language plays a major role in constructing the scientific community and the very concepts and phenomena which that community describes. The examination of evaluation will contribute to this study of language in the process of scientific research.

We can state with confidence that experimental research articles are indeed evaluative, because they have an evaluative function. Gilbert notes that as a knowledge claim is produced, that is, generated both in laboratory work and in the writing of a research article, it is evaluated for validity:

> Evaluation, the process of weighing up the validity of knowledge claims, is in practice often interwined [sic] with their production, since experimental techniques and candidate theories will usually be assessed by the researcher and his immediate colleagues during the course of the research programme.
>
> Gilbert, 1976, 288

Latour and Woolgar stress the role of the process of writing a research article in this evaluative procedure:

> statements were thus loaded with documents and modalities which constituted an evaluation of the statement.
>
> Latour and Woolgar, 1979, 84

Such evaluations are crucial to a primary function of the experimental research article: to persuade the reader of the validity of the knowledge claim(s) being presented.

It should therefore be possible, using these articles, to answer the questions: how is the evaluation expressed? and what is the function of the evaluation within the discourse?

In selecting a corpus for this study, it was decided to concentrate on a group of articles dealing with one controversial topic. In this way it was hoped to build up a sense of the interaction between texts and of what would

count as evaluation for the members of a particular scientific sub-community. In addition, as a result of working with articles of a similar type in this way, it is possible, as well as making observations about evaluation itself, to enter into discussion about the writing of experimental research articles and about the nature of register and genre.

The topic chosen was biochemical research, carried out in the early 1980s, concerning the packing of chromosomes. The concept of chromosome packing is explained in a form accessible to the non-scientist by Gribbon:

> DNA and proteins are combined in the material structure of a chromosome, called chromatin. Remember that fifty years or more ago most biologists thought that DNA provided a scaffolding for protein molecules that carried the genetic information. They had the story upside down, for in fact this particular family of proteins, called histones, provides the scaffolding on which the DNA is tightly wound and packed efficiently into a very small space. A cluster of eight histone molecules forms a bead-like structure round which the DNA double helix as a whole makes two loops, like a rope being wrapped around a basket ball. Another histone fits over the two loops of DNA, clamping them in place on the bead, and on either side of the bead there is a short stretch of spacer DNA bound to another histone and linking the DNA-wrapped bead to similar DNA-wrapped beads on either side. Each of these 'beads' is called a nucleosome, and because they are joined to one another by a flexible DNA-histone link the whole collection of nucleosomes associated with a length of DNA can be coiled up compactly, very much like the coiling of a bead necklace, to make an even more compact structure, a variation on the helical theme, which can itself be coiled (or supercoiled) still further.
>
> Gribbon, 1985, 297-8

It is the exact nature and mechanism of this coiling which is investigated in the articles used in this thesis. The texts were identified through intertextual reference and it can therefore be certain that in some respect they 'answer' one other. In addition to dealing with the topic mentioned, the texts satisfy three further criteria. Firstly, they are research articles written as a result of specific experiments carried out, and follow the usual sub-divisions of Introduction, Method, Results and

Discussion. They are not review or survey articles. Secondly, they are written exclusively for other specialists in the field. They are in no way popularised. Thirdly, they each have as one of the contributing authors someone who, judging by the name and institutional affiliation, appears to be a native speaker of English. In practice, the articles are all written from institutions in Britain or America. Much work in the area of chromatin has also been done in Europe, but these papers are excluded on the 'native speaker' criterion.

Below is a list of the ten articles referred to in this thesis (titles in italics), along with the abbreviation of each title (in bold) as cited in the examples. The articles themselves appear in the Appendix. Each paragraph and sentence is numbered, as these numbers are also used when citing examples. For instance, ONC 2.1 means *Orientation of Nucleosomes in the Thirty-Nanometer Chromatin Fiber*, paragraph 2, sentence 1.

The Articles Used in this Thesis

Adolph, K.A., *Organization of Chromosomes in Mitotic HeLa Cells*, Experimental Cell Research 125 (1980) 95-103 **OCM**

Allan, J. et.al., *Regulation of the Higher-order Structure of Chromatin by Histones H1 and H5*, Journal of Cell Biology 90 (1981) 279-288 **RHS**

Allan, J. et.al., *Participation of Core Histone "Tails" in the Stabilization of the Chromatin Solenoid*, Journal of Cell Biology 93 (1982) 285-297 **PCHT**

Butler, P.J.G. and Thomas, J.O., *Changes in Chromatin Folding in Solution*, Journal of Molecular Biology 140 (1980) 505-529 **CCF**

Finch, J.T. et.al., *X-ray Diffraction Study of a New Crystal Form of the Nucleosome Core Showing Higher Resolution*, Journal of Molecular Biology 145 (1981) 757-769 **XDS**

Lee, K.S. and Crothers, D., *Influence of Ionic Strength on the Dichroism Properties of Polynucleosomal Fibers*, Biopolymers 21 (1982) 101-116 **IIS**

Lee, K.S., Mandelkern, M. and Crothers, D., *Solution Structural Studies of Chromatin Fibers*, Biochemistry 20 (1981) 1438-1445 **SSS**

McGhee, J.D. et.al., *Higher Order Structure of Chromatin: Orientation of Nucleosomes within the 30 nm Chromatin Solenoid is Independent of Species and Spacer Length*, Cell 33 (1983) 831-841 **HOSC**

Thomas, J.O. and Khabaza, A.J.A., *Cross-linking of Histone H1 in Chromatin*, European Journal of Biochemistry 112 (1980) 501-511 **CHC**

Yabuki, H., Dattagupta, N. and Crothers, D.M., *Orientation of Nucleosomes in the Thirty-Nanometer Chromatin Fiber*, Biochemistry 21 (1982) 5015-5020 **ONC**

1.4 Rationale: Theoretical Basis of the Thesis

This thesis makes no assumptions about the position of evaluation within any particular theory of discourse, but it does orientate itself within what may broadly be described as a systemic approach to language, using the term 'systemic' to refer to two traditions: that based on the work of Halliday and that based on the work of Sinclair. These two traditions, although they may both be called systemic, are by no means identical; indeed, in many respects they conflict. The debate between the two approaches is explored in Chapter 3 of this thesis and some conclusions concerning the way in which the work presented here contributes to that debate are described in Chapter 8.

One of the ways in which systemics contributes to this thesis is in the terminology used. Firstly, the grammar used is Halliday's, as described in Halliday (1985a). Secondly, an assumption is made that the experimental research articles investigated belong to a single, identifiable register or genre (the terms are here used interchangeably) in the sense used by Halliday, Hasan and others. In addition, the terms *discourse*, meaning a level of language and *text*, meaning an instantiation of discourse, are used in a way that follows some systemic usage.

This thesis is oriented towards two different traditions because each offers a view which is important to the study of evaluation and to the study of experimental research articles. In Halliday's approach, language is seen as a social system of meaning, so that a text is explicable in terms of the society which has produced it. In other words, the realisations of the discourse in the lexico-grammar are directly relatable to the community from which the text is produced. In addition, Halliday's approach offers a systematic way of dealing with topics such as ideology, which are important to the study of scientific discourse. It is necessary, however, to turn to Sinclair for a theory of discourse in which evaluation holds a key position and which can deal adequately with the interaction between the reader and the text.

1.5 The Organisation of the Thesis

This thesis takes as its starting-point the theoretical issues referred to in Sections 1.3 and 1.4 above. Chapter 2 reviews work on scientific discourse, particularly from the point of view of sociology of science. Chapter 3 looks at theories of evaluation in discourse, concentrating on the work of Halliday and of Sinclair.

Evaluation itself is then taken as the central concern and three distinct analytical approaches are proposed, based on three perceived functions of evaluation: to bestow thing-ness (Status), to bestow value within a cultural ideology (Value) and to bestow relevance to the ongoing discourse (Relevance). The central part of the thesis, Chapters 4, 5 and 6, deal with each of these functions respectively. The concepts and related problems of Status, Value and Relevance are discussed in detail and categories for analysis relevant to experimental research articles are

proposed. In each case sample analyses are presented and the applications of these analyses, particularly to comparisons between texts, are discussed.

Chapter 7 returns to some of the theoretical issues raised in Chapter 3 and examines how notions of the structure of texts are affected by the approaches proposed in Chapters 4, 5 and 6. Suggestions are made with respect to two views of structure: particulate and wave-like. The categories proposed in this chapter are tentative, but give an indication of the direction further research might take. Finally, Chapter 8 discusses the implications of the work of the thesis as a whole for the discourse theories described in Chapter 3, and briefly explores further theoretical and practical implications of the study of evaluation.

CHAPTER 2

Approaches to Scientific Research Articles

2.1 Introduction

In this chapter I shall assume the existence of a register of experimental research articles within a more general set of registers of scientific language, and shall review research characterising this register.

Much of the available research into the character of experimental research articles has been carried out in two unrelated areas: English for Special Purposes and the sociology of science. What these areas share is an awareness of the importance of the research article as the vehicle of the scientist's research. As Collins, working in sociology, says, 'there can be no such thing as a private discovery' (Collins, 1985, 18), and discoveries are made public through the medium of the research article. Latour and Woolgar go so far as to suggest that

> The production of papers is acknowledged by participants as *the main objective* of their activity.
>
> Latour and Woolgar, 1979, 71 (emphasis added)

It is the crucial role of the research article in the future working lives of their students that concerns the more pragmatically-minded writers in English for Special Purposes. Swales, for example, refers to the '"publish or perish" syndrome' which, he says,

> has made the journal-article a high-value card in a highly competitive game of professional advancement
>
> Swales, 1981, 7

There is only a limited amount of cross-fertilisation between the two disciplines, but such as there is is explored profitably by Swales, who uses the work of sociologists as a way of understanding the genre he is attempting to characterise for pedagogic purposes (Swales, forthcoming) and by Bazerman, who forges links between societal influences and the writing process (Bazerman, 1981; 1984).

It is impossible, however, to account for all the work that can contribute to an understanding of the research article by a simple division in these two broad areas. My survey will therefore take in a wide variety of approaches. Firstly, there is the attempt to characterise scientific writing in general as a register, describable in terms of the statistical occurrence of certain grammatical forms (Huddleston et.al., 1968; Barber, 1962; Lee, 1978; Salager, 1984). Continuing in the same tradition of describing scientific 'style', although using different methodology, is Halliday's (1987) work on grammatical metaphor and the 'attic' style of language associated with written registers in general and scientific knowledge in particular. Such studies are frequently motivated by pedagogic concerns, especially in the area of ESP, as are those which attempt to characterise the organisational features of the research article (Swales, 1981, 1984; Dudley-Evans, 1986; West, 1982; Weissberg, 1984).

Turning to research into the scientific community as constructor and legitimiser of facts, we find that although most recent work in this area has been done by sociologists, it may be argued that their relativistic view of scientific knowledge as a cultural construct stems from the work of philosophers such as Kuhn. Charlesworth, for instance, notes that, although Kuhn himself did not follow the logic of his position to its conclusion, his ideas 'about the way in which the scientific community at any particular

time defines and constructs both the content and style of science' have led directly to current thinking in sociology of science (Charlesworth, 1982, 36). Such work may be divided broadly into that which takes an anthropological approach to the workings of a scientific laboratory (Knorr-Cetina, 1981; Latour and Woolgar, 1979) and that which concentrates more particularly on the discourse of scientists (Gilbert and Mulkay, 1984; Myers, 1985a; 1985b; Bazerman, 1981; 1984) and on the motivated differences or 'translations' between research articles and other types of articles written by scientists (Myers, Social Construction; Transcribing; Fahnestock, 1986).

In this chapter I shall argue that the dominant function of the research article is persuasion and that its features and characteristics are best interpreted in terms of an argument rather than of a description. In this I follow recent work in the area of sociology of science. Latour and Woolgar, for instance, argue that the goal of the writer of a research article is 'the successful persuasion of readers' (Latour and Woolgar, 1979, 76). Yearley concurs:

> formal scientific papers should be regarded primarily as contributions to scientific debates. They take the form of arguments, aimed at persuading the reader of the correctness of a specific point of view.
>
> Yearley, 1981, 410

Arguing along similar lines, Bazerman phrases the problem facing the scientific writer thus:

> Against the background of accumulated knowledge of the discipline, how can I present an original claim about a phenomenon to the appropriate audience convincingly so that thinking and behaviour will be modified accordingly?
>
> Bazerman, 1981, 364

In this chapter, I shall firstly review attempts to characterise scientific 'style' (Section 2.2) and pedagogic approaches to the structure of research articles (Section 2.3). I shall then examine the notion of the scientist-as-writer as a constructor of facts (Section 2.4). Finally, I shall take up the issue of the ideological base from which the persuasion is made, and shall argue that the research article may be interpreted in terms of a dual ideology (Section 2.5).

2.2 Pedagogic Approaches to Scientific Style

It is common to find references to a style of writing peculiar to scientific texts. Some of the features of such a supposed style are summarised by Bazerman:

> 1. the scientist must remove himself from reports of his own work and thus avoid all use of the first person;
> 2. scientific writing should be objective and precise, with mathematics as its model;
> 3. scientific writing should shun metaphor and other flights of rhetorical fancy to seek a univocal relationship between work and object; and
> 4. the scientific article should support its claims with empirical evidence from nature, preferably experimental.
>
> Bazerman, 1984, 163-165

Statistical counts of the syntactic features of scientific writing (Huddleston et.al., 1968; Barber, 1962; Lee, 1978; Salager, 1984) on the whole confirm this 'common sense' knowledge about such texts. Scientific writing has a higher proportion of passives and nominalisations than non-scientific prose, sentence structure is simple but noun phrases contain a greater than usual amount of pre-modification.

To identify such features without accounting for them is of course of little practical use and it is therefore more usual to assign a motivation to each feature, describing, say, the use of the passive as arising from the desire for impersonality. Strevens (1972), however, denies that this is so, suggesting that the passive is more common in scientific English because the semantic role of patient is frequently required to occupy the topic slot in the sentence. Tarone et.al. (1981) propose that the choice of active voice may be motivated by the need to convey a note of personal intervention at certain points in the description of procedure and, in particular,

> to indicate points in the logical development of the argument where the writers have made a unique procedural choice.
>
> Tarone et.al., 1981, 135

Similar attempts to find motivation for the occurrence of particular features is found in the work of other writers. Tense choice, for example, has been linked to the generality of a statement (Lackstrom et.al., 1973) and, when citing past literature, to its relevance to current research (Oster, 1981). Pre-modification in Noun Phrases, according to Dubois (1981) indicates what the writer assumes the reader to know already. It is acceptable, for example, for a NP to have a definite article and to carry weighty pre-modification, even though its referent is not retrievable from the preceding text, if it describes a 'known fact'. In general, we may conclude that grammatical choice is constrained by rhetorical function, but the work that is done in this area has tended to be somewhat piecemeal. The findings of Oster (1981) and Tarone et.al. (1981), in particular, do not appear to be easily generalisable to other texts.

Another approach is to to link the most commonly found relations and concepts in scientific text with 'the scientists' mental operation'

(Strevens, 1972, 4). Strevens, for example, points out that a process which is essential to scientific procedure, that of *discrimination and description*, must necessarily be written about using the concepts, and associated linguistic expression, of 'identity and difference, process, states, changes of state, quantification' (Strevens, 1972, 4). Whilst this fairly general point is undoubtedly true, attempts to distinguish between scientific disciplines in this way are less convincing. Lee's (1978) attempt to differentiate between maths-based and physical science disciplines, for example, is only partially successful. His data-base is too small for his results to be decisive and his assertion that maths uses *therefore* because it is deductive while the physical sciences use *because* because they are inductive is, without further evidence, unconvincing.

One major problem with the work reviewed so far is that, because it arises mainly from a concern with second-language teaching, it accepts as given the processes of scientific thought. The scientist-learner is assumed to have things to say for which the ESL/ESP teacher supplies the words. For a more complete understanding of the process of scientific writing, however, it is necessary to problematise the relationship between the scientist and scientific discourse. Attempts by sociologists, rather than linguists, to do this will be discussed in Section 2.4 below. One linguistic concept which is relevant to this relationship, however, is Halliday's notion of grammatical metaphor, and, in particular, nominalisation (Halliday, 1985a; 1985b; 1987). Working within the framework of systemic linguistics, Halliday explicates the relation between a scientific discipline and the register in which it is expressed. He speaks of language as a 'semiotic activity', in the course of which human beings

> [construe] the two macrocosmic orders of which we ourselves are a part: the social order, and the natural order.
>
> Halliday, 1987, 135

He notes that some scientists are dissatisfied with the tendency of language to codify phenomena as things rather than as fluxes or processes:

> David Bohm devotes a whole chapter to language, in which he objects that "language divides things into separate entities", and so distorts the reality of "undivided wholeness in flowing movement"; and he proposes a new form of language called the "rheomode", which gives the basic role to the verb rather than the noun.
>
> Halliday, 1987, 137

Halliday, however, argues that language, or at least English, as ordinarily used, is perfectly adequate for scientific expression (Halliday 1987, 142). What Bohm sees as a problem is brought about by a distinct type of codification used typically in writing as opposed to speech (and scientific writing is more 'writing-like' than other registers). In ordinary spoken language, Halliday argues, the clause

> [represents] reality as what happens, not as what exists; things are defined as contingencies of the flow.
>
> Halliday, 1987, 144

In brief, typically spoken language uses many clauses in a single clause complex and therefore encodes most processes as verbs, whereas written language tends to metaphorise processes as nominals. The structure of each clause complex becomes simpler, but the clauses are lexically more dense, and each noun phrase carries a vast amount of information, much of it embedded in pre-and post-modifiers (Halliday, 1985b). Thus a written sentence such as

> Experimental emphasis becomes concentrated in testing the generalizations and consequences derived from these theories.
>
> quoted by Halliday, 1987, 146

employs both embedding and grammatical metaphor to express what in speech would take many clauses:

> We now start experimenting mainly in order to test whether things happen regularly as we would expect if we were explaining in the right way.
>
> quoted by Halliday, 1987, 146

Halliday terms the nominal style associated with writing 'attic' and the clausal style associated with speech 'doric' and compares the bias of each in its representation of reality:

> The doric style, that of everyday, commonsense discourse, is characterized by a high degree of grammatical intricacy...it highlights processes, and the interdependence of one process on another. The attic style, that of emergent languages of science, displays a high degree of lexical density; its complexity is crystalline, and it highlights structures, and the interrelationships of their parts - including, in a critical further development, conceptual structures, the taxonomies that helped to turn knowledge into science.
>
> Halliday, 1987, 147

In other words, a typical clause in written scientific language may well have one or more complex processes which are expressed as single entities (nouns) while the main verb of the clause expresses, not an action, but the relationship between the nouns. This is a consequence of the persuasive function of the research article, as it is a distinguishing feature of argumentation that it seeks to establish relationships between entities. If science is about processes, therefore, the grammar of scientific argumentation must turn those processes into 'things' so that the relationship between them may be stressed. What scientists such as Bohm see as an inadequacy of language in general, Halliday argues, is simply a reaction to the attic style prevalent in current research articles. Bohm's proposed 'rheomode' is already catered for in the doric style of ordinary speech. What we might add is that the rheomode, or doric style, is not

available for research articles, not because of academic convention or an over-concern for formality, but precisely because the research article is essentially persuasive and not descriptive.

The prevalence of nominalisation is associated with a group of Fields (scientific and academic) and one Mode (written). (For a discussion of Field and Mode, see Chapter 3.) It does not distinguish research articles from other forms of scientific expression, such as textbooks, neither does it reflect the structure of such articles. In the next section I shall examine findings concerning the structure of the experimental research article.

2.3 Pedagogic Approaches to the Structure of Research Articles

Experimental research articles are widely acknowledged to follow a highly conventional format, often described in terms of the four-part division commonly known as Introduction-Method-Results-Discussion (see the survey in Swales, forthcoming). Hutchins (1977), for example, points out that the scientific paper can be interpreted as demonstrating the same kind of archetypal cycles or patterns as folk tales or philosophical dialogue. In a wide-ranging paper, which links features of the scientific research article to work by Danes (1974), Halliday (1973), Bremond (1970) and Kinneavy (1971), Hutchins cites several models of such patterns, of which one (Bremond's, 1970) will suffice here:

> Equilibrium
> Degradation
> Disequilibrium
> Amelioration
> Equilibrium
>
> Bremond, 1970, cited in Hutchins, 1977, 34

Hutchins also points out that scientific texts involve a series of oppositions which work at various levels, the first part of the opposition predicting (in Tadros' (1985) sense) the second. His summary of these oppositions is worth quoting in full:

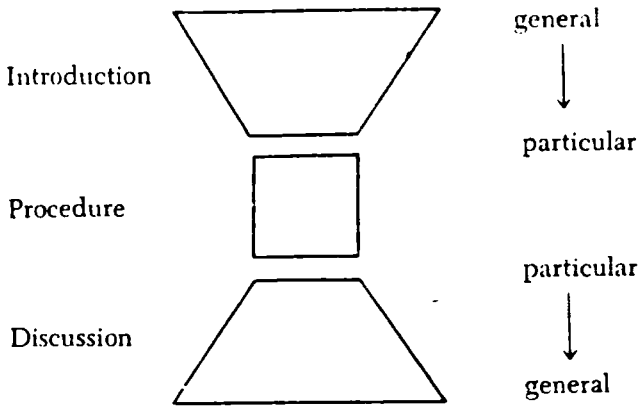
> Perhaps in the final analysis this is the essence of text structure: a network of interlocking, embedding, overlaying and underlaying oppositions at various syntagmatic levels. Some oppositions are concerned with content: problem-solution, question-answer, hypothesis-test, experiment-result, initial state-change of state; some oppositions with semantic progression: condition-consequent, cause-effect, antecedent-subsequent, denial-assertion etc; and some with thematic progression: theme-rheme, given-new, topic sentence-commentary (or elaboration), theme paragraph-body of text.
>
> Hutchins, 1977, 35

Hutchins' comments relate to text in general rather than specifically to scientific writing. Moreover, his abstract approach begs some important questions, notably what constitutes a 'level' in his terms, how one is to recognise the first part of the pair, whether the second part is expected to occur immediately or eventually, and whether the movement can be seen in terms of patterns of more than two 'moves'. If experiment predicts result, for example, then result also predicts conclusion, making a three-part pattern. Finally, it is not clear what kind of text structure is envisaged in terms of the overlaying and underlaying of patterns.

Most pedagogically-inspired research into research articles takes as a starting point a simpler concept of text structure: that scientific research articles may be divided into four distinct sections viz. Introduction, Method, Results, Discussion, each of which has a structure that may be made available as a model to students of writing. The evidence for this division is fully discussed in Swales (forthcoming) and some of it will be referred to below. I shall take as a basis for discussion the model suggested by Hill

et.al. (1982). These authors conflate the Method and Results sections of the traditional pattern into a Procedure section. They then represent the rhetorical structure of a scientific research article as shown in Figure 2.1. This figure shows a progression from the most general statements to the particular and back to the general. The Introduction begins with references to a whole field of research, later introducing a particular experiment. The Procedure section concentrates on the particular investigation while the Discussion begins with this and relates it once more to a wider field.

FIGURE 2.1



Hill et.al., 1982, 335

The movement in the research article as a whole from general to particular and back to general is borne out by Heslot (1981), who demonstrates that almost all the verbs in the Method and Result sections of research articles are in the past tense, whilst in the Introduction and Discussion sections the ratio between past and present is roughly 50:50. Lackstrom et.al.'s observation that commonly-used procedures may be referred to in the present tense, irrespective of the section, does not detract from this General-Specific movement (Lackstrom et.al., 1973).

Writers who distinguish between the grammatical characteristics of the four sections tend to emphasise the different function of each section, with the Introduction and Discussion sections described as discursive and the Method and Results sections as functioning to present facts. West (1982), for example, finds that most *that*-nominals occur in the Introduction and Discussion, with fewest in the Method. West notes that

> that-nominals are used when making claims about other statements rather than simply making statements
>
> West, 1982, 486-7

and links this with the function of the Introduction - 'to make claims about statements from other research' (West, 1982, 487) - and of the Discussion 'to explain the statistical findings in non-statistical English' which in turn involves making 'many claims about the research findings' (West, 1982, 487).

As for the Method section, Weissberg (1984), notes a pecularity in thematic progression. Weissberg examines paragraph development in scientific research articles in terms of Danes's (1974) notion of theme-rheme patterns. He points out that although in most of the sixty paragraphs examined some kind of patterning 'was significantly more likely to occur than was no pattern at all' (Weissberg, 1984, 492), in those paragraphs found in methods/materials sections, 'no pattern' was frequent. In other words, the Methods section is not a piece of normally connected prose with a repetition or reformulation relationship between the rheme of one sentence and the theme of another. Rather, it is, or can be, a recipe-like list of procedures. Informal surveying of texts suggests, however, that this finding is most likely to be true only of very highly theoretical texts. It is by no means generalisable to all experimental research articles.

One problem with the work reviewed so far is that it tends to give the impression that the features of the research article described need no explanation other than that of convention. Different types of statement may be seen as occurring in particular places simply because that is the way it is always done. Students may be taught what the conventional patterns are without recourse to their motivation.

Other writers, however, notably Swales (1981; 1984), make it clear that patterns within research articles are designed to achieve a goal: that of persuading the reader of the acceptability of the writer's position. This alone makes sense of the progression of the research article, which is 'by the sequence of ideas rather than by the narrative of the researcher's efforts' (Myers, 1985a, 233). Swales adopts the analogy of moves, as in a strategic game, in his study of article Introductions (Swales, 1981; 1984). The moves proposed by Swales for a typical Introduction are: (1) Establishing the Field; (2) Summarizing Previous Research; (3) Preparing for Present Research; (4) Introducing the Present Research (Swales, 1984, 80). The moves normally occur in this order, although there may be some overlapping. In particular, Move 2 frequently co-occurs with Moves 1 and 3. Each of these moves is a stage in the persuasive argument. The first move defines the scope of the argument and may additionally persuade the reader that the topic is worthy of discussion. The citation of literature in the second move continues to delimit the field and also sets the research within a scientifically respectable context. It also acts as the background for Move 3, which provides a motivation for the current article, while Move 4 is designed to demonstrate how the current research fills the need identified in the third move. Thus the moves in the Introduction are not predicted simply by convention but by the writer's need to persuade.

Following Swales' approach, but applying it to M.Sc. dissertations, Dudley-Evans suggests that in Discussion sections, the movement may be cyclical. He proposes a total of eleven moves, including: Explanation; Problems with Results; Hypothesis; Recommendation, whose order is not entirely predictable:

> With the exception of the few parts of the discussion section where the writer presents a series of statements of results, the discussion proceeds through a series of cycles in which a statement of result is followed by one or more of the moves listed above.
>
> Dudley-Evans, 1986, 144

Other than these two writers, it is mainly the work of sociologists of science which provides insight into the persuasive nature of the research article. Gilbert, for example, is among the many writers (see Myers and Bazerman, below) who discuss the persuasiveness of citation among scientific writers. Scientists, he says, back up their assumptions and methods by 'citing those papers which propose and justify these procedures, theories and data' (Gilbert, 1976, 287). Gilbert also points out that methods are not described neutrally, but that the researchers justify their experimental methods by 'showing that standardized and widely endorsed procedures have been employed' (Gilbert, 1976, 286).

Considering the body of work reviewed in this section as a whole, it is clear that the most useful work is that which does not simply lay down rules for the learner-writer to follow, but which explicates the rationale and the strategy behind the typical usages that are identified. As was true with regard to features of style, there is a need not only to investigate the context of scientific writing but also to problematise that context. It is in order to examine more closely two aspects of the scientific context -

experimental practice and writing practice - that the next section turns to research in the area of sociology of science.

2.4 Constructing Knowledge

2.4.1 Knowledge as a Social Construct

The work of sociologists such as Gilbert and Latour has made it possible to examine the writings of scientists from a new perspective. The sociologists themselves have placed all forms of scientific discourse at centre stage, regarding it as 'a topic instead of a resource' (Gilbert and Mulkay, 1984, 13). Much of the discussion in this area derives from intertextual evidence. The scientists' written texts are compared with their spoken discourse (Gilbert and Mulkay, 1984), with first drafts (Knorr-Cetina, 1981) and with alternative versions of the same texts for a different audience (Myers, Social Construction). Unfortunately, some of the evidence, particularly in the cases of Myers and Knorr-Cetina, tends to be anecdotal, based on comparisons between very few texts. It remains true, however, that the investigation of scientists from the point of view of sociology can offer important insights to the linguist and in particular is a useful counterpoint to the 'research article as convention' fallacy mentioned above.

The essential nature of sociology of science is that it does not regard the progression of scientific knowledge as a process of discovery of truth about the natural world but instead examines scientific claims as products of a particular society or culture. Knorr-Cetina, for example, summarises the work of 'anthropologists' of science such as herself thus:

> Rather than considering scientific products as somehow capturing what is, we will consider them as selectively carved out, transformed and constructed from whatever is.
>
> Knorr-Cetina, 1981, 3

Similarly, Collins describes sociology as the investigation of science 'as a cultural activity rather than as the locus of certain knowledge' (Collins, 1985, 1). What is so remarkable about this work is that it is not simply the descriptive framework (the model) that is viewed as a cultural construct but also the objects and substances under investigation themselves. Garfinkel et.al., for example, relate the events surrounding the observation of an astronomical phenomenon (the Independent Galilean Pulsar or IGP) and insist that the IGP is 'a *cultural* object, *not* a 'physical' or a 'natural' object' (Garfinkel et.al., 1981, 141, original emphasis).

This approach to scientific facts reveals why the research article is persuasive in nature. The writers' use of the term 'Independent Galilean Pulsar', for instance, is not simply the denotation of an external object but the outcome of complex interactions within the scientific community. Even the use of the term itself is an exercise in persuasion.

2.4.2 From Inscription to Research Article

In order to examine in more detail how scientific facts are constructed, I shall begin with the inscriptions (photographs, tracings, figures, tables, graphs) which are the immediate outcome of experiments and the raw material of research articles (Latour and Woolgar, 1979, 51) and shall survey work which discusses how such inscriptions are reported in the research literature (Latour and Woolgar, 1979; Lynch, 1985; Pinch, 1985; Latour, 1987).

Firstly, it is clear that the inscriptions themselves are abstractions and that as they are transformed from marks made by an experimental measuring instrument to a graph they become increasingly abstract. Ultimately, as Lynch notes, in a graph purporting to represent the behaviour of animal specimens:

> the lines on the graph lose such concrete reference to the visible residues of the 'animal', and reside unambiguously in a statistical space.
>
> Lynch, 1985, 56

In other words, the inscription transforms the multitude of states and events around a set of experiments into an abstract model of those events. For the scientist, what may be described as an 'observation' is in fact an interpretation of such an inscription. Latour and Woolgar, for example, in tracing the 'discovery' of the hormone TRF(H), point out that its initial appearance was as a line on a graph which was different from that representing an earlier-known hormone, TRF. In Latour and Woolgar's terms,

> From a strictly ethnographic point of view, the object [TRF (H)] initially comprised the *superimposition* of two peaks after several trials. In other words, the object was constructed out of the *differences* between peaks on two curves.
>
> Latour and Woolgar, 1979, 125 (original emphasis)

Inscriptions may in turn be interpreted with various degrees of abstraction, and these interpretations lead to 'results' which, using a spatial metaphor, are at varying degrees of distance from the original inscriptions. Pinch (1985) uses the term 'externality' to refer to this degree of distance. Commenting on a particular experiment, in which marks on a graph represent the presence or absence of Ar^{37} atoms, which in turn imply the presence of solar neutrinos, Pinch notes that

> In principle, one can imagine a whole range of different observational reports. For instance, the results of the experiment could be reported as: 'Splodges on a graph were observed'. Alternatively, they could be reported as: 'Solar neutrinos were observed'.
>
> Pinch, 1985, 9

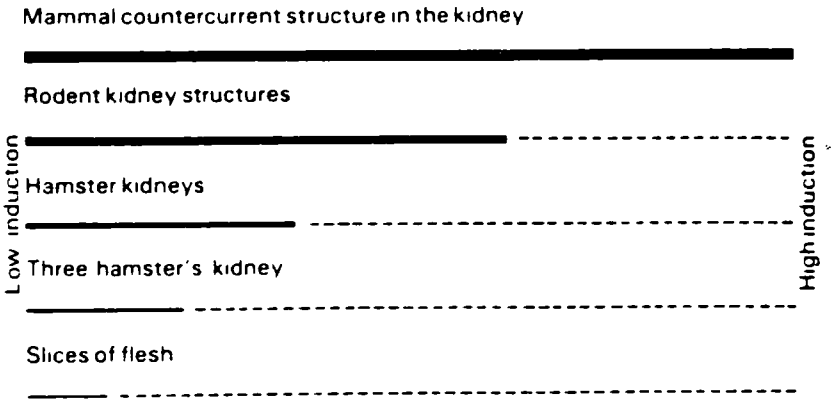
The first observation has low externality, that is, it is 'most 'proximal' to the observing agent, [and] refers to only a very small part of the observational process' (Pinch, 1985, 9), while the second has the highest externality in that it involves the greatest degree of interpretation and implication of theoretical framework. Pinch notes that all the observations are grounded in theory (Pinch, 1985, 13), but what is different about high externality reports is that they 'often incorporate assumptions about the working of the apparatus at lower degrees of externality' (Pinch, 1985, 13).

As the transition is made, therefore, between inscription and research article, the writer has options regarding the degree of externality with which to present his or her observations. Briefly, highly external reports are of more importance to the scientific community but are more open to criticism than are reports of low externality. Pinch summarises the writer's dilemma thus:

> Reports of high externality will stand a greater chance of making a contribution to the wider corpus of knowledge in view of their high evidential specificity, but such reports will also be risky. They are risky because they involve so many aspects of the observational situation, and thus give more grounds for possible criticisms. On the other hand, reports of low externality are less risky and more likely to gain acceptability - however, they sacrifice profundity. They are relevant to so many evidential contexts that for all intents and purposes they are useless.
>
> Pinch, 1985, 23

Further evidence concerning how this hierarchy of results may be expressed in a research article is given by Latour (1987). He shows how a set of objects used in the laboratory may be referred to in different ways, each expressing a different level of generality, supporting a claim of a different level of applicability. For example, as Figure 2.2 illustrates, the same substance may be referred to as 'slices of flesh' or 'mammal countercurrent structure in kidney'. The second formulation will lead to statements of a much higher level of externality, in Pinch's terms, than the former (Latour, 1987, 51). Latour notes that part of the writer's skill lies in leading the reader uncontroversially from a low-level statement to a higher-level one (Latour, 1987, 51).

FIGURE 2.2



Latour, 1987, 51

A research article, then, presents claims for judgement by the scientific community, and the writer must decide what strength of claim to present. The article will also, however, refer to other claims, that is, the

claims of previous researchers, which are at various stages towards being accepted as facts. The various statements contained in the article may be ranged along a cline of facticity (Latour and Woolgar's term), with statement types from 1 (least factive) to 5 (most factive). Types 1 and 2 appear to refer to the knowledge claims made by the writers of the research article being investigated. The types are summarised as follows.

-Type 5: a statement 'corresponding to a taken-for-granted fact' (Latour and Woolgar, 1979, 76)

-Type 4: an expression of a relationship between A and B which is 'uncontroversial' but which is 'by contrast with type 5 statements, made explicit' (ibid. 77).

-Type 3: statements assessing the certainty or reliability of other statements, by an expression such as 'is assumed to be' or by attribution to source through references. The acknowledgement of the agent in the process of scientific reasoning denies the independent facticity of the embedded statement.

-Type 2: statements which seem to 'constitute claims rather than established facts'. They contain 'modalities which draw attention to the generality of available evidence (or the lack of it)' (ibid. 78-9).

-Type 1: 'conjectures or speculations' (ibid. 79)

> Unfortunately, as Latour and Woolgar note,
>
> there seems to be no simple relationship between the form of a statement and the level of facticity which it expresses.
>
> Latour and Woolgar, 1979, 79

This makes it difficult to apply their categories systematically. In addition, some of their categorisations seem questionable. They cite the statement "It is still largely unknown which factors cause the hypothalamus

to withold stimuli to the gonads", for example, as belonging to Type 3, yet if the embedded statement is assumed to be "The hypothalamus witholds stimuli to the gonads" or even "Some factors cause the hypothalamus to withold stimuli to the gonads" this is surely being treated as a known or given fact i.e. Type 5. This is not at all the same thing as saying "It is assumed that some factors cause the hypothalamus to withold stimuli to the gonads". This problem arises partly because no indication is given as to what constitutes a 'statement': whether this should be taken as a sentence or clause or as a proposition.

In general, however, we may accept the existence of some kind of cline of facticity with points upon it such as

'accepted fact'

'proposed fact'

'speculation'.

At this point, then, we are able to see how the statements that are made in a research article do not arise automatically out of the experiment that has been done but are the result of deliberate choice on the part of the writers. Categories along a cline may be proposed, but the exact criteria for the distinctions remain obscure. Writers such as Pinch and Latour leave us with a fairly clear notion of the comparative externality or generality of claims without delineating precisely a finite number of categories into which the statements may be placed. Whether such a categorisation is indeed possible will be discussed again in Chapter 4.

2.4.3 From Research Article to Fact

In Section 2.4.2 above, the movement from experimental inscription to presentation of knowledge claim was described. In this section I shall survey discussions of how claims are constructed into facts. Various writers suggest that scientists typically make the most external, most general claims that they can without sacrificing credibility. Latour, for example, offers this advice to the writers of research articles:

> prove as much as you can with as little as you can considering the circumstances. If you are too timid, your paper will be lost, as it will if you are too audacious.
>
> Latour, 1987, 51

Both Myers and Knorr-Cetina link this point to the issue of the acceptance and publication of research articles by journals. It is the editors and reviewers of journals who act as the first arbiters of what claims will be accepted by the scientific community as a whole. Following the first draft of a research article through to its published form, Knorr-Cetina notes how the final version emerges from a 'battle' (Knorr-Cetina, 1981, 106) between the various authors, readers and critics. During this battle, details are removed, claims and evaluations are muted, so that 'the final version is a consistent understatement of the first' (Knorr-Cetina, 1981, 104). Myers claims that, nonetheless, scientists tend to 'make the highest-level claim the editors and reviewers will allow' (Myers, 1985b, 602), although he confirms that the lengthy procedure of submission, reviewing and rewriting tends to lower the claims made by the writers. Discussing his specific examples, he glosses the changes that are made from original submission to printed version thus:

> In Latour and Woolgar's terms, [the writers] have had to add modalities and move their claims away from fact-like status. In Pinch's terms, the authors, in this evidential context, have to settle for claims of somewhat less externality than those they had first proposed. They have to leave out their models, and this could be a loss for them, because whatever words have been excluded at this point, as the article goes into print, cannot be part of the authors' claims.
>
> Myers, 1985b, 623

Once an article incorporating a knowledge claim has been accepted by a journal, it is open to acceptance or rejection by the scientific community as a whole, or by one part of it. If the claim is accepted, then that acceptance, per se, constructs the claim into a fact. If at some future date the fact is no longer accepted, it reverts to being a claim. In other words,

> a knowledge claim can only be judged to be knowledge while some group of scientists accepts it as true; when the group disperses it reverts to being just a claim unless some other group also endorses it.
>
> Gilbert, 1976, 299-300

The 'group' referred to by Gilbert is that body of scientists who hold to a particular set of models and paradigms. They evaluate the new claim in terms of its compatibility with 'the family of models used within an area' (Gilbert, 1976, 299). This group of accepted models is described vividly by Latour (1987) as a 'black box'. A complex theoretical model, or a piece of technology, is a 'black box' when it is used as a single, unquestioned entity to support or refute other theories. Latour uses as an example an instamatic camera, which is composed of many technologies: camera, film, developing and so on, but which the amateur photographer treats as a single machine. At early points in the instamatic camera's development, each piece of technology could be challenged as to its usefulness, for example, but once the camera becomes a single whole such a challenge is much less likely. Similarly, the components of a theory, while they are individual claims, can

be 'disassociated, dismantled, renegotiated, reappropriated' (Latour, 1987, 131), but once the theory becomes a 'black box', this is no longer possible. Latour suggests that researchers attempt to tie new knowledge claims to existing techniques and theories in such a way that anyone who tries to challenge the claim

> [reaches] a point where he [has] either to quit or start a new controversy about a still older and more generally accepted fact.
>
> Latour, 1987, 77

Unless opposing laboratories can tie their counter-claims to more incontrovertible black boxes, the claim will become a fact.

An alternative metaphor to that of the unopenable black box is that of the web or net (Collins, 1985, following Barnes, 1983 and Hesse, 1974). The metaphor of the web suggests that all theories are interlinked, and that introducing a new theory, or modifying an existing one, will affect all the other theories. Parts of the web can be changed individually without difficulty, but it is not easy to change all of the web at once (Collins, 1985, 132). The more parts of the web a knowledge claim is compatible with, therefore, the more readily it will be accepted. Conversely, the more parts that would have to be revised to account for the new theory, the less likely it is to be accepted.

Gilbert suggests that acceptance of a claim is 'marked by frequent citation of the claim by members of a research network' (Gilbert, 1976, 299). For the claim to become a fact, however, more than frequent citation is necessary. Indeed, citation can be for the purposes of refutation. As more support for a claim is forthcoming, it is likely that the references to it will move along the scale of statement types proposed by Latour and

Woolgar (see above). Latour and Woolgar cite an example in which a published Type 2 statement concerning 'the effects of somatostatin on the secretion of TSH' receives support from other writers in other articles. This evidence is subsequently used by the original writer to recast his statement in a later paper as Type 3:

> Our original observations (ref) of the effects of somatostatin on the secretion of TSH have now been confirmed in other laboratories (ref).
>
> quoted in Latour and Woolgar, 1979, 83

The most extreme example of such intertextual re-phrasing occurs when

> a statement is quickly borrowed, used and reused, [until] there quickly comes a state where it is not longer contested. Amidst the general Brownian agitation, a fact has then been constituted.
>
> Latour and Woolgar, 1979, 87

As a claim is supported by other claims and becomes an accepted part of the scientific paradigm, it loses both its attachment to a particular researcher or laboratory and its character as 'subjective' interpretation of evidence (Latour and Woolgar, 1979, 84). When this happens, a point of 'stabilisation' is reached, when the fact stands, as it were, on its own. Latour and Woolgar stress that this does not mean that truth has been discovered, simply that the scientific community has (maybe temporarily) accepted something as a fact:

> We have been careful to point out that our determination of the point of stabilisation, when a statement rids itself of all determinants of place and time and of all reference to its producers and the production process, did not depend on our assumption that the "real TRF" was merely waiting to be discovered and that it finally became visible in 1969.
>
> Latour and Woolgar, 1979, 175-6

As facts are deemed to be constructed by the scientific community, and research articles are therefore to be seen as attempts to persuade that community, it is relevant to ask what features of the research article show awareness of that community, and how the nature of the community can affect the features of the research article. The use of technical lexis is one such feature:

> The addition or deletion of terms with meanings or connotations specific to a discipline may be [a] way of indicating one's place in the community.
>
> Myers, 1985a, 230

With particular reference to lexis, Bazerman notes that 'the accumulated knowledge of the field...is incorporated into the language' (Bazerman, 1981, 366). Speaking of the use of the name DNA, for example, he says,

> the isolation of elements and the theory of chemical combination, as well as the idea that substances can be analyzed chemically, are all implicit in the name of the object.
>
> Bazerman, 1981, 366

Such packaging of complex information in a term accepted by all the community seems to be peculiar to the scientific disciplines. Articles written in the areas of sociology and literature, for example, have fewer mutually-agreed technical terms because 'the phenomena [being described] are not equally fixed prior to the essays' (Bazerman, 1981, 378).

Citations are another way in which the writer claims a place within the community, because 'significance only has meaning in relation to the existing body of literature in the field' (Myers, 1985a, 228-9). In order to be valuable, the work that the writer presents must be original, and yet it must also exist 'entirely in accordance with the existing discipline'

(Myers, 1985a, 238). The use of citations can place the work within this context, but only if the citations are carefully chosen. Bazerman suggests that

> The previous literature on the subject is sorted out according to the criterion of closeness of fit between the observed phenomena and the claims made, and the accepted claims in the literature become assimilated into the language used to describe the phenomena.
>
> Bazerman, 1981, 364-5

Again, this is a feature that is more noticeable for science than for sociology or literature. In the sociology paper which Bazerman investigates, for example, 'The literature of the field does not provide a generally recognized framework in which to place the current claim' (Bazerman, 1981, 369). These differences reflect, not the choices of the individual writers, but the degree of cohesion in the disciplines they represent.

The point is made again in examining changes in the field of spectroscopy between 1893 and 1980 (Bazerman, 1984). For example, in discussing the increasing incorporation of citations into the body of the articles, Bazerman notes that in the early years of the discipline connections with previous work were made only in general terms, suggesting 'a loose cognitive structure', whereas during the twentieth century it became increasingly the case that citations were incorporated into the framework of the argument, 'bringing work into greater co-ordination' (Bazerman, 1984, 175).

Other discourse features, too, are ascribed by Bazerman to changes in the nature of the discipline of spectroscopy and the community carrying it out. In the early days, Bazerman notes, the work was largely concerned with improved techniques, papers being informative as to methodology as well as

persuasive. The community members were connected with each other only loosely and were confident of the theoretical background to their work (Bazerman, 1984, 189). The growth of theory, and the awareness of its 'constructed' nature, both united the community and challenged its confidence, changing the nature of the articles written in the direction of tentativeness and controversy. As Bazerman says:

> The tentativeness of the 'modelling' or 'fit' type of arguments mitigated the confrontational conflict of theoretical dispute by recognizing that each contribution was only part of a process.
>
> Bazerman, 1984, 190-191

The relationship between the writer and the community is clearly two-way (Myers, 1985a, 235), with the writer seeking to persuade the community and the community exerting a powerful influence on the writer.

2.4.4 Different Contexts, Different Facts

One fruitful way to explicate the scientific discourse of research articles is to compare those articles with the discourse of the same community under different circumstances. Research in this area will be discussed in two parts: I shall deal first with the topic of 'popularising' or 'translating' research articles for a more general audience (Fahnestock and Myers), and then with investigations of scientists speaking in informal situations (Knorr-Cetina, Gilbert and Mulkay). In one sense this work simply confirms and elaborates what has been said in the previous section: that scientists shape their research articles in order to persuade a particular audience. In another sense, however, the work to be reviewed here adds two important qualifications. First, as the informal and popularised versions of research are no more to be counted as 'truth' than the research article

versions (and in some cases are arguably much less so), it would be wrong to see the research articles, although carefully crafted to fit the preoccupations of a particular group, as distortions of any kind. Second, it becomes very clear from examination of the work of Myers and Gilbert and Mulkay that any change in the form of expression of research articles alters not only the interpersonal nature of the writing but also what it is that the writer is writing about. There is also, however, a problem which arises out of this work, which will be discussed more fully in Section 2.5 below. This is that comparison with other types of writing tends to make the research article appear more like the product of simple convention.

When scientists write for a different, specifically a 'lay' audience, they have to make accommodations to the interests and prior knowledge of this new readership. This may not be an easy matter. In talking about how review articles are written, for example, Myers characterises them as texts which speak to a new audience:

> The writing of a review is not just the collecting of facts: it involves thinking of a new audience, seeing the work of one's subspeciality from the outside for the first time, asking what the broader goals are, what assumptions are made, what results matter enough to tell the world. Instead of focusing on details, and thinking of one's immediate colleagues and rivals, one has to step back and try to answer the always risky question, "So what?"
>
> Myers, Transcribing, 3

He suggests that the writer may experience difficulty in finding a voice for such an audience:

> because the author is doing something scientists aren't usually supposed to do, giving personal evaluations of the work of other scientists, putting forth his or her own hypotheses or hunches, he or she may have trouble settling on a persona to project.
>
> Myers, Transcribing, 4

These comments on review articles indicate the kind of changes that are made: a greater concern for the implications of the research in a field wider than the scientist's own, a more obviously personal intervention in the assessment of other researchers' work and of the likely outcome of present research. Similar changes are made when research is popularised. Fahnestock is one writer who asks the crucial question: 'what happens to scientific information in the course of its adaptation to various noninitiated audiences?' (Fahnestock, 1986, 276). Her answer is that it changes considerably; in particular, writers of popular articles are guilty of the following:

> legerdemain in phrasing, changing qualified claims into certainties, omitting contradictory evidence and giving space to unsupportable claims.
>
> Fahnestock, 1986, 285

This is done to emphasise both the extraordinary nature of the research itself and its relevance to the preoccupations of everyday life. In Fahnestock's terms, the writers' guilt is real, as the public is seriously misled by the changed information, particularly in areas of research which have important social implications (Fahnestock, 1986, 285-289).

Myers (Social Construction) also answers Fahnestock's question, but in terms that are kinder to the writer of popular articles. He argues that research and popular articles present internally consistent but mutually incompatible views of science, each of which represents a *partial* perspective only (Myers, Social Construction, 38-39).

Myers summarises the differences between research article and popular article by referring to the first as 'the narrative of science' and to the second as 'the narrative of nature'. The narrative of science, Myers

suggests, is organised as an argument rather than as a chronological account and stresses 'the conceptual structure of the discipline' (Myers, Social Construction, 2), whilst the narrative of nature is organised as a chronological narrative about the natural object being described and emphasises 'the externality of nature to scientific practices' (Myers, Social Construction, 2). In other words, the popular article, when compared with the research article, is not simply a more accessible version of the same information. It presents essentially different information on a different topic: it is about animals, plants and scientists collecting data in the field rather than about a process of scientific experiment and deduction within existing paradigms. Unfortunately, Myers does not show in any great detail the linguistic consequences (or causes) of such a change, but his illustrations offer some interesting insights. For example, he quotes the following abstract of a research article:

> Experiments show that Heliconius butterflies are less likely to oviposit on host plants that possess eggs or egg-like structures. The egg mimics are an unambiguous example of a plant trait evolved in response to a host-restricted group of insect herbivores.
>
> quoted in Myers, Social Construction, 9

where the sentence topics are *experiments*: 'actions scientists perform' (ibid, 9) and a conceptual category, *egg mimics*. When this article is re-written for Scientific American, the topics of these sentences become *butterflies* and *the vines*:

> Heliconius butterflies lay their eggs only on Passiflora vines. In defense the vines seem to have evolved fake eggs that make it look to the butterflies as if eggs have already been laid on them.
>
> quoted in Myers, Social Construction, 9

One important implication of this observation is that the contextual categories of Field (what the text is about) and Tenor (to whom the text is addressed) are not independently variable. (Field and Tenor will be discussed in the next chapter.) Once the readership changes from the fellow-scientist working in the same field to the general, interested but non-expert public, the subject-matter and goals of the article also, inevitably, change.

The second aspect of translation that has been widely studied is the transition from scientists' informal spoken discourse about their research to their formal written texts dealing with the same subject. Many researchers have described in detail the lengthy and painstaking rewriting of articles and other papers for submission to journals and other evaluating bodies (Myers, 1985a; Knorr-Cetina, 1981). Although these studies contain much that is of interest, I shall here refer only to the comments made by Knorr-Cetina about the differences between the sociologist's accounts of what has happened in the laboratory and the scientists' formal written accounts of the same events. For example, Knorr-Cetina notes that the first draft of one research article Introduction presents the need for a new method of potato protein retrieval as the problem for which a solution (the use of FeCl) is discovered, whereas her observations in the laboratory suggest that the technique of using FeCl to isolate protein occurred to the researcher more or less by chance and was only later associated with the problems of the potato-processing industry. In another comment, Knorr-Cetina stresses the lack of explanation and rationale for the laboratory research procedures in the research article. She argues that this is not a simple omission of detail, but a deliberate obscuring of the possibility of

alternatives and she characterises the description of method in the research paper thus:

> Compared with the relevant work in the laboratory, where the *making* of selections dominates the scene, the paper offers a curiously purged *residual* description, constituted more by what is *not* at stake in the research...than by what is.
>
> Knorr-Cetina, 1981, 115, original emphasis

Further differences between scientists' formal and informal accounts of their work are examined by Gilbert and Mulkay (1984). In summary, their work suggests that scientists, when talking informally in the laboratory or in interviews with sociologists, present their ideas and their work as highly personal, in two senses. Firstly, the researcher's evaluation of a model is likely to be affected by his or her attitude to the proposers of the model. In other words, the politics of various schools of thought have an influence on an individual researcher's stand with regard to controversy (Gilbert and Mulkay, 1984, 47; 50). Secondly, much of the work reported owes a great deal to intuition. The adoption of a particular method or a particular explanation for a puzzling result follows from a 'hunch' rather than from inescapable logic. The dominant tone of the research article, on the other hand, is impersonal. Methods are described 'as if the individual characteristics of researchers have no bearing on the production of results' (Gilbert and Mulkay, 1984, 52) and models, theories and explanations are described as arising inexorably from results unproblematically obtained.

Gilbert and Mulkay label the formal discourse found in research articles 'empiricist discourse' and the informal discourse found in interviews, conferences and casual discussions 'contingent discourse'. In empiricist discourse, the person of the researchers, their personal commitments to certain schools of thought, their individual methods of

carrying out experimental procedure and their constant application of judgement, are routinely omitted, so that 'the physical world seems regularly to speak, and sometimes to act, for itself' (Gilbert and Mulkay, 1984, 56). Empiricist discourse, in short,

> is organised in a manner which denies its character as an interpretative product and which denies that its author's actions are relevant to its content.
>
> Gilbert and Mulkay, 1984, 56

Contingent discourse, on the other hand, is constructed to make allowance for the fact that opinions and actions are influenced by considerations 'outside the realm of empirical biochemical phenomena' (Gibert and Mulkay, 1984, 57). The person of the scientist is evident in the discourse:

> When this repertoire is employed, scientists' actions are no longer depicted as generic responses to the realities of the natural world, but as the activities and judgements of specific individuals acting on the basis of their personal inclinations and particular social positions.
>
> Gilbert and Mulkay, 1984, 57

In a more light-hearted vein, Gilbert and Mulkay show how the incongruence between empiricist and contingent discourse is used by scientists themselves as a source of humour. They cite lists of phrases in formal scientific language 'translated' for comic effect into contingent discourse. For example:

What he wrote	*What he meant*
(c) The W-PO system was chosen as especially suitable...	The fellow in the next lab had some already prepared.
(d) Three of the samples were chosen for detailed study	The results of the others didn't make sense and were ignored.
(j) Of great theoretical and practical importance...	Interesting to me.

Gilbert and Mulkay, 1984, 176-7

What the work on re-writing and translation makes clear is that the features of the scientific style noted in Section 2.2 are in no way an inevitable consequence of scientists describing the work they have done. The relative invariability of the research article, therefore, must find its explanation in the precise co-incidence of written mode, formal presentation of experimental findings and peer-group audience rather than in anything inherent in 'scientific method'. The scientists interviewed by Gilbert and Mulkay ascribe the way they write research articles to mere convention or to a desire to avoid a possibly dangerous personal commitment. Their choices of expression, however, create unique meanings, which in turn create the social context of the research article (Gilbert and Mulkay, 1984, 40, following Halliday, 1978, 189).

In the following section, I shall look again at this social context and shall argue an alternative view of the dichotomy between academic and popular, between laboratory talk and written account and between empiricist and contingent discourse.

2.5 The research article: Ideology and Genre

The work surveyed so far in this chapter suggests a dilemma in respect of the experimental research article. This dilemma is focussed in particular on the nature of the interpersonal in research articles. On the one hand, the sociologists reviewed tell us that the research article reifies claims, stages battles between opposing claims and turns claims into facts. It is argued to be essentially persuasive in nature and to represent an attempt on the part of the writer to change, if only slightly, the paradigm of beliefs of the scientific community. This implies a personal and evaluative approach to the material. On the other hand, comparisons of research articles with popular and review articles tend to carry the implication that the research article is impersonal, descriptive, non-evaluative. Myers, for example, describes the writer of review articles as 'giving personal evaluations' (Myers, Transcribing, 4) and suggests that this is an unusual activity for scientific writers. Two types of intertextual evidence, then, give apparently contradictory results. Whilst the two perspectives on research articles as persuasive and as impersonal are not necessarily incompatible, the exact nature of the interaction between the perspectives needs to be spelled out. For the analyst interested in the interpersonal feature of evaluation, the dilemma may be phrased as a question: do the interpersonal features that are available for analysis in contingent discourse remain available for analysis in empiricist discourse?

One possible approach to the dilemma is to adopt Fahnestock's suggestion that while research articles are indeed persuasive, they belong to a particular type of persuasive genre which, following Aristotle, Fahnestock labels 'forensic' (Fahnestock, 86, 278). In forensic discourse, the audience is to be persuaded of the 'nature and cause of past events'

rather than, as in epideictic or deliberative discourse, their current significance (Fahnestock, 86, 278). Since the aim of the research article is to 'validate' rather than 'celebrate' (Fahnestock, 1986, 279), this presumably accounts for its impersonality. Fahnestock's account is useful in that it treats the research article as genuinely persuasive rather than descriptive, but it does over-simplify the nature of the validation procedure. She describes the goal of research articles as 'establishing the validity of the observations they report' as opposed to spelling out the significance of such observations, which, she says, is 'largely understood' (Fahnestock, 1986, 178). This begs the question of what is meant by 'observation' and 'significance'. If we accept Pinch's notion of 'externality' of results, then little of what appears in research articles is actual observation. Most is, in fact, interpretation of the significance of that observation. There is a further simplification in that, although Fahnestock does acknowledge that 'scientific papers are also to some extent epideictic and deliberative' (Fahnestock, 1986, 278), as her concern is to point out a contrast with popular articles she does not pursue the interesting implication that the research article may be a 'mixed' genre.

An approach which seems to me to err in the opposite direction, that is, in paying too much attention to the interpersonal features of the research article, is that of Myers (1989). In this paper, Myers subsumes everything to the interpersonal by applying Brown and Levinson's (1978) notion of Negative and Positive Face to research articles. Negative face, Myers argues, may be threatened by, among other things, the making of a claim:

> The making of a claim threatens the general scientific audience (the exoteric community) because it is a demand by individuals for communally-granted credit...The claim also threatens the negative face of other researchers - the esoteric scientific community - because it implies a restriction on what they can do now.
>
> Myers, 1989, 5

Such threats are mitigated by strategies to uphold positive face, such as the use of hedges and other indications of tentativeness. The problem is that many of these devices are those which adjust the status of claims. In other words, Myers appears to be replacing the idea of negotiation of what is to constitute scientific knowledge with the notion of politeness. He says,

> As with other hedges, the form of the statement reflects a relation between the writer and the readers, *not the degree of probability of the statement*.
>
> Myers, 1989, 15 (emphasis added)

Such a statement makes too sharp a distinction between Field (what is said) and Tenor (to whom it is said). As I have argued above (Section 2.4.4), most of Myers' own work shows that such a disjunction is unjustifiable. The work of both Fahnestock and Myers shows that if the interpersonal is separated from other factors, one is in danger of either ignoring it (as Fahnestock does) or of allowing for nothing else (as Myers in this case does).

Latour and Woolgar take an alternative approach to the dilemma by stressing the curious contradiction in research articles. They suggest that, while the aim is to persuade, the articles imitate exposition, the setting out of facts rather than the construction of a persuasive argument. This is because readers are successfully persuaded only if they see themselves as having responded to facts rather than to coercion. As Latour and Woolgar

express it: 'readers are only fully convinced when all sources of persuasion seem to have disappeared' (Latour and Woolgar, 1979, 76). This is because

> the practice of science relies on the assumption that there is a world 'out-there' which has an existence quite apart from that of the investigating scientists.
>
> Gilbert, 1976, 285

As a result of this,

> the scientist can demonstrate the veracity of his reporting by showing that he has followed the correct procedure for uncovering the truth, and then letting the truth speak for itself, being careful to omit the biases and interpolations of the messenger.
>
> Gilbert, 1976, 285

In other words, the stylistic features of impersonality typical of the research article maintain the persona of science as discovery rather than construction and are therefore crucial to the 'inversion' (Latour and Woolgar, 1979, 240) of persuasion through non-persuasion. Latour and Woolgar neatly summarise this:

> The result of the *construction* of a fact is that it appears unconstructed by anyone; the result of rhetorical *persuasion* in the agnostic field is that participants are convinced that they have not been convinced; the result of *materialisation* is that people can swear that material considerations are only minor components of the "thought process"; the result of the investments of credibility, is that participants can claim that economics and beliefs are in no way related to the solidity of science; as to the *circumstances*, they simply vanish from accounts, being better left to political analysis than to an appreciation of the hard and solid world of facts!
>
> Latour and Woolgar, 1979, 240

An alternative account of this may be found in the systemic notion of the ideological determination of meanings in a register, and in a text (Halliday, 1987; Kress and Hodge, 1979; Martin, 1986; Fairclough, 1988). Opinions differ as to the exact relation between ideology, register and

text, but one which I think is fruitful in the present context is that of Fairclough (1988). Register, Fairclough argues, is 'an ideologically particular, situation-specific meaning potential' (Fairclough, 1988, 112), but individual texts, rather than being supposed to instantiate single registers,

> should be seen as products of speakers' adaptation of old resources to new situations - one consequence being that several registers may be drawn upon in text creation, so that texts may be 'multi-registerial'.
>
> Fairclough, 1988, 112

Similarly, where there are diverse ideologies, there may be 'different "discursive" formations' (Fairclough, 1988, 113). Fairclough is mainly interested in the role of 'mixed' texts as instigators of register change and analyses a typical hybrid: a bank advertisement which uses the language of the gate-keeping bank manager together with that of the supplicant commercial salesperson. The experimental research article is clearly not a mixed-register text of the same kind, for there are no two independent register-resources upon which it could be drawing. Indeed, to propose the research article as a mixed register would be to negate the whole notion of register itself. However, if instead of (or as well as) describing texts as belonging to multiple registers, we regard registers as being potentially the products of more than one ideology (defining ideology as a system of thought rather than, as Kress for example does, as a dominant system of thought (Kress, comments made at the 14th. International Systemics Workshop, Sydney, 1987)), we are then in a position to describe the meanings in texts as defined by multiple ideologies. (Candlin and Lucas, 1986, adopt a similar position in suggesting a motivation for the language of family planning counselling.) It is now possible to account for the 'inversion' of the research article in terms of the article as a product of both the ideology

of the neutrally-observed 'world out there' and the ideology of the community-created fact. Two apparently contradictory claims that will be made in the course of this thesis - that research articles are organised around an evaluative framework and that the evaluation is realised in language that is frequently not attitudinal - then become unsurprising.

This concludes my examination of the research article as a socially-constructed type of writing. In the next chapter I shall turn my attention to linguistic approaches to the study of discourse structure in general and to the role of evaluation in particular.

CHAPTER 3

Evaluation and Discourse Structure

3.1 Introduction

Any attempt at defining the term *evaluation* must take into account two different usages of the term (see Chapter 1). It is used, first of all, to describe a kind of language, a choice of lexis and grammatical structure which is made in order to indicate what the writer thinks of the facts being presented (Winter, 1982, 9). It is necessary, therefore, to examine what those lexical and grammatical choices are that convey this information. Secondly, *evaluation* is commonly used as a label for a stage in a 'schematic structure' (Martin's 1985 term). The schematic structure may be a common text pattern, such as the Problem-Response pattern described in detail by Hoey (1979; 1983), or, as Martin uses the term, it may be a generic structure:

> a way of getting from A to B in the way a given culture accomplishes whatever the genre in question is functioning to do in that culture.
>
> Martin, 1985, 251

However the term 'evaluation' is used, it is widely acknowledged to be an important discourse phenomenon. Hoey, for example, asserts that 'Situation and Evaluation are the fundamental units of discourse analysis' (Hoey, 1983, 55). Labov makes a similar point with respect to narrative, stating that evaluation is 'perhaps the most important element in addition to the basic narrative clause' (Labov, 1972, 366). Sinclair and Brazil give

a reason for the importance to spoken interaction of continual evaluation or 'feedback' as it is termed here:

> Discourse is constructed by more than one speaker, and its structure bears the marks of this fact. Each new utterance tells the previous speaker something about the effect of the previous utterance, its success or failure, the warmth of its reception, etc. This 'feedback' is a powerful organizing factor in conversation, and lack of it can cause problems
>
> Sinclair and Brazil, 1982, 44

Yet the use of the term 'evaluation' is hedged about with qualifications. Hoey, for example, while proposing a discourse element termed Evaluation, argues that

> Strictly speaking, all signals, whether in signalling sentences, clauses or phrases, are evaluative, though not at the level of the over-all organisation.
>
> Hoey, 1983, 55

Labov, having similarly established an Evaluation category separate from others in the narrative, suggests that

> The evaluation of the narrative forms a secondary structure which is concentrated in the evaluation section but may be found in various forms throughout the narrative.
>
> Labov, 1972, 369

Moreover, some writers avoid the term altogether. It appears to be largely irrelevant to the field of text linguistics. For example, van Dijk elaborates a theory of macro-structures with only a fleeting reference to Evaluation as a narrative category (van Dijk, 1977, 154). De Beaugrande and Dressler (1981) manage without the term altogether. More surprisingly, Halliday does not use the word 'evaluation' in his *Introduction to Functional Grammar*, although his *attitudinal* category may be assumed to be roughly the same thing (Halliday, 1985a, 163).

The issue of the features and function of evaluation is not an isolated one, but is part of the more general discussion of the nature of discourse. So Hoey sees evaluation as part of a general theory of clause relations. Sinclair places evaluation at the centre of his theory of discourse because of his emphasis on the essential dialogic nature of even written monologue, and on the need for the interactants to '[determine] the significance of [their] interaction' (Sinclair, 1987, 6). Halliday, on the other hand, treats evaluation as of no particular importance because he interprets it as only part of only one of three metafunctions of language.

This chapter will discuss in greater detail the issues raised by analysts' use of the term *evaluation*. It begins with an overview of different definitions of evaluation (Section 3.2) and goes on to survey two approaches to discourse structure (Section 3.3 and Section 3.4). Finally, in Section 3.5, the argument to be developed in this thesis is outlined.

3.2 Approaches to the Definition of Evaluation

3.2.1 The Contrastive Approach

The first approach to the definition of evaluation to be considered here may be termed the contrastive approach, as it defines evaluation as that which is different from, and therefore stands out against, the background 'norm' for the text in question. Polanyi, for example, observes that:

> anything which departs from the norm of the text acts evaluatively by drawing attention to itself and also to the material which surrounds it. For example, a descriptive interlude, event, or series of events may act evaluatively in a largely monologic or dialogic text because differing from the reported speech norm of the text, it calls attention to itself and the information it encodes.
>
> Polanyi, 1978, 38

What counts as evaluation, therefore, should depend on the nature of the background discourse. Polanyi suggests that:

> What is functioning evaluatively in a given text is the language which stands out from the rest of that particular text. For example, in a story which is composed of complex sentences heavily evaluated by many devices, a simple sentence may appear very "stark" and thus noticeable. In the "Eating on the New York Thruway" story we will examine below..., the narrative events stand out because their syntax is so simple compared to the descriptive information.
>
> Polanyi, 1978, 40

The rather strange implication of this is that a text might be composed of some sentences which were 'heavily evaluated' and others which were evaluative because they did not possess such devices.

In spite of her emphasis on a notion of contrast, Polanyi appeals to a common understanding of 'sentences heavily evaluated by many devices', and indeed she presents a list of commonly-used evaluative devices that is not very different from Labov's. She lists, for example,

> Repetition of key words or phrases, the use of reported speech, increased use of modifiers, or suspension of the action by retarding discussion
>
> Polanyi, 1979, 209

as well as 'heightened stress...a negative proposition' (Polanyi, 1979, 215) and 'hesitation...and the choice of *the crush of the bodies* as an encoding for *crowded*' (Polanyi, 1979, 217).

This is similar to Labov's listing of evaluative devices: intensifiers, comparators, correlatives and explicatives (Labov, 1972, 378-393), each of which is a contrast to the syntax of the basic narrative clause. Labov is concerned with the relative syntactic placing of various strengths of explicitness of evaluation. Evaluation may be external to the narrative i.e. uttered by the speaker in the 'real time' of the story's narration (Labov, 1972, 371), embedded, that is, attributed to one of the characters in the story (ibid., 372-373), or it may co-occur with the action of the story (ibid., 373) or be realised by a suspension of the action (ibid., 374-375). However explicit the evaluation, however, it is essentially a contrast to, or departure from, the 'basic narrative syntax' defined by Labov as potentially filling up to eight slots:

1. Conjunctions
2. Simple subjects
3. Auxiliaries such as *was* in orientation sections; quasimodals *start, keep, want* etc.
4. Preterite verbs
5. Complements, direct and indirect objects
6. Manner or instrumental adverbials
7. Locative adverbials
8. Temporal adverbials

adapted from Labov, 1972, 376

What Polanyi does is to elaborate on this notion of departure.

Her point is taken still further by Hunt and Vipond, applying the notion of evaluation to literary texts and noting thereby a link between 'the processes of conversational story understanding and literary reading' (Hunt and Vipond, 1986, 68). Hunt and Vipond categorise three types of evaluation, that is, three ways in which a discourse may deviate from 'the norm'. The first is 'discourse evaluations', which are 'distinctive or marked ways of expression', such as "they *crowded* into our narrow little hall" instead of "they *came* into our narrow little hall" (Hunt and Vipond,

1986, 61). The second is 'story evaluations', which are 'distinctive story events, characters, descriptions or settings', such as the detail of men in plain clothes carrying revolvers (Hunt and Vipond, 1986, 61). Thirdly, they note 'telling evaluations', where, instead of something being inherently incongruous and therefore noteworthy, 'the incongruity is due to the narrator's mentioning something *at all*, or mentioning it *at a particular moment*' (Hunt and Vipond, 1986, 64). An example is the mention of a character's age (*'five years old'*) at a time when it appears to be irrelevant to the story and therefore marked.

The work discussed above is instructive in its conclusions and also in the problems that it encounters. Several conclusions may be drawn. Firstly, it may be concluded that evaluation is discoursal rather than syntactic. That is, it may not be possible to tell whether a sentence taken in isolation is evaluative or not. The fact that something is said may be as important as the way it is said. Secondly, while Polanyi seems to endorse a text-by-text identification of evaluation, in practice all the writers, when discussing non-literary narrative, agree on an inventory of evaluative devices, which suggests that while evaluation may not be identifiable on universal criteria, it may not be wholely text-specific either, although specific devices may be identifiable within a particular genre. It is possible, for example, that the devices noted by Labov and by Polanyi are true only for narrative.

Thirdly, these writers on evaluation run into a common problem: that the greater their comprehensiveness in identifying all the evaluative devices in a particular text, the less verifiable their evidence for doing so, and the less extendable their findings. This is particularly true of Hunt and Vipond's categories of 'story evaluation' and 'telling evaluation',

in which we are asked to share a belief that the sentence *She had been trying to have her baby for two days* is evaluative because any reader would recognise 'the seriousness of a forty-eight-hour labor, even if that information is presented in an understated manner' (Hunt and Vipond, 1986, 54). The difficulty here is that the category of evaluation becomes ever wider, until it becomes possible to find reasons for terming everything evaluation and the non-evaluation category shrinks into nothingness.

There is, however, some measure of agreement among the various writers. The process of evaluation is a social one in the sense that what is evaluative is what the society holds as having value. Readings may therefore change because social allocations of value change. Although this social definition makes it a product of the discourse rather than of the lexico-grammar, certain lexical and grammatical items may be cited as being frequently associated with the linguistic representation of evaluation. Labov tends to concentrate on the closed-class grammatical items, such as comparators and intensifiers, but lexical items can also be cited. Hunt and Vipond, for example, note that *screamed* as a lexical item is almost bound to be evaluative. One of the more important points noted by Hunt and Vipond is that evaluation is cumulative. A single evaluative item tends to be ambiguous until supported by other items that make the same point (Hunt and Vipond, 1986, 67). In this they make explicit something implied by Polanyi when she observes that

> A great deal of repetition, hesitation, heightened stress...*combine* to give a very vivid impression...
>
> Polanyi, 1979, 217 (emphasis added)

Finally, evaluation is essential. Polanyi emphasises this point:

> Without evaluation by the narrator, the audience has only a mass of detail - temporal, situational, and characterological, and no way of understanding what the story is really about - why the narrator took up so much conversational room in reciting a collection of details.
>
> Polanyi, 1979, 209

What the evaluation is necessary to is an issue that will be taken up in Chapter 6.

As a final point, it must be noted that all the writers cited refer to an 'evaluative structure' existing alongside a 'narrative structure' and, in Polanyi's case, a 'descriptive structure' too (Polanyi, 1979, 209). It is clear, however, that what they mean by the term 'structure' is simply the presence of information of the type mentioned. An explication of the evaluative structure, for instance, consists solely of a listing of the evaluative devices as they are used in a particular text. There is no sense of 'structure' as a pattern chosen from among possible patterns, such as Halliday or Sinclair may use the term. If it is true that texts possess an 'evaluative structure', however, as I believe it is, it should be possible to describe that structure in more precise and meaningful terms.

3.2.2 The Lexico-Grammatical Approach

This section will consider the work of systemic linguists, especially Halliday (1985a), in relation to the definition of evaluation. Halliday does not himself use the term *evaluation*, but discusses matters relating to it under the heading of Tenor. Tenor is the aspect of context that varies according to the participants in the interaction.

In her detailed study of Tenor, Poynton suggests that three parameters of difference be considered: *power*, *contact* and *affect* (Poynton, 1985, 76-78). *Power* refers to the hierarchic or non-hierarchic relationships between participants that exist as a result of factors such as authority, occupational status or expertise. *Contact* may be glossed roughly as how well people know each other and under what circumstances. Martin calls this 'the degree of involvement of the speakers with each other' (Martin, 1986, 243). For example, people may meet frequently or seldom, they may know each other in a variety of roles (colleagues, friends, committee chairperson and member etc.) or only in one role (vendor and customer, for instance). *Affect* refers to positive and negative attitudes towards the addressee or towards the field of discourse.

One of the basic tenets of systemic linguistics (see Section 3.3.1 below) is that aspects of context affect choices in the lexico-grammar. Poynton makes it clear, in fact, that Tenor influences all language levels. Hierarchical power relationships, for example, affect turn-taking and other aspects of discourse, whilst affect can influence rhythm, rate of delivery and pitch, that is, aspects of phonology (Poynton, 1985, 81; cf Polanyi's observations discussed in Section 3.2.1 above). The greatest area of influence, however, is still the lexico-grammar, where Tenor is seen as determining interpersonal meaning. Martin, following Poynton, suggests that this is done 'via three realisation principles', which he calls *amplification*, *reciprocity* and *elaboration* (Martin, 1986, 243).

Amplification, or the 'intensity of a realisation', reflects affect, the attitude of the speaker. It is described as influencing

> degree of pitch movement, loudness, extended prosodic realisations of attitude and modality, intensification and superlatives, repetition and so on.
>
> Martin, 1986, 243

Reciprocity, which reflects status, or power in Poynton's terms, refers to the degree to which the speakers make use of the same sets of options within the linguistic system, or whether some options appear to be reserved for the socially more powerful speaker. Finally, *elaboration* is described as reflecting 'the degree of involvement of the speakers with each other' (Martin, 1986, 243). A relatively large degree of involvement, such as experts in a particular field might have, will lead to the use of a wide range of lexical items used without explanation, that is, technical lexis (Martin, 1986, 243).

To these, Poynton adds the Mood system, commonly held to vary according to Tenor, and attitudinal lexis (Poynton, 1985, 81).

It may be noted in passing that the Hallidayans' discussion of Tenor focuses exclusively on the relationship between discourse participants as realised in the text. What it misses is the I-You parameter of text construction itself. In other words, it concentrates on the relationship between the-person-who-is-author-of-the-text and the-presumed-reader, at the expense of the interaction between current-text-encoder and presumed-text-decoder. This omission is not only rectified by Sinclair (see Section 3.4 below), but is brought by him to the forefront of discourse theory and made the central tenet of a theory of discourse structure.

Of the aspects of lexico-grammar associated with Tenor, the ones which are discussed in most detail by Halliday are mood and attitudinal language.

As these features are also the ones which will be used most in the rest of this thesis, I shall restrict my discussion to these areas.

According to Halliday's *Functional Grammar*, the Mood system of the English clause comprises choices of subject position and of finiteness, tense and polarity. Betweeen the two polarities, positive and negative, lies the area of modality (Halliday, 1985a, 335). Modality is broadly divided into modalization, which modifies clauses giving or requesting information (the 'indicative' type) and modulation, which modifies clauses offering or requesting goods and services (the 'imperative' type). Modalization is further categorised in terms of a scale of *probability* and a scale of *usuality*, while modulation is categorised as a scale of *obligation* (requesting goods and services) and a scale of *inclination* (offering goods and services). The various posibilities are set out by Halliday (1985a, 335) in a diagram presented here as Figure 3.1.

Halliday further considers distinctions in *orientation* (explicitness of speaker involvement) and in *value* (strength) of modality. *Orientation* may be illustrated with reference to the obligation type of modulation (requesting goods and services). Indication of personal intervention by the speaker, as in

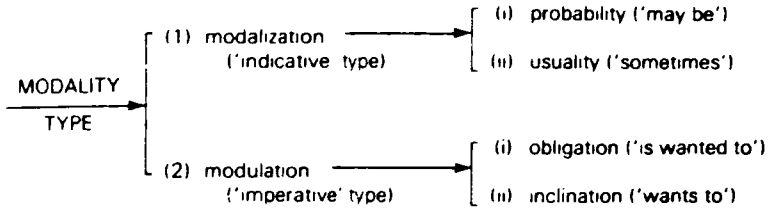
I want John to go.
or *John should go.* (Halliday, 1985a, 336, emphasis added)

are termed 'subjective' (explicit and implicit respectively), while indications of some external obligation, as in

John's supposed to go.
and *It's expected that John goes.* (Halliday, 1985a, 336)

are termed 'objective' (implicit and explicit respectively). Halliday's examples of type and orientation are reproduced here as Figure 3.2.

FIGURE 3.1



Halliday, 1985a, 335

FIGURE 3.2

	Subjective explicit	Subjective implicit	Objective. implicit	Objective. explicit
Modality. probability	I think [in my opinion] Mary knows	Mary I know	Mary probably knows [in all probability]	it's likely that Mary knows [Mary is likely to]
Modality usuality		Fred I sit quite quiet	Fred usually sits quite quiet	it's usual for Fred to sit quite quiet
Modulation obligation	I want John to go	John should go	John s supposed to go	it's expected that John goes
Modulation inclination	I undertake for Jane to help)	Jane I help	Jane s keen to help	it s a pleasure for Jane to help

Halliday, 1985a, 336

Finally, *value* of modality refers to the strength or degree of modal modification. Halliday does not present this as a cline, however, but as a system of choices, the main one being between median and outer values. The

distinction here is grammatical, depending on whether transference of a negative between the proposition and the modality, as in

It's likely/certain Mary doesn't know.

and *It isn't likely/certain Mary knows.*

results in sentences of similar value, as with the word *likely* in the above sentences, or in sentences of very different value, as with *certain*. As Halliday expresses it:

> The median value is that for which the negative is freely transferable between the proposition and the modality....With the outer values, if the negative is transferred the value switches from high to low, or from low to high...
>
> Halliday, 1985a, 337

There are therefore three dimensions of choice within the modality system: *type*, *orientation* and *value*. Modality in general 'represents the speaker's angle, either on the validity of the assertion or on the rights and wrongs of the proposal' (Halliday, 1985a, 340). It is this 'speaker's angle' which associates it with evaluation. Halliday notes that modality is most congruently 'an adjunct to a proposition ' (ibid., 340), that is, it is realised grammatically through a modal verb or an adjunct. Frequently, however, in real discourse, the modality is itself made the focus of a proposition, either through an overt statement of personal opinion (*I think that...*) or through an equally overt appeal to objectivity (*Evidence suggests that...*). Halliday terms these non-adjunctal realisations of modality *interpersonal metaphors*, and notes that

> whereas the subjective metaphors, which state clearly 'this is how I see it', take on all values...most of the objectifying metaphors express a 'high' value probability or obligation - that is, they are different ways of claiming objective certainty or necessity for something that is in fact a matter of opinion. Most of the 'games people play' in the daily round of interpersonal skirmishing involve metaphors of this objectifying kind.
>
> Halliday, 1985a, 340

Certainly in scientific writing, the objectifying type of interpersonal metaphor is widely used. Chapter 4 will illustrate this point further.

We may now turn to the second aspect of lexico-grammar influenced by Tenor: attitudinal language. This is a lexical, rather than a grammatical, phenomenon. Attitudinal words are notoriously difficult to define because they appear to resist classification into a single group. Halliday, however, seeks to identify an interpersonal class of epithets, based on their lack of objective meaning and their consequent inability to restrict reference. For example, *The long train* identifies and (potentially) defines the train in question whereas *The mighty train* does not (Halliday 1985a, 163). It is interesting to consider how far this principle might be extended to other word classes. For example, *that policeman* is presumably more precise in identification that *that fool*, and *The man who beats his child* defines the man in a way that *The man who spoils his child* does not. In other words, *policeman* and *beat*, in Halliday's terms, have experiential meaning whereas *fool* and *spoil* have interpersonal meaning: they are attitudinal. In other examples, however, the distinction between experiential and interpersonal is impossible to make. Depending on one's view of the police, for instance, they might be identified as *the pigs* or *the boys in blue*, each nominal expressing both experiential and interpersonal meaning. In other words, the examples of attitudinal language cited above - *mighty, fool, spoil* - are

differentiated from the others not by the presence of interpersonal meaning but by the relative absence of experiential.

It is now possible to look at Halliday's treatment of both modality and attitudinal language and to consider whether such evaluation may be adequately accounted for in terms of contextual Tenor. It seems that the concept of Tenor is useful in making two distinctions with great clarity: firstly, the distinction between different registers which vary in terms of the relationship between their participants; secondly, the differences in the use of certain discoursal and lexico-grammatical features by interactants with different social roles. Other aspects of evaluation, however, are less satisfactorily dealt with in this way.

Most importantly, evaluation reveals an attitude to the text itself as well as to other interactants or to the topic under discussion (Francis, 1986, 96). This interaction between writer and text is not separate from the interaction between writer and reader, but neither is it subsumed by it.

Secondly, it is not the case that evaluation is always to be seen in terms of Tenor alone. Halliday, for instance, on at least one occasion places it under Field (Halliday and Hasan, 1985, 34). Furthermore, even when Tenor is the relevant category to look at, it is clear that Tenor is extremely difficult to translate into lexico-grammatical terms. Martin's discussion (above) shows that Tenor may influence degrees of probability and relative distribution of occurrences rather than actual system choices. Where attempts are made to restrict the lexico-grammatical systems that are subject to the influence of Tenor, these attempts are only partially successful. As Martin (1986) demonstrates, Tenor influences choice of participant as well as choice of Mood etc.

Finally, the 'parcelling out' of grammatical systems among the possible variables within Tenor seems to me to be not entirely satisfactory. This is particularly true of the treatment of modality and modulation. I hope to show in Chapter 4 that issues of certainty and of good and bad are closely linked, so that modality reflects attitude rather than, or as well as, power relations.

3.2.3 Evaluation as a Discourse Element

The previous section has shown some of the problems inherent in trying to define evaluative aspects of the lexico-grammar. An alternative approach is to take evaluation as a discourse element: in other words, to identify those parts of the text which evaluate other parts. Most theories of schematic structures in discourse incorporate an Evaluation element as part of that structure.

In narrative, for example, Labov (1972) places the Evaluation element immediately prior to the Resolution. The Evaluation appears to delay and therefore dramatise the Resolution:

> A complete narrative begins with an orientation, proceeds to the complicating action, is suspended at the focus of evaluation before the resolution, concludes with the resolution, and returns the listener to the present time with the coda.
>
> Labov, 1972, 369

Given the inevitable circularity of element-realisation definitions, this pattern leads Labov to define any pre-Resolution delaying mechanism as evaluative.

Other work with narrative has shown the difficulty of distinguishing the element Evaluation from other evaluations in the narrative. Plum and Rothery (1987), for example, distinguish between the 'local' and 'global' significance of some interpersonal meanings. Evaluation with global significance has cohesive ties with other events, in such a way that this interpersonal meaning refers (forward or backward) to other types of meaning, including experiential meaning. Only evaluation with this kind of global significance can be said to constitute an element in a schematic structure.

Although Labov places Evaluation at the centre of the narrative syntagm, work in other genres suggests that it is more commonly to be found at the end of a sequence. Sinclair's work, to be discussed more fully in Section 3.4.2 below, sees evaluation very much as a terminating, culminating element.

Evaluation is the final element also in the Situation-Problem-Response-Evaluation pattern discussed by Hoey (1979; 1983). This pattern has a predictive power, in the sense that the presentation of a Situation predicts the identification of a Problem, and that Problem predicts a Response. Evaluation is predicted as a discrete element unless it is incorporated into the Response. Two points need to be noted about Hoey's work, which have significance also for other evaluation-element theories. Firstly, although the Evaluation may be signalled by the presence of attitudinal language, its identification rests partly on its position in the syntagm. Consider, for example, the Evaluation element of the helicopter text in Hoey (1983):

> Trials have been carried out with freight-dropping at rates from 19 feet to 42 feet per second. The charge weighed about one and half tons, but the system can handle up to eight tons. At low altitudes freight can be dropped without a parachute.
>
> Hoey, 1983, 68

This fulfills Plum and Rothery's criterion of an external, superordinate referent (*the system*), but it is not noticeably attitudinal in content. What characterises it as evaluation is that it follows the Response element and yet is clearly different from it (there is a change in tense). Position as much as realisation identifies the element.

Secondly, the evaluation element is in fact part of a concentration on the evaluative aspect of the text as a whole..Hoey makes this clear in his expansion of the terms Situation, Problem, Response, Result and Evaluation:

> *Situation* - Evaluation of Situation as non-Problem
> Situation - Evaluation of Situation as *Problem*
> Situation - Evaluation of Situation as *Response*
> Situation - Evaluation of New Situation as *Result*
> *Evaluation*
>
> Hoey, 1983, 55

In identifying this pattern, therefore, Hoey is selecting evaluation as the most salient point of organisation. A systemicist might object that Hoey, by claiming that Problem-Response is <u>the</u> pattern of this text, is stressing interpersonal meaning at the expense of experiential and textual. Such as objection would, however, miss the point: that evaluation organises all the meanings in the text into a coherent entity.

The problem with concepts of evaluation as an element in a syntagm is that they tend to down-play or even ignore the evaluation that occurs outside that element. Bolivar, for example, implies that only terminating evaluation is discoursally significant (Bolivar, 1985, 346-7). Plum and Rothery similarly attempt to discard much attitudinal language from the

evaluation category. Evaluation, in fact, refuses to be confined to a single discourse element. Hoey's insistence upon the overall organising function of evaluation is a useful corrective.

3.3 Halliday: System in Discourse

3.3.1 The Notion of Discourse in Systemic Linguistics

The systemic school of linguistics associated with the work of Halliday, Hasan, Martin and Butt, among others, emphasises the role of language as a **social semiotic**. That is, language is one of the 'sign systems' which are 'bearers of meaning in the culture' (Halliday and Hasan, 1985, 4). The term 'social' stresses not only the role of language in a particular culture or social system, but also its relation to the social structure, the sets of relationships and activities possible within that culture (Halliday and Hasan, 1985, 4).

This perception of language as an essentially social, rather than, say, a psychological phenomenon leads to one of the central concerns of systemic linguistics:

> that language is functionally variable; any text belongs to some register or other.
>
> Halliday, 1985c, 9

A register is a particular configuration of the variables of the context or situation in which texts belonging to that register are produced. The contextual configuration (Hasan's term, Halliday and Hasan, 1985, 55) is composed of three clusters of variables: Field, Tenor and Mode. These are glossed by Halliday as follows:

> 1. The FIELD OF DISCOURSE refers to what is happening, to the nature of the social action that is taking place: what is it that the participants are engaged in, in which the language figures as some essential component?
>
> 2. The TENOR OF DISCOURSE refers to who is taking part, to the nature of the participants, their statuses and roles: what kinds of role relationship obtain among the participants, including permanent and temporary relationships of one kind or another, both the types of speech role that they are taking on in the dialogue and the whole cluster of socially significant relationships in which they are involved?
>
> 3. The MODE OF DISCOURSE refers to what part the language is playing, what it is that the participants are expecting the language to do for them in that situation: the symbolic organisation of the text, the status that it has, and its function in the context, including the channel (is it spoken or written or some combination of the two?) and also the rhetorical mode, what is being achieved by the text in terms of such categories as persuasive, expository, didactic, and the like.
>
> Halliday and Hasan, 1985, 12

This view of context as multi-dimensionally varying is a useful heuristic tool for examining the ways in which text-producing situations may incorporate both similarities and differences. The classification of the variables into the three metavariables of Field, Tenor and Mode, however, leads to some problems. The difficulties of working with Tenor have been discussed in Section 3.2.2 above. Turning to Field, Halliday insists that this does not refer simply to 'what the text is about', but to the activity of which the text is a part (see above). The activity or goal of many texts, however, comes under the heading of persuasion, exposition, and so on, which Halliday classifies as rhetorical mode. In practice, discussion of Field tends to focus on topic. Martin, for example, says that

> In reflective modes field is commonly thought of as topic or subject matter.
>
> Martin, 1986, 236

Only in active modes, where the text achieves (or fails to achieve) a goal in real time, such as in the service encounters investigated by Ventola (1984; 1987), can the Field be properly described as an activity.

The difficulty in assigning a particular variable to one of Field, Tenor or Mode may be illustrated by a glance at the debate over the rhetorical function which Halliday reviews in Halliday (1982, 218). The variation between exposition, hortation, persuasion etc. is variously ascribed to the Mode (Halliday, McIntosh and Strevens, 1964), to the Tenor (Gregory, 1967), to a separate independent category (Ure and Ellis, 1979), and to a level superordinate to register, that is, genre (Martin, 1986). Such disagreement suggests a certain arbitrariness in assignment.

Finally, the division into Field, Tenor and Mode gives the false impression that the three are independent variables, that is, that it is possible to change one while holding the others constant. Martin acknowledges cultural constraints on certain combinations:

> Logically, field, mode and tenor choices...can combine freely with each other. But every culture makes far more use of some combinations than others (and may even proscribe certain combinations through taboo or ideologically motivated gaps).
>
> Martin, 1986, 247

and gives an example:

> Sex for example does not readily combine with power (tenor) and spontaneous dialogue (mode). It is not always 'polite' in our culture to talk about sex to our inferiors; if one does so, it may be construed as a rather threatening, often sexist, demand for sexual favours. Similarly there is a general constraint against talking about sex while doing it, regardless of the tenor involved. There are however genres which legitimize this field. Sex is fine as a topic among peers (realizing solidarity tenor) providing the mode is reflective; and sex is acceptable in lectures and seminars where there is bound to be differentiated power relationship of some kind but the mode is reflective monologue (where children are involved this is only just becoming a legitimate combination in our culture).
>
> Martin, 1985, 251

In fact, however, there are far fewer possible combinations that these observations might suggest. As Myers' work discussed in Chapter 2 shows, for example, a change in the Tenor, such as from expert-speaking-to-peers to expert-speaking-to-amateurs, necessitates a change in the topic or Field of the discourse. In other words, a lecture about sex and a solidarity-affirming conversation about sex would not in fact have the same Field. Martin himself is obviously so concerned by the way the Field changes when the interactants do that he is forced to set up more and more abstract levels of semiotics to account for this:

> Again, this kind of interaction between field, mode and tenor choices is not predictable from the register variables themselves, nor from genre....A model of ideology on the other hand can be used to predict these interactions.
>
> Martin, 1986, 251

The triumvirate of Field, Tenor and Mode is matched in texts by the three metafunctions: ideational or experiential, interpersonal and textual. This is the second lynch-pin of systemic linguistics: the 'metafunctional hypothesis' (Halliday 1988a, viii). Each metafunction represents a different type of meaning and each influences certain systems in the lexico-grammar. The meanings and their influences are summarised by Halliday:

> The ideational voice provides the content: the things, facts and reports; processes, participants and circumstances; the logical relations of different kinds. The interpersonal voice provides the interaction: mood, modality, person, polarity, attitude, comment, key. The textual voice provides the organization: thematic and informational prominence, grammatical and lexical cohesion among the parts.
>
> Halliday, 1982, 224

The relation between context and text may be represented by the diagram reproduced here as Figure 3.3 (Halliday and Hasan, 1985, 26), where the items in brackets show the lexico-grammatical systems associated with each metafunction. The sloping arrow signifies that there is no one-to-one determination between, say, Field and experiential meaning, but that Field will influence all meanings, particularly the experiential one. It is because he expects a more direct influence that Martin finds some influences of Tenor problematic, needing recourse to another semiotic level for explanation:

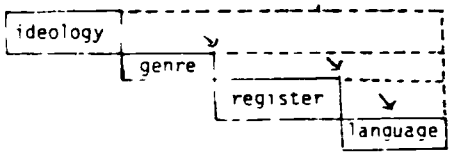
> In male oriented heterosexual pornography for example...males take on a large number of agentive roles while females do not...Put technically males are realised as Agent or Medium women as Medium only.
>
> *This is problematic if we want tenor to affect only interpersonal choices - agency is an experiential system.* Given a level of ideology however we might argue that it is the realisation of power in sexist discourse that we are observing here, not simply the realisation of the tenor category status.
>
> Martin, 1986, 253 (emphasis added)

FIGURE 3.3

SITUATION: Feature of the context	(realised by)	TEXT: Functional component of semantic system
Field of discourse (what is going on)		Experiential meanings (transitivity, naming, etc.)
Tenor of discourse (who are taking part)		Interpersonal meanings (mood, modality, person, etc.)
Mode of discourse (role assigned to language)		Textual meanings (theme, information, cohesive relations)

Halliday and Hasan, 1985, 26

FIGURE 3.4



Martin, 1986, 227

The theory of multiple, and therefore divided, functions is in a sense a convenience for discreteness in analysis. Halliday stresses that in the complete text the functions work together:

> The "character" of the text is its pattern of selections in these various voices, and the way they are combined into a single whole.
>
> Halliday, 1982, 224

and urges the analyst not to overlook completeness in favour of discreteness:

> Having separated the metafunctional components in order to understand why the text means what it does, we put them together again to explain why the text is valued as it is.
>
> Halliday, 1988a, ix

It is not surprising, therefore, that, as in the case of the context variables, difficulties of categorisation occur. Martin, for example, notes that a feature of the experiential function of a particular text, the predominance of passive voice, has nothing to do with the suppression of an agent but rather is dependent on thematic choices, which belong to the textual metafunction (Martin, 1986, 239).

The third crucial concept in systemic linguistics is that of levels or strata, each of which has its own systems of choice. The three levels of language are:

> **semantics**, whose fundamental unit is the text, and which is represented through attention to meaning;
> **lexico-grammar**, whose fundamental unit is the clause or word and which is represented through attention to 'wording';
> **phonology**, whose fundamental unit is the syllable and which is represented through attention to sounds.
>
> adapted from Halliday, NUS lectures/seminars, 1986-7

(Halliday's proposed level *semantics*, in taking the text as unit, corresponds to other writers' use of the term *discourse*. I shall use the latter term here.) The relations between the levels are not symmetrical, however. The lexico-grammatical level is deemed by Halliday to be 'The heart of language' (Halliday 1985c, 8) and organisation at the discourse level is dependent upon patterns in the lexico-grammar. Butt's analysis of the discourse structure of a poem, for example, is in fact an analysis of the lexical chains and grammatical choices in the poem (Butt, 1988b). Furthermore, as a result of the links between the Field, Tenor, Mode of discourse and the grammatical systems, the relation between discourse and lexico-grammar is not arbitrary as that between the lexico-grammar and phonology is (Halliday, 1985c, 8).

Some writers have proposed that language be seen as a semiotic system which realises other semiotic systems, specifically genre, register and ideology. Martin, for example, proposes a set of connotative semiotic levels or planes of which language is the lowest and ideology the highest (Martin, 1985, 250; 1986, 227). His modelling of these levels is reproduced as Figure 3.4. Martin then attempts to account for all the features in a text by reference to these levels of meaning. In Martin's model, genre precedes or is superordinate to register. In other words, 'The genre...is predictive of the combinations of field, mode and tenor choices we find' (Martin, 1986, 248). Hasan, however, reverses this relationship and suggests that schematic structures (GSP) 'are determined by particular values of field, mode and tenor' (Martin, 1985, 252).

In fact, Hasan does not distinguish between genre and register, and has said that her Generic Structure Potential could equally well be called a Register Structure Potential (comments made at the 14th. International Systemics Workshop, Sydney, 1987). She is more concerned to stress the crucial and symbiotic relationship between text and context, describing the stages which a text realises as determined by its Field, Tenor and Mode.

Where genre and register are distinguished, the term *genre* is used to account for the sequence or staging of a text (see further discussion in Section 3.3.2 below), while *register* refers to the ways in which things are expressed, such as the distinction made by Halliday between 'attic' and 'doric' styles (Halliday, 1987, 16; see Chapter 2).

3.3.2 Text Structure in Systemic Linguistics

It is now possible to consider what this strata-based, multi-functional view of the social semiotic of language has to say about the structure of discourse, the semantic level of language, and of a text, the instantiation of that level. The first point to be made is that for Halliday, discourse, properly speaking, has no structure, only system, while each text has an instantially-created structure, or pattern of meanings, which it will share, more or less, with other texts of the same genre. This is consistent with Halliday's view that

> What distinguishes systemic theory is that its basic form of synoptic representation is not syntagmatic but paradigmatic: the organising concept is not structure, but system.
>
> Halliday, 1985c, 8

At the lexico-grammatical level, then, various systems of choices are available, and the pattern of choices made in each text characterises the structure of that text. Along with this denial of structure in discourse, which is at variance with the work of other discourse analysts such as Sinclair, is a downgrading of the notion of constituency, which informs much other work on discourse structure. Halliday points out that

> In systemic theory, constituency is treated as a small, though essential, part of the total picture; and it is treated in a specific way, using ranks...instead of immediate constituents for the bracketing, and functions instead of classes for the labelling.
>
> Halliday, 1985c, 7-8

In particular, discourse, as a level of language organisation, is not seen as being organised in ranks, which would give it an organising principle independent of the lexico-grammar, but has its structure entirely dependent on the patterns created by the lexico-grammar (see above, Section 3.3.1).

Because both the lexico-grammar and the discourse are multi-functional and multi-systemic, that is comprising many types of meaning and realising choices from many different systems, each text realises not one but many structures. Halliday, borrowing Pike's (1959) terminology, speculates that these structures might be analogous to those to be found in the clause:

> But if it seemed useful to set up simultaneous structures in a text along these lines we might ask whether there is the same kind of structural variation as we find in the clause, with the eidological structure being "particulate" (represented by definable segments of the text) and the ethological being "field-like" (represented by overlapping prosodies in the text). (The "wave-like" periodic movement corresponding to the textual dimension of clause structure has already been referred to...)
>
> Halliday, 1982, 226

In this extract, eidological may be re-written ideational, and ethological is the more commonly-named interpersonal. The 'particulate' structure of the ideational metafunction is the one associated with constituency (Halliday, 1985c, 8). The notion of 'waves' is further expanded by Halliday:

> The pattern [Theme-rheme] is the "method of development" of the clause. It is closely analogous to what takes place in a text; not only over the whole text but also in structurally defined intermediate units within the text. The classic movement of a paragraph, beginning with a topic sentence (<u>from</u> theme to elaboration) and culminating - having a high point, unmarkedly but not obligatorily final - in a climax (from prelude <u>to</u> main point), is one of the clearest manifestations of the analogy between clause and text.
>
> Halliday, 1982, 229

It is worth noting, however, that Martin associates these same 'waves' with the interpersonal, in contrast with an experientially-biased schematic structure:

> This structure has an experiential bias, and it should be noted in passing that there is an interpersonal attitudinal wave passing through the text, crescendoing with the grammatical parallelism of [the end of the selected text].
>
> Martin, 1986, 247

Halliday's referent for the term 'structurally defined units' in the quotation above is not clear. He may be referring to the 'phases' or units such as those proposed by Gregory (1985) and Malcolm (1985) and used by Halliday in his interpretation of part of Tennyson's "In Memoriam" (Halliday, 1988b, 37). These phases represent segments of the text identified by the changes in ideational, interpersonal and textual structures, coinciding boundaries between these phases indicating a more major text boundary.

Halliday's theories will be discussed further in comparison with those of Sinclair (Section 3.4) and, in relation to the work undertaken in this thesis, in Chapter 8.

Whereas Halliday argues that discourse has system but not structure, Hasan points out that once culturally-defined language situations are taken into account it is possible to posit a structure potential for a particular genre of discourse. Any text belonging to such a genre would then be predicted to have as constituents certain semantically-defined elements. Martin refers to these elements as the 'stages through which one moves in order to realize a genre' (Martin, 1985, 251). The possible stages through which a text belonging to a particular genre may pass are expressed as a Generic Structure Potential (GSP). Hasan decribes a GSP as incorporating the following information:

1. **What elements must occur;**
2. **What elements can occur;**
3. **Where must they occur;**
4. **Where can they occur;**
5. **How often can they occur.**

> More succinctly we would say that a CC [Contextual Configuration] can predict the OBLIGATORY (1) and the OPTIONAL (2) elements of a text's structure as well as their SEQUENCE (3 and 4) *vis-a-vis* each other and the possibility of their ITERATION (5).
>
> Halliday and Hasan, 1985, 56

Each element is defined as 'a stage with some consequence in the progression of a text' (Halliday and Hasan, 1985, 56). It is recognised via its realisation criteria, which 'need not be identical across genres' and 'might be stated most clearly in terms of some semantic property' (Halliday and Hasan, 1985, 68). As an example, Hasan offers the following definition of a Sales Request (SR):

> SR must be realised by the following set of semantic properties:
> * demand
> * reference to goods
> * quantity of goods.
>
> Halliday and Hasan, 1985, 68

Genres investigated so far, as well as the Service Encounters discussed by Hasan (Halliday and Hasan, 1985) and Ventola (1984; 1987), include Nursery Tales (Hasan, 1984) and numerous genres used in education (e.g. Christie, 1984; Martin and Rothery, 1980; 1981; Rothery, 1984). An interesting account of the debate over the use of genre-theory in the teaching of writing, particularly to young children, is to be found in Reid (nd).

The issue of genre will be discussed further in Chapter 8. For the moment I shall make some general comments based on purely practical difficulties I have encountered in trying to work with Generic Structure

Potentials. By way of illustration I shall refer to my own attempts to analyse a popular Singapore genre: the 'radio phone-in programme'. In these programmes the caller, often a child, takes part in a quiz, for which prizes are often awarded. The first problem lies in delimiting the genre to be investigated. This is, of course, always a difficulty in any work on language variation, but it is made particularly crucial by the notion of internal variability central to the idea of GSP. Put simply, if one has two texts to analyse, one must decide first whether or not they belong to the same genre before deciding whether differences between them should be accounted for by the same GSP. For example, each of the phone-in programmes I have investigated has a different set of rules: in one, the caller is automatically given three clues before attempting to answer the quiz question, in another, clues are given only if the child is unable to answer the question; in one the child always reciprocates by asking the quiz host a riddle before being asked one in return, in another the child is always asked to dedicate a record to friends. In other words, each show has its own discourse rules. Is each show therefore a different genre? Such a possibility negates the whole value of the notion of genre, as the 'radio phone-in programme', as a discourse type, has a place in the culture, the social system, of Singapore.

Secondly, there appears to be no principled way of deciding what constitutes an element in the GSP. To take a simple example, does a pair of greetings constitute one element or two? Does a quiz exchange consisting of a question, an answer and an evaluation of the answer comprise one element or three? In Ventola's work, questions and answers are variously treated as one or two elements, without any apparent reason. (See especially Ventola, 1987.) Above all, what scale of text is to be taken as an element? One of

the phone-in programmes to which I refer, for example, can be analysed in two completely different ways. One way is to treat each segment (Introduction, Discussion of Ethical Issue, Child's Question, Quiz Section, Close) as an element, each comprising many utterances. Another is to propose elements roughly corresponding to utterances. The Quiz Section, for example, may be divided into Question, Answer, Evaluation, Clue and so on. Both methods of analysis satisfy the criterion that an element is 'a stage with some consequence in the progression of a text' (Halliday and Hasan, 1985, 56). (Harris, 1988, experiences similar difficulties when considering courtroom discourse in the light of GSP and, like myself, suggests a solution based on analysis at two ranks.)

3.4 Sinclair: Structure in Discourse

3.4.1 The Planes of Discourse

The school of linguistic theory developed by Sinclair and others at the University of Birmingham is best seen as an alternative branch of systemic linguistics. Many of the basic premises of Halliday's and Sinclair's systemics are the same, but in the subsequent development of those premises, different priorities have been stressed, particularly in the area of discourse. As a result, although the system of lexico-grammar used by both schools is the same (Sinclair's (1972) grammar is clearly a forerunner of Halliday, 1985a), the systems used to analyse discourse are different, not only superficially but radically, in their very aims and assumptions.

This discussion begins with a recapitulation of those aspects of Halliday's theory with which Sinclair is in agreement. Language as a system is to be decribed in terms of both paradigm and syntagm, both choice and chain (Pearce, 1977; Halliday, 1963) but whereas Halliday stresses the importance of the paradigm (discourse has system, not structure, see Section 3.3.2 above), Sinclair emphasises the importance of syntagm. Both see language as describable on three levels: discourse or semantics, lexico-grammar and phonology, and draw on analogy with the lower levels to support their arguments vis-a-vis the discourse level.

Like Halliday, Sinclair sees language as an essentially social phenomenon. Whereas this leads Halliday to a theory of register, it leads Sinclair to an emphasis upon the interactive and dialogic nature of linguistic communication. The 'I' and the 'You' of text production, i.e. the speaker/writer ('I') and the hearer/reader ('You'), are the essential motivators of its structure (compare my comment on the ignoring of this aspect by work on Tenor, Section 3.2.2). Conversation is two-party, and if more than two speakers are present (say, A, B and C), there are in fact three dialogues taking place, between A and B, B and C, A and C.

Sinclair's perception of the negotiative process of text production leads to a dual perspective on discourse. It is

> at one and the same time...a continuous negotiation between participants, and a developing record of experience.
>
> Sinclair, 1981, 71

Sinclair names these aspects, respectively, the interactive plane and the autonomous or interpretive plane. The autonomous plane is language as 'The stage-by-stage tally of the record of experience' (Sinclair, 1981, 72). Somewhat parodied, it may be described as 'a string of verbalised content

propositions, with appropriate logical connections' (Sinclair, 1981, 74). The interactive plane shows the interactants' awareness of their own and each others' roles as speakers, writers, hearers and readers, and of their role in the creation of a text. Explicit indication of the interactive plane would involve a performative speech act, such as

> I claim that I'm innocent.
>
> quoted in Sinclair, 1981, 76

In most texts, however, indications of the awareness of the gradual unfolding of the text are more implicit. Sinclair suggests two broad types of indication. The first is an active or passive reference to the interactants or to the activity making up the text. Examples noted by Sinclair include participant intervention (*We allow wide margins for error; It is interesting to note that...*), self-reference (*This book is...*), discourse labelling (*Heat is defined as...*) and cross-references. The second is a more-or-less binding commitment on the part of the writer to perform a particular discourse act subsequently. (This is analogous to the constraint of one speaker upon another in dialogue.) Sinclair calls absolute commitments *predictions* (following Tadros, 1985) and less binding ones *anticipations* (*prospections*, in Cooper's (1983) terms). Anticipations, which limit either the generality of the statement or the writer's commitment to it, are best seen, as Sinclair notes, as points where the writer allows for, rather than commits him/herself to, a subsequent discourse act (Sinclair, 1981, 74).

An important aspect of Sinclair's theory is that

> Every utterance.. is to be described on both planes, no matter how intractable the surface representation may appear.
>
> Sinclair, 1981, 75

Each 'utterance', then, participates in two modes of organisation. Organisation on the interactive plane is prospective, as indicated by the features of prediction and anticipation. The interactive plane tells the reader: This is where our discourse is, and this is where it goes next. It must be noted, however, that 'where our discourse is' may be observable only by reference to where it has been, and in this sense the interactive plane may make retrospective reference. Organisation on the autonomous plane is claimed to be entirely retrospective, as the autonomous plane is

> a gradual sharing of relevant experience by recalling previous words and phrases and reworking them in the new contexts provided by movement on the interactive plane.
>
> Sinclair, 1981, 72

The two planes of discourse are sometimes spoken of as if they were totally different entities, and indeed as though only the interactive plane were of interest to the linguist. As the above quotation makes clear, however, the two planes interact. This interaction is particularly noticeable in two phenomena. Firstly, there is the phenomenon of plane change, where the discourse itself, which has been constructed on the interactive plane, becomes part of the content of the discourse and is treated as an item on the autonomous plane. This happens in all report (Sinclair, 1981, 76) and when anaphoric, discourse-referential nouns are used (Francis, 1986, 35). Secondly, there is the all-important area of discourse structure. Sinclair appears to reserve the word 'structure' for the interactive plane. Cooper (interpreting Sinclair), for example, summarises the two planes thus:

> The interactive plane has to do with the pragmatics and *structure* of discourse, and the interpretive [autonomous] plane has to do with its semantics and *organisation*.
>
> Cooper, 1981, 403 (original emphasis)

Here *structure* is a rule-governed syntagm of elements, predictive in the sense that at any point it is possible to say what options are currently open to the writer. The *organisation* of a discourse, by contrast, is the decision by the writer to develop a topic in a particular way. Such decisions are made apparent by choices of lexical items and other features such as the choice of clause theme. The organisation is retrospective in that it categorises what has gone before rather than what is to follow, and in that it can be observed only at the conclusion of a discourse or unit of discourse. Sinclair makes it clear, however, that, although structure may exist on the interactive plane, a record of it is kept on the autonomous plane: 'the organisation and maintenance of text structure is the focus of the autonomous plane' (Sinclair, 1981, 72-3).

It is interesting to compare planes with metafunctions as devices to explicate discourse. At first glance it seems that the autonomous plane is to be identified with the ideational metafunction and the interactive plane with the interpersonal metafunction. Sinclair would then be criticised (from Halliday's standpoint) for stressing the interactive (concerned with constituent structure) over the autonomous, and for ignoring the textual metafunction altogether. A moment's reflection, however, reveals the internal inconsistency of this hypothetical criticism. It cannot be true both that Sinclair stresses the interactive/interpersonal at the expense of the autonomous/ideational and that he is concerned only with constituency (the ideational). It is in fact not the case that the autonomous plane and the ideational metafunction are the same, or that the interactive plane and the interpersonal metafunction are the same.

The relations between them are far more complex, because planes and metafunctions do not simply represent ways of dividing the text up

differently. Rather, the difference between the two theories lies in what is deemed important in the description of discourse. The metafunctions represent parameters of choice within three aspects of meaning. The planes represent primarily patterns of organisation, or how the meanings are organised.

The following observations may be made about metafunctions and planes prior to an attempt to systematise the relations between them.

a) Discourse organisation is associated with the textual metafunction and with the interactive plane. 'Interactive' is thus primarily associated with 'textual', rather than with 'interpersonal' as might be expected.

b) On the other hand, the textual function is responsible for grammatical and lexical cohesion (Halliday, 1982, 224), and for the reworking of 'new' material as 'given', which concerns are located on the autonomous plane.

c) The content of a text is associated with the ideational function and with the autonomous plane, implying a link between ideational and autonomous.

d) On the other hand, logical relations, associated with ideation, may be predictive i.e. interactive.

e) The participants in a discourse, who influence the interpersonal function, may be seen as affecting the discourse in two ways: in their attitude to the content (autonomous) and in their roles as speaker/writer and hearer/reader (interactive).

A preliminary representation of the relation between planes and metafunctions is attempted in Figure 3.5. The matrix representation captures the fact that there is no one-to-one correspondance between the categories of the two theories but that each divides experience along different parameters. How such a figure is devised, however, depends on the theoretical standpoint which is taken as prior. Figure 3.5 reflects a bias

towards a planes theory and therefore shows aspects of language which that theory holds to be distinct, such as content as a commodity to be exchanged and content as the interpretation of experience, as being unfairly treated as one by the metafunctions theory. Similarly, single aspects of language, such as its prospective organisation by speakers taking different roles, appear to be, equally unfairly, divided between the different metafunctions and therefore unavailable for consistent investigation. An alternative diagram devised from the point of view of metafunctions would show similar inconsistencies in the planes theory. Such diagrams can only be made at all, however, if both planes and metafunctions are treated at a fairly high level of abstraction. It is necessary, for example, to define the textual metafunction simply as being concerned with 'organisation' in order to calibrate it with the interactive and autonomous planes. If it is defined via the lexico-grammatical system it is held to determine - thematicity - then no equivalent can be found within the theory of planes. The explanation for this is then either that plane theory cannot account for the Theme-Rheme system or that this system should be accounted for as a whole on the discourse level, depending on one's theoretical bias.

FIGURE 3.5

Interactive	*Autonomous*	**Planes** **Metafunctions**
content as commodity	content as interpretation	*Ideational*
speaker role	social role	*Interpersonal*
prospective organisation	retrospective organisation	*Textual*

FIGURE 3.6

Non-Linguistic Organization	DISCOURSE	Grammar
course		
period	LESSON	
topic	TRANSACTION	
	EXCHANGE	
	MOVE	sentence
	ACT	clause
		group
		word
		morpheme

Sinclair and Coulthard, 1975, 24

3.4.2 Rank, Constituency and the Three-Part Exchange

The second area in which Sinclair's theory is at variance with Halliday's is in the area of discourse structure, and, particularly, the notion of well-formedness. The first stage of an investigation in this area must lie with Sinclair and Coulthard's pioneering work on the structure of spoken interaction (Sinclair and Coulthard, 1975). Three important features of this work are also a hallmark of Sinclair's work in written interaction, with which this thesis is more directly concerned. Firstly, like the lexico-grammar, discourse is structured on a rank scale. Whereas the ranks in grammar are sentence, clause, group, word, morpheme, those in the discourse are lesson/interaction, transaction, exchange, move, act (see Figure 3.6). On both levels, the relationship between the ranks is one of realisation. As a result, each unit of grammar and of discourse, other than those at the uppermost and lowermost rank in each case, is coded dually, once in terms of

its internal structure and once in terms of the structure of which it realises an element. A move, for example, may have the structure *pre-head*, *head*, *post-head*, each element being realised by an act, while the move itself will realise an element (I, R or F) of the exchange of which it is a part.

The notion of rank solves several problems in Discourse Analysis. One is the existence of segments of different scales, which were discussed in relation to GSP elements in Section 3.3.2 above. Some utterances undeniably organise the discourse on an immediate scale, such as when a question predicts an answer (Sacks et. al., 1974), but others, such as those which Sinclair and Coulthard call Framing moves, organise on a longer term. Some, such as the arrowed utterance in Example 3.1 below, do both.

Example 3.1

--> A: Hey Danny
B: Yeah
A: You know we bought Ben that helium balloon
B: Yeah

quoted in Francis and Hunston, 1987, 144

This summon predicts a response (*Yeah*), but it also shows that a new section of the conversation, dealing with the topic of the helium balloon, is starting.

Another potential problem solved by the notion of rank is that some parts of an utterance are less important than others in terms of the other speaker's next utterance, in other words, in terms of the development of the discourse. In Example 3.2, for instance, the arrowed utterance, while undeniably part of the conversation and needing to be coded, does not have the same effect on speaker A's contribution to the conversation as the question *Did you wake up late today* does. The structural notion of rank

scale enables the arrowed utterance to be labelled a pre-head, accurately assigning its relative importance.

Example 3.2

--> B:	Why	pre-head	
	Did you wake up late today	head	eliciting
A:	Yeah pretty late	head	informing
B:	Oh dear	head	acknowledging

quoted in Francis and Hunston, 1987, 143

In addition, as in Example 3.2, the dual labelling attendant upon rank scale can show both the function and the position of an utterance. The meaning of an utterance within a discourse depends on both of these.

Finally, a rank scale is essential to the notion of predictiveness in structure which is the second important feature of Sinclair and Coulthard's work. Sinclair and Coulthard assert that discourse has structure in the same sense that the lexico-grammar has, and that a description of that structure must fulfill four criteria:

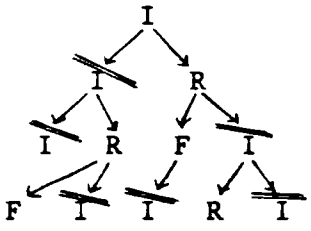
> A. The descriptive apparatus should be finite, or else one is not saying anything at all, and may be merely creating the illusion of classification....
> B. The symbols or terms in the descriptive apparatus should be precisely relatable to their exponents in the data, or else it is not clear what one is saying. If we call some phenomenon a 'noun', or a 'repair strategy' or a 'retreat', we must establish exactly what constitutes the class with that label....
> C. The whole of the data should be describable; the descriptive system should be comprehensive....
> D. There must be at least one impossible combination of symbols. This is the basic notion of linguistic structure, although here couched as a prohibition. A, B, and C above could be general standards for linear string analysis, but this one is linguistic....
>
> Sinclair and Coulthard, 1975, 15-17

The last criterion holds the key to Sinclair's concept of the term *structure*. If there is an impossible combination of elements, there must be

rules for well-formed structures and ill-formed ones. Because of this, at any point in the language sequence (clause or text), it is possible to predict what the interactants will do next, in the sense of knowing what options are open to them. Basically, these options are two: the expected next element in the sequence, or the opening of a new sequence. Within the exchange, for example, the expected sequence is IRF. Following I, then, the next speaker has the option of producing an expected R or of leaving the exchange unfinished and opening a new one with another I. The ever expanding, but rule-governed, set of possibilities is represented in Figure 3.7. (This discussion ignores the optional element R/I proposed by Coulthard and Brazil (1981). Introducing that element would complicate Figure 3.7 but would not invalidate it.) The incorporation into the figure of the possibility that a given conversation will not follow the IRF pattern is an important acknowledgment of the fact that real-life conversation, though 'messy', is still rule-governed. As Tsui puts it:

> While it is true that a speaker cannot put absolute constraint on what the next speaker is going to say, it does not follow that there is no structural relation between utterances.
>
> Tsui, 1988, 4

FIGURE 3.7



etc.

= new exchange

This kind of prediction operates at all ranks, and as the structure of each is different, it is essential to know how many ranks there are. An alternative notion of text as an endlessly repeating hierarchy, as a pattern repeating itself on a larger and larger scale, as Butt, for example, suggests (Butt, 1988a), will not lead to predictions in the same way, as it will not be possible to describe the structural position of a given unit within each distinctive rank pattern.

The third important feature of Sinclair and Coulthard's work is the notion of the three-part exchange as the basic unit of conversation, as opposed to the adjacency pair which up until that time had been largely accepted as the 'basic unit of conversational interaction' (Tsui, 1988, 2). In the teacher-initiated elicit exchanges which form a large part of Sinclair and Coulthard's data, the F element is obligatory and evaluates the fit between the teacher's elicitation and the student's response (Sinclair and Coulthard, 1975, 51). How far the F element is obligatory in other registers is open to debate. Berry, for example, argues that where the elicitor is the Secondary Knower, the F element of the exchange is optional and non-evaluative (Berry, 1981). Tsui, however, makes out a convincing case for the position that the absence of F can always be accounted for (Tsui, 1988).

The debate suggests that whereas F may not be obligatory in the same sense that R is, it is part of the abstract 'template' of the normal exchange. The question remains as to the nature of the F element. Tsui argues that it is not necessarily evaluative, whereas Sinclair seems to imply that it is.

The difference lies in the use of the term *evaluative*. Tsui apparently uses the term to mean 'an assessment of right or wrong', as when a teacher assesses a student's response to a question. Clearly, such evaluation is not particularly common: it is only one of the options open to the teacher and one that is rarely open to anyone else. Sinclair, however, uses the term to mean a recognition, however expressed, of the satisfactory exchange of information, a tacit agreement that that part of the conversation is complete. In this sense, the F element evaluates the satisfactory mutual achievement of dialogue rather than the acceptability of one utterance.

In another paper (Sinclair, 1986), Sinclair restates this in terms of the interactants using the F element of the exchange continually to evaluate the correspondance between fact and averral, that is, between the world and the speaker's assertion about the world. Their consensus that this correspondance has, at least temporarily, been achieved is signalled by the fact of the conclusion of the exchange.

Written discourse is also essentially interactive, in that the same consensus must also be reached between writer and reader if the discourse is to continue. To achieve this, the writer and reader must negotiate meaning in some way analogous to the speakers' manipulation of exchange structure. The consensus may be made open, but if it is not, a default condition operates: providing no challenge is made, the consensus is assumed to exist. However, as written discourse is monologue there is no opportunity for the consensus to be negotiated,

> and so the responsibility is with the author to ensure that the default condition can be operated safely.
>
> Sinclair, 1986, 47

Sinclair's view is that evaluation, which he describes as 'not yet clear enough for a restrictive definition to be reliably formulated' (Sinclair, 1981, 2), is a direct consequence of the interactive nature of discourse:

> of the difference between people which must be expressed or implied verbally, so that they can share their experiences and not just their information.
>
> Sinclair, 1981, 2

If it were possible to have a text totally isolated from any communicative context, a text which was completely autonomous, in the sense of not relating to the non-linguistic world, that text would have in it nothing which could be called evaluation.

Perhaps the most controversial hypothesis proposed by Sinclair is that written discourse shares the three-part structure of the exchange. In Sinclair (1987) he analyses a newspaper science report into a hierarchy of five layers, each consisting of one or more three-part units. The units in each layer have the internal structure PRD. Sinclair explains the symbols thus:

> P stands for posit, whether proposing, imposing, opposing, or just positing.
> R stands for react - reacting to a posit.
> D stands for determine - determining the previous posit-react pair.
>
> Sinclair, 1987, 6

I would gloss *determine* as something close to *evaluation*, bearing in mind that it is the progression of the discourse that is being evaluated rather than, necessarily, the truth or desirability of the information in either the Posit or the React.

Evidence for the analysis of a text into PRD, at various layers in the hierarchy, comes from two sources. One is what Sinclair terms a change in *posture*, that is, 'changes in orientation of different aspects' (Sinclair, 1987, 13). The main changes in posture in the text analysed by Sinclair (1987) are verb tense and attribution. Morgan (1987) suggests that different types of text will make use of different posture changes. In a narrative, the important changes are tense change and a movement to the 'emphatic use of the authorial voice' (Morgan, 1987, 77). In expository text, changes of mood and adversative statements are important. Bolivar (1985) suggests that mood is a primary indicator of posture change in newspaper editorials.

Sinclair makes it clear, however, that changes in posture alone are not sufficient to reveal the PRD structure of the text. In other words, the structure of each unit is not always clearly signalled. Instead, in order to identify the PRD structure, an assumption must be made that such a structure exists, that any given text is likely to be interpretable in terms of this hierarchy of three-part units. Sinclair summarises the relation between these two sources thus:

> The comparison of one sentence with the next yields evidence of changes in orientation of different aspects....This evidence is partial and often inconclusive. Alongside it we place the predictive power of a hierarchical PRD model, and thus put syntagmatic and paradigmatic evidence together. In many cases a change in posture is then interpreted as a signal of a boundary between P and R, R and D, or D and a new P.
>
> Sinclair, 1987, 13

Ultimately, then, there can be little in the way of conclusive proof of the PRD hypothesis. The more texts that are analysed using this system, however, and the more intuitively reasonable and enlightening such analyses appear, the greater support accrues to it. In Chapter 7 of this thesis, I

shall discuss how far analysis of my data in terms of units supports the PRD hypothesis.

It is again interesting to compare Sinclair's view of structure with that of Halliday and Hasan. As discussed in Section 3.3.2 above, according to Halliday and Hasan, structure, or structure potential, belongs to text and genre, not discourse. Hasan's description of what a GSP does fulfils Sinclair and Coulthard's four criteria for structural description. In particular, the information about where elements must and can occur fulfils the criterion of ensuring an impossible combination of elements. Apart from GSP, discourse has choice, with each text having a structure, or rather a set of structures, seen only in retrospect, that is, observed only when the whole text is available for examination.

In contrast, Sinclair asserts that discourse has a structure, that is, a ranked syntagm of possibilities, and that the discourse derives meaning from that structure, because part of an element's meaning is its position in the structure. The actual structure of a text means which of the obligatory and optional elements are actually realised, but absence of an element can be as meaningful as its presence because of the existence of the abstract structure.

The two approaches are not wholely incompatible. Consider, for example, Hasan's critique of dialogue as a discourse 'type', on the grounds that it does not provide an 'outline' or schematic structure (Hasan, forthcoming, 3-10). Some idea of the critique is given by the following:

> It seems to me that the limitations of speech-act-oriented analysis of dialogue in providing an outline could be overcome only if it can meet one condition: namely, that a more delicate analysis of acts, moves, sequences and exchanges etc. should be made, yielding determinate classes of each in such a way that it becomes possible to claim that the instantiation of such and such a class of acts etc. will always be unambiguously associated with some specific, identifiable stage in the development of all dialogues. I suggest that this condition will not be met, just as it is highly improbable that we would be able to formulate rules whereby specific types of sentence-structure could be shown to be unambiguously associated with specific identifiable stages/parts of all monologues.
>
> Hasan, forthcoming, 7

The implication of this is that conversational structure simply accounts for the turn-taking mechanism. That is, it can account for exchange boundaries but not for the more crucial issue of how exchanges follow on from each other or what meaning sequences are encoded by conversation. For example, it can explain how the utterances of, say a vendor and customer, are structurally related to each other, but not how the service encounter develops from Greeting to Sale to Finis. Hasan's approach only appears incompatible with Sinclair's, however, if one contrasts assertions such as 'We cannot specify any ordering of transactions into lessons' (Sinclair and Coulthard, 1975, 59) with work on the GSP of certain classroom genres (e.g. Christie, 1984; 1985; 1987). A genre such as the radio phone-in programmes discussed in Section 3.3.2 follows a regular pattern of transactions, and a structural description taking the interaction as its top-most unit would look very like a rank-scaled GSP (cf Harris, 1988).

To a large extent, the argument over structure really concerns the distinction between a common pattern, where the reader expects certain things to happen, from experience, but where the possibility of something different is always present, and rule-governed order, where deviance from the expected order must be explicable or will constitute an ill-formed, less

acceptable discourse. Halliday would, I think, argue that only the former kind of patterning exists, and that what appears to be the latter is only a strong form of this. Sinclair, on the other hand, would argue that only the latter type of organisation is the true object of description by linguists, whose aim is (or should be) to find rules, not patterns.

Hoey (forthcoming) proposes a way out of this impasse by suggesting two types of organisation at the discourse level, one rule-governed and based on the exchange structure of dialogue (*interaction*), and one which is patterned, largely through lexis, certain patterns being expected by experienced language-users (*text*). The structure of the dialogic exchange can be said to influence even monologic text, in a manner analogous to the ways textual choices influence the clause, leading to some aspects of the text pattern being rule-governed.

3.5 Discourse Theory and the Study of Evaluation

Having compared two theories of discourse structure, and the part played by evaluation in them, I shall now consider an example of evaluative writing in a research article (Example 3.3) in the light of each theory.

Example 3.3

[1]We interpret the dichroism changes as implying an increase of the tilt of the nucleosome diameters relative to the fiber axis, from about 30^{0} in the presence of Mg^{2+} at low salt to about 38^{0} in the compact cross-linked form. [2]Much larger angular alterations of the linker DNA would be required to produce the observed dichroism increase upon compaction. [3]Taken together, the results argue strongly for angular placement of nucleosomes relative to the fiber axis. ONC 4.1-3

Although this passage in written in a typically 'objective' scientific style, it is nonetheless heavily evaluative. The evaluation is part of the

persuasive aim of the article. The reader is presented with two Knowledge Claims: that the nucleosome diameters change their position relative to the fiber axis upon cross-linking (S1) and that the nucleosomes are placed at an angle to the fiber axis (S3). The Knowledge Claims are both moderated and supported. This moderation and support are the constituents of the evaluation in the passage. Moderation of the Knowledge Claims is achieved by the use of the lexical items *interpret*, *imply* and *argue*, which qualify the certainty of the claims. The claims are supported, on the other hand, by the evidence given in S2 that the writers' interpretation is the most reasonable and by the lexical item *strongly* in S3. Furthermore, it may be argued that there is an order to the evaluation, in the sense that S3 represents a culmination of the significance of the results and therefore provides a definitive statement of their import.

How might the two theories of discourse examined in this chapter account for the observed evaluation? Taking first Martin's description of Tenor under the headings of affect, status and contact (Martin, 1986, 244), the following points may be raised. With respect to affect: there is little in the way of attitudinal language, *strongly* being the only instance; the affect is orientated towards veracity rather than emotion, that is, the reader is to be persuaded that something is true rather than that it is good or bad. With respect to status: the passage makes no pronominal or other reference to the reader, and the relationship between writer and reader is therefore asymmetrical; on the other hand, the very fact that persuasion rather than teaching is going on suggests that the writer is addressing peers, who must be involved in evaluating the text although the lexico-grammar itself tends to disguise this fact. With respect to contact: the lexis is highly technical and therefore assumes an esoteric readership, that

is, it includes the specialist reader and excludes the non-specialist. The problem with such an analysis is that, whereas it provides a basis for contrast with texts of other registers, features such as little attitudinal lexis and low reader rapport tend to suggest a characterisation of this text as unevaluative. In other words, Martin is simply restating in systemic terms the normal assessments of research articles as objectively written. Little of the observed evaluation in this passage is made available for study by the discussion of Tenor.

As an alternative, Sinclair's notion of a three-part text structure may be considered, each sentence of the passage corresponding to one of the proposed elements. S3 certainly fits the hypothesis of a third element which marks a discourse boundary and which is evaluative in the sense that it marks a temporary agreement of the correspondance of fact and averral by reader and writer. The discourse boundary role of S3 explains the sense of culmination and finality mentioned above, and S3 takes as given the factual nature of the 'results' given in S1-2. The ordering of the evaluation, then, may be explained with reference to structure on the interactive plane. The other evaluation observed, however, must be assigned to the autonomous plane. The essential unity of the evaluation in this passage is ignored.

It seems, then, that evaluation is a phenomenon which resists the kinds of categorisation that Halliday's and Sinclair's theories of discourse require to be made. Whilst both theories can partially account for the observed evaluation, neither does so entirely satisfactorily. Moreover, because both theories deal, quite properly, with a finite set of categories: affect, status and contact in the one case and interactive and autonomous in the other, the evaluation which is left unaccounted for is also rendered invisible and unavailable for analysis. For this reason, in this thesis I

shall presuppose the veracity of neither theory but shall attempt to categorise my observations concerning evaluation in their own terms before reconsidering their relation to the theories discussed.

Returning to my initial commentary on Example 3.3, then, I shall re-cast it in these terms:

(a) Each piece of information which is made available to the reader may be described as belonging to a classification which describes the level of certainty attached to it. The classifications may be nominalised in order to refer anaphorically both to the information and to the writers' assessment of it (e.g. *result*, *implication*, *interpretation*).

(b) The passage simultaneously evaluates much of the information in terms of its 'goodness', that is, in terms of its value to the scientific community. Even though attitudinal lexis is not used, therefore, it is clear that the experimental results and their implications are being evaluated positively.

(c) S3 of the Example has a further, metadiscoursal role in assigning significance to what has gone before and thereby of marking a boundary in the discourse.

In each sentence of Example 3.3, one of these evaluation types assumes a particular importance. That is, S1 presents a Knowledge Claim of a particular certainty classification, S2 asserts its value to the scientific community and S3 asserts the significance of the whole passage. I shall refer to these three functions of evaluation as Status, Value and Relevance respectively. In the next three chapters, the identification and significance of the three functions will be discussed. In Chapter 7 I shall return to the notion of text structure, while Chapter 8 will re-examine some of the issues raised in this chapter in the light of the work undertaken in Chapters 4-7.

CHAPTER 4

Evaluation of Status

4.1 Introduction

The purpose of this chapter is to examine the first function of evaluation mentioned in Section 3.5 above: evaluation of *status*. This may be briefly defined as the placing of an item in the first part of a *thing-evaluation* pair within an evaluative category. The chapter begins with a discussion of Halliday's notion of interpersonal metaphor and the realisations of evaluation of certainty in experimental research articles (Section 4.2). I shall then propose categories of status (Section 4.3) and discuss the relevance of these categories to prediction in text (Section 4.4). Section 4.5 presents analyses of two research articles and considers some implications of the analyses. Following that, I shall reconsider the whole notion of status in relation to another phenomenon to which it bears resemblance: Francis' notion of anaphoric nouns (Section 4.6). The chapter ends with a short conclusion (Section 4.7).

The certain/uncertain parameter of evaluation represents both an interaction between the reader and writer and also a recognition by the writer of institutional categories of good and bad. Halliday (1985a, 332) describes the modality system, expressing certainty, as realising the interpersonal function of the text. That is, choices in modality are motivated by perceptions of the I-You relationship in the text. In addition, it is the goal of every writer of such an article to make as certain and as general a statement as possible (see Chapter 2). As a result, certainty may

be allied with 'good', whilst uncertainty or lack of knowledge is a 'problem', that is, 'bad'.

As an illustration of the concept of status, consider a pair of sentences which demonstrate the Situation-Evaluation relation identified as central by Hoey (1983, 20) and Winter (1982, 9):

Example 4.1

The dichroism, p, is plotted vs 1/E, and the lines represent our estimates of the best linear extrapolation to obtain the intercept, p_a.
Other functional forms of the extrapolation will be considered below and will be shown to have negligible effect on our estimates of p_a. HOSC 8.2-3

In this example the intercept p_a is characterised as an extrapolation. Such a characterisation has important consequences for the reader. Firstly, it gives the information that the writers are less than completely certain that p_a is accurate. Furthermore, this lack of certainty clearly evaluates p_a, even before its further evaluation in the second sentence. By giving p_a the status of an extrapolation, the writers have already evaluated it as less certain, and therefore less good, than a measurement, but more certain, and therefore better, than a mere guess. Secondly, it instructs the reader how, or by what criteria, the intercept p_a may be verified, that is, not by checking measurements but by considering the reasonableness of continuing graph lines beyond what may be measured. Thirdly, it informs the reader how the intercept p_a may subsequently be evaluated by the writers themselves. Here the extrapolation of Sentence 1 is evaluated positively in Sentence 2 on the grounds that it is not dependent on a particular method of calculation, and may therefore be considered 'reasonable'. This particular evaluation is possible only because the entity being evaluated is an extrapolation, as opposed to, say, a measurement or a hypothesis. In other words, the status of p_a as an extrapolation constrains the writers to

evaluate it in a particular way. This example illustrates the concept of evaluation of status. Whenever there is a pair consisting of *thing + evaluation* the 'thing', be it a person, object, action, event, argument, idea, utterance, book or anything else, must be placed within a category, which category will then determine the nature of the evaluation which may follow.

The same idea may be expressed using Sinclair's notion of *initial statement + response*. In Example 4.1 above, then, S1 is a statement to which S2 is a response. The nature of the response is determined by the status of the information in S1. In this case, S2 is a response to an extrapolation. The status of a statement, therefore, is that to which a response may be made. I propose that within a single text there will be a finite set of status categories, and that the same set will be found also in other texts of the same type, register or genre. My claim for experimental research articles is that the certainty parameter of evaluation is crucial in defining the set of status categories employed.

4.2 Certainty and Scientific Writing

In every declarative finite clause, an expression of the writer's level of certainty of the truth of the ideational meaning of the clause is obligatory. This means that there is a 'default' condition (Sinclair, 1987, 10): in the absence of any indication to the contrary, assume the highest level of certainty.

Certainty may be expressed through choices in the lexico-grammar other than within the modality sytem. Halliday terms these alternative

realisations *grammatical metaphor* (in this case, *interpersonal metaphor*) (Halliday, 1985a, 332) and argues that, because their metaphorical nature tends to disguise some of their meaning, they are motivated by the ideology of the register in which they are used. I shall illustrate this concept with the examples given below (Examples 4.2 to 4.4), although it should be mentioned that in applying the term *interpersonal metaphor* to these examples I am extending the term beyond Halliday's usage.

Example 4.2

Since the calculations are much more sensitive to particle length than to particle diameter, Figure 3D implies that...the average solenoid helical pitch is unlikely to vary by more than one nucleosome away from 6 nucleosomes per 11nm. HOSC 20.4

Example 4.3

In contrast, Crothers and coworkers (refs) claim actually to reach p_a at field strengths similar to ours. HOSC 15.2

Example 4.4

This can be modeled as a repeating array of spacer DNA sections alternating with "chromatosomes". HOSC 1.2

In terms of the apparent interaction between 'I' and 'you', all these sentences represent maximum certainty (assuming the *can* in Example 4.4 expresses potentiality rather than probability). This is in keeping with the ideology of objectivity which informs scientific writing. In fact, however, the modality is simply hidden by the metaphors used. This may be most clearly illustrated by Example 4.2. The phrase *Figure 3D implies that* is in keeping with the scientific ideal of results speaking for themselves. The fact that *Figure 3D* is the Subject of the clause means that, in grammatical terms, the Figure is what is to be held by the reader to be 'responsible for' the truth of the information in the clause (Halliday, 1985a, 76). The phrase must be, in Halliday's terms, 'unpacked' before it can be seen that

what is involved here is an interpretation by the writers of the graphic configuration which comprises Figure 3D (cf Pinch, 1985). A more congruent representation of Example 4.2 might therefore be:

Example 4.2a

Since the calculations are much more sensitive to particle length than to particle diameter, we interpret figure 3D as implying that the average solenoid helical pitch is unlikely to vary by more than one nucleosome away from 6 nucleosomes per 11nm.

This version, not surprisingly, makes more sense of the initial 'since...' clause. The tentativeness of the statement is still, however, hidden within the lexical items *interpret* and *imply* which may be glossed as containing a 'certainly' and a 'probably' element respectively. A foregrounding of these elements would give:

Example 4.2b

Since the calculations are much more sensitive to particle length than to particle diameter, we think that it is probable that Figure 3D means that the average solenoid helical pitch is unlikely to vary by more than one nucleosome away from 6 nucleosomes per 11nm.

In Example 4.3 the need for unpacking arises from the fact that two modalities - between Crothers et.al. and their readers and between the 'We' of this text and its readers - are lexicalised in the single verb *claim*. This will be discussed in more detail in Section 4.4.3 below. For the moment, a more congruent version may be given as follows:

Example 4.3a

[It is unlikely that] + [BUT] [Crothers et.al. say it is certain that] + they reach p_a at field strengths similar to ours.

The lexical item *model* in Example 4.4 provides an example of an institutional, as opposed to a personal, assessment of certainty. I would gloss the example as

Example 4.4a

A reasonably certain picture of this is of a repeating array of spacer DNA sections alternating with "chromatosomes".

It is true that because the level of certainty here seems to be institutional rather than personal, the example is outside Halliday's definition of modality, which operates only between the 'I' and the 'you' of the text. On the other hand there seems to be in Example 4.4 a deliberate lack of distinction, again relevant to the authority ideology of science, between the possible paraphrases b) and c) below:

Example 4.4b

It is probable that this is like a repeating array of spacer DNA sections alternating with "chromatosomes".

Example 4.4c

The common view is that it is probable that this is like a repeating array of spacer DNA sections alternating with "chromatosomes".

where Example 4.4b would encode writer certainty of the proposition, while Example 4.4c would not. I suggest that such ambiguity is, like Example 4.2, a way of metaphorising modality and thereby 'hiding' the interpersonal meaning. I would propose Example 4.4b as the more congruent version.

When the idea of interpersonal metaphor is taken to this extent, it represents a blurring of the distinction between the interpersonal and the ideational. In other words, interpersonal meanings are being realised through grammatical systems normally said to realise ideational meaning. This suggests that the interpersonal may have a more significant role in determining choices made in the lexico-grammar than is normally allowed for.

4.3 Categories of Certainty

4.3.1 Parameters of Difference

I propose that the status of any piece of information given in an experimental research article is not to be expressed as a single category, but rather as the intersection of three different scales or parameters. These are: the activity of the writers, such as *narration of events* compared with *interpretation of results*; the source of the information, such as *another research article* compared with an *experimental inscription*; and the modification of certainty by modality and by similar expressions.

The first parameter is the activity being undertaken by the writers. The activities identified are as follows:

assert status; state (non-experimental) fact; narrate event; narrate procedure; state result; interpret; hypothesise; assume; describe figure; state formula; describe equation; state aim; state question; focus; postulate; assess; recommend .

The activities may be roughly grouped according to whether or not they constitute a Knowledge Claim, that is, whether or not the writer is claiming some degree of truth to be attached to the proposition. The activities which are not Knowledge Claims may further be divided into those whose purpose is primarily to organise and explicate the discourse and those which create alternate worlds upon which the discourse may act. The groupings are as follows:

Knowledge Claim: **assert status; state (non-experimental) fact; narrate event; narrate procedure; state result; interpret; hypothesise; assess.**

Non-Knowledge Claim: Discourse Related **describe figure; state formula; describe equation; state question; focus.**

Non-Knowledge Claim: World Creating **assume; postulate; recommend; state aim.**

Further sub-divisions may be identified in some categories. For example, the category **interpret** needs two further categorisations. First, a distinction must be made according to what is interpreted: the writer's own results described in the current text, another writer's results, or facts not marked as results. Secondly, there are, as Pinch (1985) notes (see Chapter 2 for details), varying degrees of interpretation. Although these in fact form a cline rather than a discrete set of categories, an attempt can be made to identify three distinct degrees of interpretation: **mean** (what the data mean), **support** (what theory the data support) and **significance** (a further stage of interpretation and correlation of facts).

Activity may be identified through selection of lexical items, tense and modality. Narration of an event, for example, is achieved through a material process in the verb or nominalised noun phrase, past tense and absence of modal modification. Describing a counter-factual or hypothetical case would use the modals *could*, *would*, *should*, while an interpretation of results might use verbs such as *interpret* or *imply*, or might use non-definite lexical items associated with comparison (*same*, *different*) or support (*is consistent with*). I shall now give a description of how each category is identified, together with an example of each, taken where possible from the texts analysed in Section 4.5.

Activity: *Assert Status*
Identification: clause in the pattern identified-identifier, where identifier is assessment of status.

Example 4.5
The detailed structure of the 30-nm chromatin fiber...remains unknown. ONC 1.1

Activity: *State Non-experimental Fact*
Identification: no reference to experimental data; non-past tense.

Example 4.6
The 30-nm fiber results from further coiling or folding of the 10-nm fiber... ONC 1.5

Activity: *Narrate Event*
Identification: material process verb or relational verb with nominalised material process; past tense or historic present.

Example 4.7
Calf thymus chromatin fragments were prepared and cross-linked as described earlier (refs). ONC 5.1

Activity: *Narrate Procedure*
Identification: material process verb; non-past tense with non-past meaning.

Example 4.8
The reduced dichroism is usually measured over a range of electric field strengths (E) and extrapolated to infinite field. HOSC 6.3

Activity: *State Result*
Identification: reference to data; no signal of interpretation.

Example 4.9
Accompanying this compaction is a change of the dichroism from -0.09 to +0.05, the latter measured after cross-linking. ONC 3.4

Activity: *Interpret*
Sub-type: *mean*
Identification: reference to data; projecting verb e.g. *show*, *mean* or similar.

Example 4.10
Our results show that chromatin samples in Mg^{2+}-containing low-salt buffer and in 100 mM salt cross-linking buffer differ by about 25% in sedimentation coefficient... ONC 17.1

Sub-type: *support*
Identification: reference to data; lexical items *(in)consistent with, (not) support*

Example 4.11
This result is consistent with compaction of the fiber... ONC 18.4

Sub-type: *significance*
Identification: reference to data; any one of: modal *must*; comparator such as *same*, *different*; evaluative item such as *problem*; indication of personal assessment such as *We believe that, give us confidence that, It is clear/certain that.*

Example 4.12
Once correction is made...the orientation vs. field curves are very similar for cross-linked and un-cross-linked samples. ONC 17.2

Activity: *Hypothesise*
Identification: lexical items *hypothesise*, *propose* etc.

Example 4.13
It has been proposed that in the 10nm fiber observed at low salt concentration, the nucleosomal disks are arranged with their diameters nearly parallel to the fiber axis. ONC 1.3

Activity: *Assume*
Identification: lexical items *assume*, *assumption*, *expect (=assume)*, *believe (=assume)*, *ignore (=assume)*, *presumably;* construction on the pattern *let x=2*

Example 4.14
The linear dichroism of oriented 30-nm chromatin fibers is expected to be a sensitive function of the orientation of nucleosomal disks relative to the fiber axis. ONC 2.1

Activity: *Describe figure*
Identification: reference to figure in current text; copula verb e.g. *represents* (not interpretative/projecting verb e.g. *show that*, *imply that* etc.)

Example 4.15
Figure 6 shows two possibilities, differing in the postulation of either a mononucleosome or dinucleosome repeat in a solenoid superhelix (ref). ONC 28.3

Activity: *State formula*
Identification: equation.

Example 4.16
$-P_{linker} = -3/4\ (3\cos^2 B_{linker} - 1)$ ONC 24.4

Activity: *Describe equation*
Identification: reference to equation in current text; copula verb e.g. *represents* (not interpretative/projecting verb e.g. *show that*, *imply that* etc.)

Example 4.17
y is the angle between the fiber axis and the local superhelix axis of the nucleosomal DNA. ONC 26.2

Activity: *State Aim*
Identification: reference to aim, purpose etc; discourse or writer self-reference.

Example 4.18
One of our objectives upon initiating this study was to compare the dichroism properties of calf thymus and avian erythrocyte chromatin, both with cross-linking and without cross-linking. ONC 10.1

Activity: *State Question*
Identification: cataphoric reference to discourse act; discourse self-reference; lexical item *question* or equivalent

Example 4.19
Measurement of the dichroism of low-salt chromatin samples in the presence of Mg^{2+} raises the question of the relationship of the fiber compaction under these conditions to its state under a more nearly physiological concentration of monovalent ions. ONC 12.1

Activity: *Focus*
Identification: cataphoric reference to discourse act.

Example 4.20
An instructive example is provided by the dichroism of chromatin in low-salt conditions, without added Mg^{2+}. ONC 22.3

Activity: *Postulate*
Identification: statement of hypothetical or limiting case; hypothetical modal *would*; *if* + past tense.

Example 4.21
First, we consider the case in which the entire dichroism change...is ascribed to change in the angular orientation of the linker DNA... ONC 24.3

Example 4.22
Since the linker DNA constitutes only 32/200 of the total DNA, its dichroism would have to change by (200/32) x 0.14=0.88 to account for the observed dichroism increase of 0.14. ONC 24.5

Activity: *Assess*
Identification: copula verb, not result, non-identifying attribute e.g. *difficult*.

Example 4.23
This range of values is likely to be an underestimate. OCM 13.5

Activity: *Recommend*
Identification: modal verbs *ought*, *should*, lexical item *require*, *need* etc.

Example 4.24
More detailed electron microscope studies will be required ... OCM 14.7

The categories mentioned above differ in their orientation towards the 'world of nature' (Bazerman's term). For example, an *assumption* takes something which may or may not be true and simply treats it as though it were the case, an *interpretation* deduces from available data that which is unavailable, a *recommendation* makes a statement about a future or ideal world. The activities concerned with making statements about, respectively, events, results, procedures and facts, however, differ only in terms of what I shall call generality. Two types of generality may be distinguished, forming a matrix (Figure 4.1). Along the occurrence axis, time-specific and time-general distinguish between items which are 'true for a specific time' and those which are 'generally true'. That is, to verify a time-specific occurrence, one would have to refer to a specific time (and place), whereas that is not the case for time-general occurrences. Thus it is possible to distinguish between the events of a single experiment and the standard procedure adopted whenever the experiment is carried out. (It must be noted, of course, that a 'single experiment' is one designated by the text writers as such. The term does not imply that the experiment was in fact performed only once.) The importance of such a distinction is clear in the case of a result and a fact. Both are outside the probability scale and demonstrate the highest degree of writer commitment, but a result is a one-off occurrence and may be unrepeatable, whereas the fact has been determined many times: it is 'received' by the scientific community. As a scientific statement, then, the fact is 'more certain' than the result, but this certainty reflects generalisability rather than probability. In consequence, a result may be later evaluated for validity (repeatability) but a fact may not be. In turn, event and result are differentiated by how far over time they extend. Put simply, an event ceases to exist once the experiment is completed, whereas the result remains for all time. It is significant that

whereas past tense must be used for events, results may be expressed either in past (*We found that*) or non-past (*We find that*). The difference is not one of generalisability here so much as the extent to which the proposition is significant. Similarly, whereas a procedure is simply an oft-repeated event, a fact has a significance which extends beyond the simply repetition of results.

FIGURE 4.1

Occurrence / Extension	Time-specific	Time general
occurrence-specific	event	procedure
occurrence general	result	fact

The second parameter which defines status is the source of the information. This area of distinction is important because status, while indicating primarily the writers' attitude to a proposition, indicates also the writers' perception of institutional attitudes to the information. What the acknowledged source of the information is may therefore modify its status. Four primary sources are identifiable in the texts under discussion: **received knowledge**; **experimental data records** (for a discussion of this interesting instance of intertextuality, see Latour and Woolgar, 1979, 45-53); **citations** (reports of other writers' work, including the current writers in another paper); and the **writers' own argument**, which is subdivided into **writers' statements** (the unmarked or default source) and those derived from the **text**.

The recognition of the sources is as follows.

Received Knowledge is an AB-event, in Labov and Fanshel's terms (Labov and Fanshel, 1977, 100), which may be identified explicitly by a term such as *generally*, *common* or by reference to a model or theory which is not acknowledged as a citation. It is the unmarked source where the information is not part of the writers' own experimental work. Often, however, the unmarked form of received knowledge is indistinguishable on formal grounds from writer as source (see below).

If the source is a **citation**, there is a reference to a specific paper or unnamed researcher.

Data as source is indicated by a reference to experimental data. When the writer activity is interpretation, it may be difficult to distinguish between the data as source and the writer as source (see below).

The **text** as source is marked by *hence*, *therefore*, *thus*, *since*, *because* and *given*.

The **writer** is the unmarked source when the information being given is part of the writers' experimental work. In addition there may be reference to the writers, either pronominally (*we*) or implicitly through a process of which they are the agent or senser (*extrapolate, infer*).

There are two possibilities of ambiguity in the assignment of source. The first arises from the deliberate obscuring of the researcher's operations upon data in order to interpret them (cf the discussion of ideology and grammatical metaphor, Section 4.2 above). Because of this, it can frequently be unclear whether the data or the writers' own argument is the source of a particular piece of information. In Example 4.25 below, the

results are marked as the source of the interpretation, but in Example 4.26, the word *presumably* indicates an operation on the part of the writer.

Example 4.25

The results of those studies left some unresolved discrepancies... ONC 2.3

Example 4.26

Presumably this contrast reflects the replacement of histone H1 in thymus chromatin by H5 in erythrocytes. ONC 10.5

The second case arises when it is not clear whether a piece of information has its source in the writers' current work, or whether it is received knowledge. In Example 4.27, for instance, it is assumed that the source of the first clause is received knowledge, since it is not perceived to arise from the content of the rest of the article, whilst the source of the second clause is interpreted as writer, as this is an integral part of the claims the writers are making.

Example 4.27

The nature of this folding is not yet achieved structurally: the angular orientation of nucleosomal disks relative to the fiber axis allows length changes that accompany small angular changes in disk orientation. ONC 30.1-2

The third parameter of difference in status is the modification of certainty using modal verbs (e.g. *may*, *must*, *could*), modal constructions such as *It is possible/clear/plausible that*, *We believe that*, *gives us confidence that*, *probably*, *possibly*, modal copulas (*appear*, *seem*) and lexical items in projecting verbs (*demonstrate*, *suggest*, *claim*, *mean*, *imply*). Some examples of whether and how the different activity types may be modified are given below.

Activity: Narrate Event

In many registers, it is reasonable to express uncertainty about past events. This is not so, however, in experimental research articles. The stages in the experiment are presented without modification for certainty.

Activity: State Result

Results may be modified lexically, by the choice of, for example, *measure* as opposed to *extrapolate* or *estimate* (see the discussion of Example 4.1 above). These accounts of how the results were obtained indicate the degree of certainty as to their accuracy. It is interesting, also, that it is not possible, for ethical reasons, for a writer to cast doubt upon the results obtained by other writers. What may be challenged is either the interpretation of the result, the repeatability of the result (cf Halliday's *usuality* scale) or the advisability of the means used to obtain the result. (See Chapter 5 for further discussion of this point.)

Activity: Assume

Because an assumption is the creation of a fact rather than the reporting of one, it is not open to modification of certainty.

Activity: Interpret

Interpretation is the activity which lends itself most clearly to modifications of certainty. The modification may be through the use of modal verbs, through modal-like constructions (Example 4.28) or through lexical items, particularly report verbs. In Example 4.29, for instance, the verb *imply* is a modfication of certainty.

Example 4.28

Hence, it is plausible that their results are in error because of neglect of this factor. ONC 21.3

Example 4.29

We interpret the dichroism changes as implying an increase of the tilt of the nucleosomal diameters relative to the fiber axis... ONC 4.1

Activity: Hypothesise

A hypothesis may be made stronger through the use of a lexical item such as *propose*, or weaker through the use of a lexical item such as *suggest* or even *speculate*.

Activity: Recommend

Recommendations may be modified by adverbials: *certainly*, *strongly*, *probably* and by the replacement of the modal *ought* with the stronger *must*.

It should be noted also that clauses of one status may affect the status of other clauses which follow. Example 4.30 below, for instance, has the effect of modifying the following four paragraphs, reducing the certainty of all the clauses.

Example 4.30

We take here two limiting views of the problem to illustrate the possibilities. ONC 24.2

4.3.2 The Certainty Scale

The three parameters of status interact with each other, so that a categorisation on any one parameter may be modified by categorisations on the other two. Before examining this phenomenon in detail, I shall first consider how the examples discussed in Section 4.3.1 might fit into the scales of modality and modulation proposed by Halliday (1985a). This will allow us to systematise the relations between the categories.

As surveyed in Chapter 3, Halliday discusses the modality system of grammar in terms of **type**, **orientation** and **value**. Taking **type** first, it is apparent that within experimental research articles, the 'indicative' types (modalization) are far more common than either the 'imperative' types (modulation) or the 'potential' type. In the activity types discussed above, only 'Recommend' is relevant to modulation (obligation).

The 'indicative' types of modality are probability and usuality. In experimental research articles, these are closely allied, as the more frequently a result has been found, the more certainly it can be taken as a general rule. Furthermore, writers of scientific research articles tend to translate frequency into certainty: a 'usually-occurring result' becomes a 'typical result'.

Within the grammar of the language, then, Halliday distinguishes five types of modality (probability, usuality, obligation, inclination and potentiality), each of which has its own systems of orientation and of value or degree. Certainty categories in experimental research articles, however, make full use of only one of those systems of types, the probability one.

It does not appear that orientation is a distinguishing feature in differentiating certainty categories in this register, but **value**, or degree of certainty, certainly is. Halliday's categories of high, median and low do not account for all the status distinctions, however, because status refers not only to the degree of certainty but also to the degree of writer commitment to the truth of a particular proposition. Propositions of different polarity are therefore not necessarily equivalent in status, although they may be equivalent in **value**, or strength. Whereas the sentences

That possibly is John.

and

That possibly is not John

mean approximately the same, the sentences

That probably is John.

That probably is not John.

are by no means equivalent in terms of how the statement may be responded to, although the degree of certainty is the same. The various possibilities may be represented as a vee-shaped plotting on a graph (Figure 4.2) with two axes: *probability value* and *degree of commitment to the truth of the proposition*. The certainty categories may also be shown in the form of a network (Figure 4.3). It has been observed (Fawcett, remarks made at the 14th. International Systemics Workshop, Sydney, 1987) that network nodes represent questions. I shall here discuss the choices represented by the network by articulating the question which motivates each node. The question numbers refer to the numbers on the network in Figure 4.3.

FIGURE 4.2

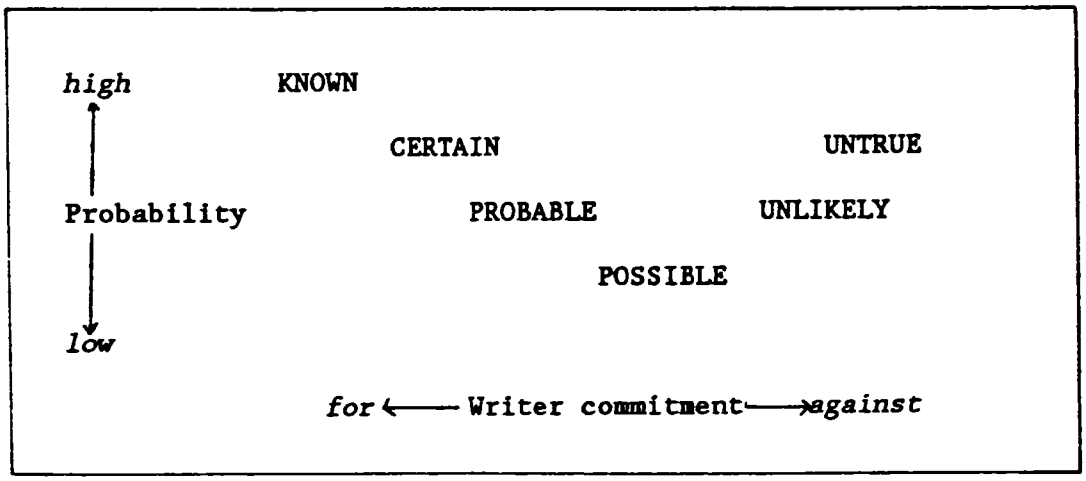
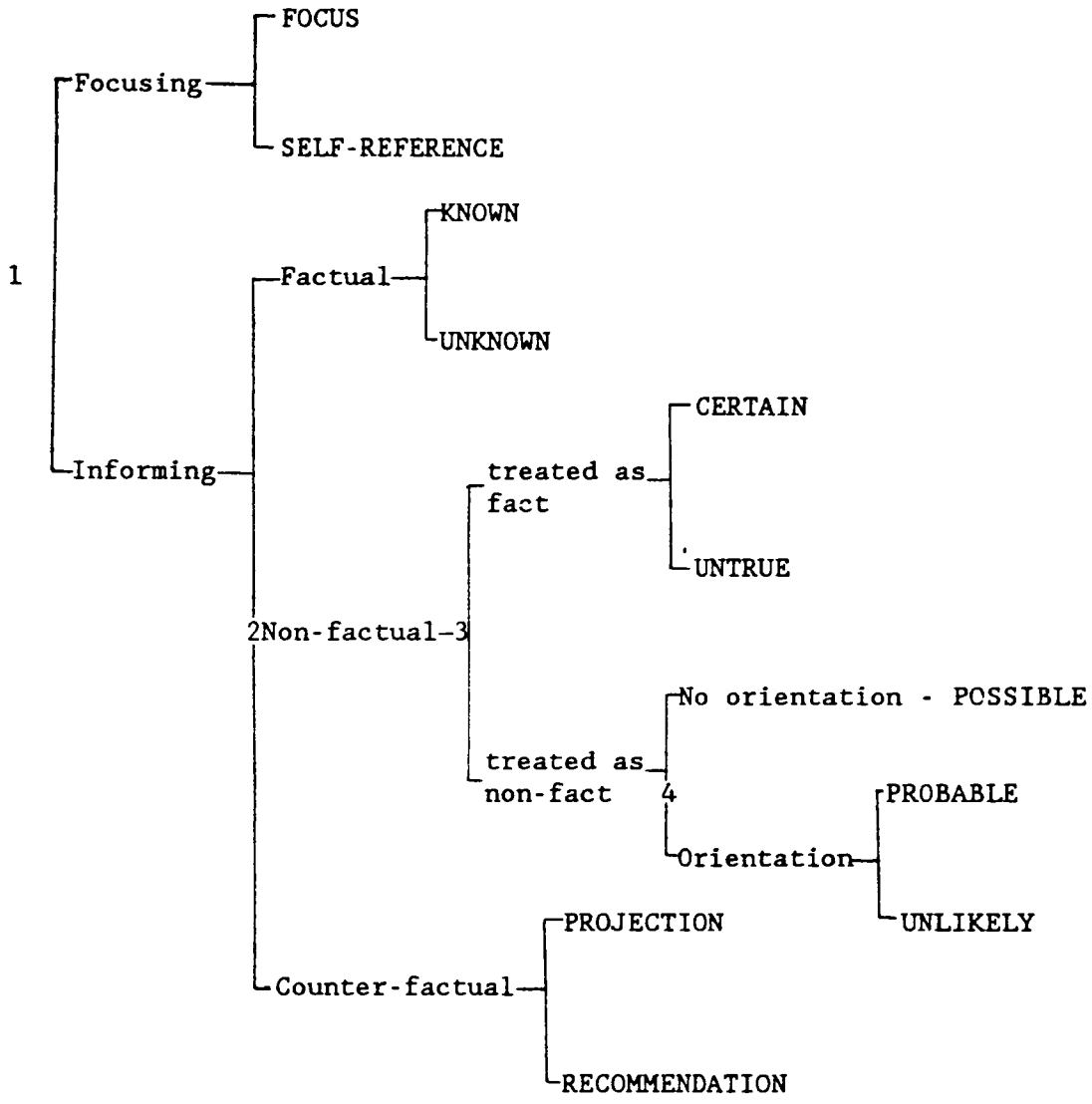


FIGURE 4.3



1. Question: Is writer accuracy relevant?

For a small minority of sentences in experimental research articles, any evaluation of the writers' accuracy is irrelevant, and it is therefore unnecessary to label the degree of certainty expressed in those sentences. Two types of sentences may be included in this category: those which describe the content of part of the text, often a figure (SELF-REFERENCE),

and those which describe an aim or question posed by the research (FOCUS). These two types may be summarised as focusing, while all other categories are subsumed under informing. In informing sentences, it is relevant and possible for the reader to make an assessment of the writers' accuracy.

2. Question: Is the statement modified by any expression of modality, including that expressed by interpersonal metaphor?
Sentences which fall outside the modality range proposed by Halliday are given a factual status. Although it is relevant for the reader to assess their accuracy, the writers may not further modify their status, and for the reader to challenge the accuracy of the statement would involve an imputation of a lie. Information which is factual may be given the status of KNOWN or UNKNOWN. Information which is modified as being more or less certain is non-factual, and the degree of certainty is open to further modification by the current or subsequent writers. A third possibility is that the information may be counter-factual. That is, it may refer to a non-present world, either a future world, in a RECOMMENDATION, or a hypothetical one, in a PROJECTION.

3. Question: Is the information treated as fact or as non-fact?
Although all non-factual information is open to modification of status, some of it is treated as definitely CERTAIN or, the negative counterpart, UNTRUE, in the sense that it is simply asserted by the writers in a way that makes further modification in the current text implausible. At the same time, it is possible for a subsequent writer to disagree with the accuracy of the information without raising the imputation of a lie. Information which is treated as non-fact, on the other hand, is open to discussion and modification in the current text.

4. Question: Is the writer constrained as to the ultimate evaluation of the item?

Where information is treated as non-fact, the writer may remain neutral as to whether the status will eventually be modified 'upwards' or 'downwards'. In that case, the certainty category is POSSIBLE. Alternatively, there may be clearly positive orientation, in which case the writer is constrained subsequently to upgrade the status, or a clearly negative orientation, in which case subsequent downgrading of the status is expected. The certainty category in these instances is PROBABLE and UNLIKELY respectively.

Examples of each certainty category will now be cited.

KNOWN: See Examples 4.7; 4.9; 4.6 above.

UNKNOWN: See Example 4.5 above.

CERTAIN: See Examples 4.10; 4.11; 4.12 above.

POSSIBLE: See Examples 4.13 above and 4.31 below.

PROBABLE: See Example 4.29 above.

UNLIKELY: See Example 4.3 above.

Example 4.31

[McGhee et.al.] concluded that the nucleosomal disk diameters in the 10-nm fiber are roughly parallel to the fiber axis. ONC 22.4b

It is now possible to use the terminology presented in Figure 4.3 to express the relationship between the different parameters that go to make up status. Even within the parameter of writer activity type, there is an ordering of those types along a scale of certainty. For example, *narrating results*, *interpreting results* and *hypothesizing*, in that order, carry a decreasing amount of certainty. The highest level of certainty for a result is KNOWN. In other words, the result is treated as a fact. For an interpretation, however, the highest level of certainty is CERTAIN. That is,

factuality cannot be attained. A hypothesis is in theory only POSSIBLE, but in practise the writers' own hypothesis, where it is evaluated, is normally upgraded in certainty, so that it is in fact a PROBABLE.

The activities are further modified by modality and by source of information. Any item, for example, may be placed within the POSSIBLE or PROBABLE categories by modality. A statement which is a consequence of the writers' own argument, or an interpretation of the writers' experimental data, for example, may be said to be a Knowledge Claim, but whether this will be CERTAIN or PROBABLE depends on the degree of modification by modal verbs and other items, such as the report verbs *show* and *imply*. Compare, for instance, Examples 4.11 and 4.12 (CERTAIN) with Example 4.29 (PROBABLE), repeated here for convenience.

Example 4.11

This result is consistent with compaction of the fiber... ONC 18.4

Example 4.12

Once correction is made...the orientation vs. field curves are very similar for cross-linked and un-cross-linked samples. ONC 17.2

Example 4.29

We interpret the dichroism changes as implying an increase of the tilt of the nucleosomal diameters relative to the fiber axis... ONC 4.1

Turning to the source of information, it is noticeable that in general any piece of information derived from the work of other writers is lower down the certainty scale than that derived from the current writers' own work, whilst information which is received knowledge is in general higher up the scale than equivalent information from other sources. So, for instance, a writer's own assumption is CERTAIN, but a reported assumption is UNLIKELY. The explanation for this is that the only reason for a current writer to

mention the assumptions of a previous writer is in order to challenge them. To take another example, a model may be CERTAIN, if the source is received knowledge, PROBABLE or POSSIBLE, if the source is the writers' own argument, or POSSIBLE, if the source is other writers' work. Where information comes from a source other than the current writers, the certainty category into which it is to be placed may depend on the activity predicated (a received knowledge fact, such as Example 4.6, is KNOWN but a received knowledge model, such as Example 4.4, is only CERTAIN) or by lexical choices such as the choice of *show*, *conclude* and *claim* when the source is other writers (see Examples 4.32; 4.33; 4.3 (repeated here), where the certainty categories are KNOWN, POSSIBLE and UNLIKELY respectively).

Example 4.32

Renz et. al. (ref) have shown that H1 displays a preference for binding to chromatin that is long enough to form higher-order structures such as would be found in the solenoid model (refs). RHS 40.2

Example 4.33

Mainly on the basis of these latter observations, Lilley and Tatchell (ref) concluded that removal of the core histone tails leads to a release of DNA from the confines of the core particle. PCHT 43.5

Example 4.3

In contrast, Crothers and coworkers (refs) claim actually to reach p_a at field strengths similar to ours. HOSC 15.2

4.4 Status and Prediction

4.4.1 The Nature of Prediction

It has been claimed that the writers' choice of status category constrains or predicts what may come later in the discourse. It is necessary at this stage, therefore, to discuss what is meant by prediction and to ask

in what sense status is predictive. Basically, prediction is the ability of discourse participants (readers or speakers) to guess accurately what is coming next in the discourse. It is one of the key terms in Sinclair's discussion of the interactive plane (Sinclair, 1981, 74). The term *prediction* itself is often reserved for those cases where the 'guess' can be made with absolute certainty of success (assuming, of course, a non-defective text) (Tadros, 1985, 6) while *prospection* may be used to decribe less certain predictions (Cooper, 1983). I shall not distinguish between prediction and prospection here, but shall use *prediction* to cover both and shall identify two distinct ways in which discourse items are referred to, within the Sinclair approach to discourse, as being predictive. I shall label these for convenience *structural prediction* and *marked prediction.*

Structural prediction is the ability of one discourse item to predict another based on the position of the first item within a pattern or structure. Whether such predictions arise out of the structure of discourse itself, or whether they occur because of the familiarity of the discourse participants with culturally-constrained registers and genres is a matter of potential conflict between some of the writers discussed in Chapter 3. The difference is not important here. In a formal classroom, for example, a teacher elicitation predicts firstly an informational response by a student and then an evaluation by the teacher (Sinclair and Coulthard, 1975). To take another example, a problem, as identified by Hoey (1983) predicts a response, and a subsequent evaluation. Finally, in the Generic Struture Potential proposed for a service encounter by Hasan (Halliday and Hasan, 1985), a Sales Request predicts a Sales Compliance.

Marked prediction refers to the option open to the producers of monologue to express a sentence or utterance in such a way as to guide the

reader/hearer towards certain expectations. These expectations may be so strong and universally-held as to commit the writer/speaker to a particular discourse act (Tadros, 1985, 6) or they may simply constitute strong hypotheses as to what will happen next. Marked prediction, like structural prediction in monologue, reduces the number of discourse acts the reader/hearer need be ready to decode. It increases the redundancy in the text and so facilitates the decoding process (cf Smith, 1971, 18-19).

From the writer/speaker's point of view, marked prediction acts as a constraint, in that having produced the first member of a prediction pair, the writers are more or less constrained to produce the second member. It is worth remembering, however, in passing, that the constraint is not external to the writers but is instigated by them. In the actual process of writing, for example, very few writers would produce the sentence *There are three reasons why this happens* and then find themselves unexpectedly constrained to produce three reasons. It is more likely that the writers either plan or actually write the three reasons and only then insert the focusing sentence. In fact, it may be more profitable to think of the writers leaving certain options open rather than of the text enforcing constraints. If, for example, a proposition is presented as a <u>hypothesis</u> rather than as a <u>fact</u>, the writers then have the option of presenting evidence contrary to the hypothesis, something which is not available following a fact. Similarly, a statement containing a hedge or restriction may be partially contradicted later. This contradiction may be said to be predicted or constrained by the hedged statement, but it is also true to say that the use of a hedge has allowed the writers to produce a contradictory statement without inconsistency. What may be a narrowing down of possibilities for the reader may constitute an opening-up for the writers.

The writers' control over the production of the whole monologue is in contrast to a dialogue, where two speakers co-operate to produce a text. That co-operation is by no means guaranteed, however, as attempts to constrain the next speaker, by structural or marked prediction, may not be successful. A structural unit begun by one speaker may be challenged instead of continued by the second (Burton, 1980, 142; Sinclair, 1987, 5), and commitment to future discourse acts can only be made for oneself, not for an interlocutor.

In written monologue, then, the writers themselves set up predictions or constraints precisely because in fulfilling them they will arrive at the point they wish to make. Moreover, the writers have the time to apply prescriptive standards to the text and the motivation to achieve clarity and 'good writing', in which the use of prediction may play a part. In dialogue, on the other hand, attempts to constrain the next speaker may be only partially successful, and failure need not necessarily constitute a poor interaction. An experimental research article is both a written monologue and a move in a dialogue (cf Hoey, 1988, 71). For this reason, the present discussion of the predictiveness of status categories must address both intra-textual and inter-textual issues.

4.4.2 Intra-textual Prediction

The choice of an item of a particular status is predictive in an experimental research article in two ways. Firstly, different writer activities allow subsequent evaluations of different types (see Chapter 5 for a further discussion of this point). Secondly, the place of a statement on the certainty scale decides whether it may subsequently be evaluated as

true or false, and whether that evaluation is more likely to be positive or negative. Here I shall concentrate on this second aspect.

Considering the certainty scale, then, an item which is either KNOWN or UNKNOWN, being at the extreme end of the probability scale, cannot have that status made more or less probable (although it may be made more general). From observation of the texts it appears that an item which is in the category POSSIBLE may be 'moved' up or down the probability scale, whereas a PROBABLE may be moved only upwards, and an UNLIKELY may be moved only downwards. CERTAINTIES and UNTRUTHS appear to behave like KNOWNS, but it is assumed that, unlike KNOWNS, they are open to modification in subsequent texts. A network representing these possibilities is shown in Figure 4.4.

As in marked prediction, then, how a proposition is phrased, that is, what degree of probability it is assigned, both constrains what the writers may do subsequently and allows the writers to make points they wish to make. What is different, however, is that a choice of status category does not commit the writer to an evaluation, but rather lays down what may occur in the evaluation should one be made. Whether or not this subsequent evaluation is made depends not on the choice of status category but on the place of the item in the structure of the research article. Structure will be discussed more fully in Chapter 7, but two examples will illustrate the point here. Firstly, a hypothesis (POSSIBLE) occurring in the Introduction as the question motivating the article will certainly be evaluated in the Discussion section, whereas a proposal made in that Discussion section as a stimulus to further research may well not be evaluated. Secondly, sentences which themselves evaluate preceeding items are unlikely to be subsequently

evaluated themselves, whatever their status. It is their position at the end of a unit which precludes the further evaluation, not their status.

FIGURE 4.4

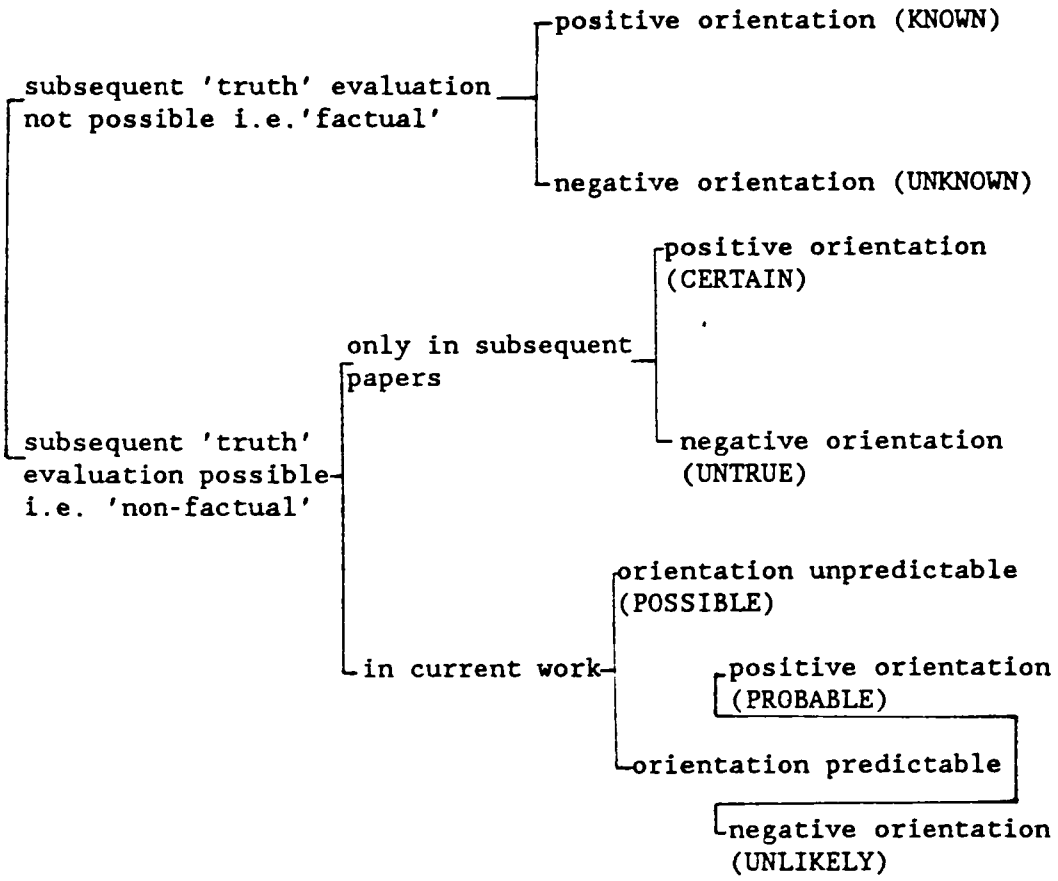


FIGURE 4.5

Wr. A / Wr. B	Relative Certainty	Relative Uncertainty
KNOWN	*show*	
POSSIBLE	*say*	*suggest*
UNLIKELY	*claim*	

4.4.3 Intertextuality

An experimental research article may be seen as one move in a dialogue. The analogy between a research article which refers to a previous one and a move in a face-to-face interaction should not be taken too far, as research articles do not form adjacency pairs or exchanges. The point of the analogy is, however, that similar limitations on the absoluteness of constraints exist in both cases. Just as in a dialogue, the utterance of the first pair part of an adjacency pair may constrain the other speaker to produce the second pair part, while leaving him or her free to ignore or to exploit the constraint, so the choice of status may be interpreted as an attempt by the writers of one article to constrain how the same information may be referred to in any subsequent article. As in a dialogue, however, such constraint cannot be absolute but may be flouted or exploited by the writers of the second article.

When one article, or a part of an article, responds to a previous article, reference to the first article must be made through the mechanism of reporting. The key distinctions between reponses to the status of previous information are therefore to be found in the report verbs. Report verbs, I would argue, give two pieces of information regarding writer certainty. They indicate the current writers' attitude to the proposition and also the reported writers' attitude. In terms of status, then, it is arguable that not only is the proposition placed into a current category, but there is also an indication as to its original category. Only broad category differentiations may be made here, i.e., for writer A (the original writers), the report verbs distinguish between relative certainty on the part of the writers (KNOWN, CERTAIN, PROBABLE) and relative uncertainty (POSSIBLE), while for writer B (the current writers), the report verbs

distinguish between KNOWN, POSSIBLE and UNLIKELY. The matrix of possibilities, with example verbs in each cell, is given in Figure 4.5.

In choosing the report verb *show*, for example, Writer B is saying 'Writer A is sure of this and so am I', whereas in choosing *claim*, Writer B implies 'Writer A is sure of this but s/he is probably wrong'. Note that two of the cells under Writer A, 'relative uncertainty', are empty. This means that I cannot find a verb that implies 'Writer A is unsure of the proposition but I know it is true/false'. The implications of this for Writer A are obvious. If Writer A gives a clause the status of POSSIBLE, that status must be adopted also by Writer B. If Writer A makes a stronger statement, that is, expresses himself as relatively more certain, the category used may be upgraded by Writer B, but the risk is that it may also be downgraded.

There are implications here also for the ethics of scientific reporting. Although Figure 4.5 implies that Writer A KNOWNS, like PROBABLES, may be placed into the UNLIKELY category, in practice it is a very serious matter for a writer to evaluate as unlikely to be true a proposition which a previous writer has evaluated as KNOWN. In particular, a result reported by one writer may not be deemed by another writer not to have occurred, without very serious consequences. This gives the reported result a very priviledged status, as it may not be deemed not to have occurred. In my sample texts there is one example which apparently breaks this rule because a negative report verb, *claim* is used to report previous writers' results (see Example 4.34), but in fact the result is then criticised for its lack of generalisability rather than the probability of its occurrence. The serious implication remains, however, that an error has been made.

Example 4.34

[1]Due to the typical saturation properties of polyelectrolyte dipole moments (ref), we only reach 85% of p_a at the highest field strengths available to us. [2]In contrast, Crothers and coworkers (refs) claim actually to reach p_a at field strengths similar to ours. [3]Additionally, they report that solenoids orient with a classical induced (non-saturating) dipole moment, unlike polyelectrolytes of similar lengths. [4]We note that this saturation of the dichroism reported by Crothers and coworkers is obtained only after correcting for a large field-induced absorbance decrease, which is assumed to be isotropic. [5]As will be discussed in detail below, we do not observe this pulse-associated absorbance change. HOSC 15.1-5

4.5 Analysing a Text for Status

4.5.1 Selecting the Unit of Analysis

As evaluation of status involves the intersection of three parameters, it follows that the labelling of such status evaluation must have three components, indicating (a) the writer activity involved, (b) the source of the information and (c) the level of modification of certainty. Such a three-term labelling is clumsy, but it has the advantages of avoiding giving undue priority to any one of the three parameters and of including all relevant information. What has not yet been made clear is what units in the text should be assigned to these categories. There seem to be two significant possibilities: to assign status to propositions, which means in effect to clauses and nominalisations, or to assign status to clauses or sentences. The first alternative is based on a semantic unit, primarily the process, however it is realised, whilst the second is based on a grammatical unit centred around the verb. Because modality, the most congruent realisation of certainty assessment, is essentially associated with the verb phrase, the clause (both finite and non-finite, but not rank-shifted) is the

unit selected for analysis. The identified activity of the writer, therefore, hinges around the verb phrase.

What a clause analysis omits is the status assigned to nominalised processes. In Example 4.15, repeated here, for instance, the activity in both clauses is *description of figure*, but this analysis omits the assignment of the status of *postulation* to the entities *mononucleosome repeat* and *dinucleosome repeat*.

Example 4.15

Figure 6 shows two possibilities, differing in the postulation of either a mononucleosome or dinucleosome repeat in a solenoidal superhelix (ref). ONC 28.3

Attempting to analyse semantic units as opposed to grammatical ones introduces yet another possibility of subjectivity, however, and, it may be argued, leads to the amassing of too much information to be useful in the analysis. Consider Example 4.35 as an illustration of this.

Example 4.35

Thus, on balance, while the significant disagreement over the calculated rise per nucleosome of cross-linked and un-cross-linked fibers leaves some residual grounds for disquiet, the small change in directly measured sedimentation behavior upon cross-linking supports the view that cross-linking produces at most only modest (10-15%) further compaction beyond that induced by increased salt concentration. ONC 20.8

This sentence consists of three clauses centred around the verbs *leaves*; *supports*; *produces* and status labels assigned to these clauses will take into account the arrangement of information by the writers to give a reasonable 'status picture' of the sentence as a whole. An analysis based on each proposition would in addition have to deal somehow with the following nominalisations: *disagreement*; *calculated rise*; *change*; *directly measured sedimentation behavior*; *modest further compaction*; *increased salt*

concentration. A list of such status labels on its own would be of little value, as it would obscure the writers' assignment of emphasis. It would be difficult in such a case, for example, to see that Example 4.35 is essentially an interpretation of results and that the more certain status assignments of *calculated* and *measured* are subsidiary to this.

In my analyses the following information is given for each clause: the writer activity; the source of the information; a citation of lexical items or modals which modify the certainty of the clause; and an assessment of the certainty category to which the clause belongs. This is true of all clauses except projecting clauses such as:

Tjerneld suggests that...
McGhee found that...
The results argue for...
Saturation of the signal means that...
We assume that...

modal constructions such as:

This gives us confidence that...
It is possible/clear/certain that...

and those which act like them, such as:

We interpret ...as...
The value was estimated to be...

The function of these clauses is to assess the status of the following clause: they act simply as carriers of interpersonal metaphor. Also assigned to this category are clauses which introduce, and assess the certainty of, equations and formulae, such as:

The dichroism is EQUATION.
The dichroism is approximated by EQUATION.

In all these examples it is superfluous to assign status labels to the clauses cited, and this is not done. Instead, the clauses are shown bracketed with the clauses whose status they indicate.

An additional value to noting lexical modifications of certainty is that the status of non-clausal items may be noted. In Example 4.1 above, for instance, the activity of the second clause is *describe figure*, but the modification column would note the status of *extrapolation*.

4.5.2 Dual Status and Status Change

The discussion of status so far has implicit affinities with Speech Act theory. In particular, a change in status may be effected by changing an averral (*We aver that...*) to a report (*We aver that they aver that..*) (cf Sinclair, 1986). To carry the affinities further, certain problems of Speech Act theory may be considered as analogous to problems of status. In the following examples, the arrowed utterances may be said to represent two speech acts:

a) -->*I request that you close the door.*

b) *I want to help you...*
-->*...and that's a promise.*

In a) the two speech acts are (i) a request (to close the door) and (ii) an averral (I aver that I request you to do something). In other words, the very act of making a speech act (request) explicit necessitates performing another speech act (averral). In b) the second utterance, referring anaphorically to the first one, simultaneously (i) redefines the first utterance as a promise and (ii) performs an averral. Problems arise if

the analytical process demands assigning a single Speech Act label to each utterance.

Problems analogous to (a) and (b) above arise in the assignment of status. Similar to (a) are Examples 4.5, repeated here, and 4.36 below.

Example 4.5

The detailed structure of the 30-nm chromatin fiber...remains unknown. ONC 1.1

Example 4.36

The reduced dichroism is usually measured over a range of electric field strengths and extrapolated to infinite fields. HOSC 6.3

In each of these examples, the writer expresses complete certainty, and yet the certainty of the statement as a whole is less salient (arguably) than the assignment of status to part only of the clause. In Example 4.5, the status of the initial NP (as UNKNOWN) is made explicit in much the same way as

a) *I request that you close the door.*

makes explicit the illocutionary force of 'close the door'. Just as the most obvious, or default, interpretation of (a) is as a request, so the most obvious certainty label for Example 4.5 will be UNKNOWN, applied to *the detailed structure of the chromatin fiber.*

Example 4.36 illustrates a rather different phenomenon. The two co-ordinated clauses obviously have a factual status, as statements describing frequently repeated processes. Those processes do, however, create entities which have different statuses: a measurement as opposed to an extrapolation. The terms measurement and extrapolation are ambiguous between non-evaluative descriptions of a process and certainty evaluations of the products of that process. In the two sentences immediately following Example 4.36, the

extrapolation as a process is evaluated and the extrapolation product, *the extrapolated intercept* p_a, is referred to. The extrapolation p_a is subsequently further evaluated in the passage quoted as Example 4.37 below. If Example 4.36 is assigned a status label which only reflects the status of the process, the status of p_a is lost, and the subsequent change in the status of p_a cannot be traced. Using the Modification column to record items such as extrapolation is a way of dealing with this.

Problems similar to that of the Speech Act example b) above are illustrated in Examples 4.37 and 4.38.

Example 4.37

The dichroism, p, is plotted vs 1/E, and the lines represent our estimates of the best linear extrapolation to obtain the intercept, p_a....Indeed this slight and easily explained discrepancy gives us confidence that p_a is a significant description of filament structure. HOSC 8.2 & 10.3

Example 4.38

It has been proposed that in the 10nm fiber observed at low salt concentration, the nucleosomal disks are arranged with their diameters nearly parallel to the fiber axis.
However, this conclusion is not supported by the flow dichroism studies of Tjerneld and Norden (ref). ONC 1.3-4

In each of these examples, the status of (one of the clauses in) the first sentence is modified in the second. In Example 4.37 the extrapolation is up-graded to what might be termed a significant description; in Example 4.38 the proposal is down-graded to an unsupported proposal. However, in each case the second sentence has, in turn, a status of its own. As a status analysis is intended to include both a label of each clause and a tracing of status development, it may not be entirely satisfactory either to label the second sentence in each example with its own status label only or to label the second sentence 'up-grade' or 'down-grade' only. The first of these options seems to be the lesser of the two evils, however, and will be

adopted here, with movement and development of evaluation being left to the discussion of evaluation of Value in Chapter 5.

4.5.3 The Analyses

Two analyses are presented in Figures 4.6 and 4.7. One text is analysed in its entirety. This is *Orientation of Nucleosomes in the 30-Nanometer Chromatin Fiber* (ONC), the authors being Yabuki, Dattagupta and Crothers (see Figure 4.6 at the end of this chapter). For purposes of comparison, the Discussion section of a second text is also analysed. This text is *Organization of Chromosomes in Mitotic HeLa Cells* (OCM), the author being Adolph (see Figure 4.7, also at the end of this chapter). Some of the data from these two figures are further analysed in Figures 4.8 and 4.9.

These papers comprise an interesting example of intertextuality. Neither of the papers refers to the other, but both are referred to by another article - HOSC (McGhee et.al. 1983). Adolph (OCM) is referred to briefly but approvingly as one of the observers of the 30 nm chromatin fiber whose findings have become part of basic background information regarding chromatin (HOSC 2.2). Yabuki et. al. (ONC) are referred to disapprovingly as supporters of a conflicting model of chromatin structure (HOSC 15.2). From this evidence, it appears that Adolph's paper (OCM) belongs to an earlier point in the development of the sub-discipline, in which the seeable is being observed and described, whilst Yabuki's (ONC) belongs to a later phase of building models of the unseeable. Whilst acknowledging that all observation is, of course, theory driven, we may nonetheless usefully describe this as a movement from an observation phase to a theoretical phase

(cf Bazerman, 1984, 184, see discussion in Chapter 2 and Section 4.5.4 below).

4.5.4 What the Analyses Show

Figure 4.8a shows the total number of clauses, excluding projecting clauses, in each section (Introduction, Method, Results and Discussion) of the text ONC, as analysed in Figure 4.6. Figure 4.8b shows the number of clauses in each section which present the activities *interpret*, *state result*, *state fact* and *narrate event*. These are shown also as percentages of the non-projecting clauses in each section. In the Introduction section, for example, eight clauses present the activity *interpret*, and these eight represent 27% of the total of thirty non-projecting clauses in the section.

FIGURE 4.8a Non-projecting Clauses in ONC

Introduction	30
Method	17
Results	49
Discussion	128
TOTAL	224

FIGURE 4.8b Sections and Activities in ONC (Percentages of non-projecting clauses)

	Interpretation	Result	Fact	Event	Total %
I	8 (27%)	8 (27%)	4 (13%)	5 (17%)	84%
M				17 (100%)	100%
R	21 (43%)	15 (31%)	2 (4%)	4 (8%)	86%
D	42 (33%)	11 (9%)	17 (13%)	14 (11%)	66%
Total	71	34	23	40	

FIGURE 4.9a Discussion Section in OCM and ONC

	Interpretation	Result	Fact	Event	Total%
ONC	42 (33%)	11 (9%)	17 (13%)	14 (11%)	66%
OCM	11 (32%)	4 (12%)	3 (9%)	6 (18%)	71%

FIGURE 4.9b Sources in Discussion Section in OCM and ONC

	ONC	OCM
received knowledge	19 (15%)	2 (6%)
data	14 (11%)	15 (44%)
citation	26 (20%)	0 (0%)
text	20 (16%)	1 (3%)
writer	49 (38%)	16 (47%)
Total	128	34

These four activities account for 75% of the total number of non-projecting clauses in the text as a whole. They account for a much larger

percentage in the Introduction and Results section: 84% and 86% respectively. The Discussion section clearly includes many more clauses of different types, but on the whole the four activities mentioned are those of greatest importance to the research article. Of these, interpret is the most frequently found.

Figure 4.8b indicates certain differences between the sections. The Introduction has an equal number of *interprets* and *results*, and an almost equal smaller number of *facts* and *events*. The Method section consists entirely of *narrating events*. The Results section relies most heavily upon *interpretation*, less so upon *results* and hardly at all upon *facts*. The Discussion section is predominantly a section of *interpretation* and includes surprisingly few *results*.

A comparison between the analyses of the Discussion sections of the two texts shows an interesting uniformity and some revealing differences. Figure 4.9a shows that the distribution of activities in the non-projecting clauses of the Discussion section of OCM is practically identical to that of the Discussion section of ONC. The percentage of clauses accounted for by the four activities is also very similar: 66% in ONC and 71% in OCM. Figure 4.9b shows, however, that almost all the clauses in the OCM Discussion (91%) have the writer or the data as the source of information, whereas in the ONC Discussion, those two sources account for only half (49%) of the clauses, the rest having citations (20%), received knowledge (15%) or the text (16%) as source. This indicates that the argument in the ONC Discussion brings together information from outside the researchers' own experimentation as well as within it and that the argument makes use of explicit logic. The OCM Discussion is far more closely tied to the results of the particular experiment being reported. As mentioned above, it is interesting that OCM is

an earlier paper in a fast-moving field and, in a sense, represents an earlier stage in the discipline than the ONC paper. In keeping with Bazerman's (1984) observations that disciplines tend to develop out of mere reporting of results to an integration of theory and observation, it is therefore not surprising that the sources in ONC are so much more varied than those in OCM.

Returning to the main analysis of ONC (Figure 4.6), this may be used to establish phases of the type proposed by Gregory (1985) and by Halliday (1988b). In other words, a section of the text may be deemed to form a unit because the clauses in it share a feature or set of features which distinguishes them from the surrounding text. The following are examples of phases which may be proposed using Figure 4.6 as a base but using various different identification criteria.

If the degree of homogeneity and heterogeneity are taken into account, the Materials and Methods section may be singled out as unified in its homogeneity, as all the clauses share the same status type. The Discussion section, on the other hand, is peculiar in its extreme heterogeneity. This may be seen also from Figure 4.8 discussed above.

The source of information may be used to distinguish the Results section from the Introduction and from the Discussion, as the former contains no citation as source. Also, within the Introduction, it may be noticed that the first two paragraphs show a preponderance of citations, the third paragraph has data as its main source while the fourth paragraph has the writer as the most common source of information. It may be argued that this corresponds to phasal divisions in the Introduction: background theory;

account of experimental results; interpretation of experimental results in the light of theory.

Turning to the final column of Figure 4.6, the degree of certainty and the modifications which give rise to it again serve to distinguish between the first three paragraphs of the Introduction and the fourth paragraph. The first three paragraphs show a preponderance of KNOWN clauses, using modifications such as *find*, *observe*, *show* and *demonstrate*, whilst the fourth paragraph reduces the certainty to that of PROBABLE, with the modifications *interpret*, *imply*, *argue strongly* and *appear*.

The phases identified using the analysis can be shown to correspond to the sub-sections identified by the writers, using sub-headings. The Discussion section, for example, consists of six such sub-sections, which, using evidence from Figure 4.6, may be characterised as follows:

paragraphs 17-18: **evidence**: interpretations of data and statements of facts, followed by interpretations drawn from the text
conclusion: draws logical conclusions from results and background knowledge

paragraphs 19-20: **evidence**: interpretations of data and citations of results, also POSSIBLES and hypotheses
conclusion: draws logical conclusions and forms hypotheses from results and cited results

paragraphs 21-23: **evidence**: description and interpretation of own and cited results
conclusion: compares results and cited results

paragraphs 24-27: **evidence**: hypotheticals, postulations and interpretations derived from text
conclusion: presents hypothetical data and postulations and draws logical deductions

paragraph 28: **evidence**: description of figure
conclusion: presents arguments concerning a figure

paragraphs 29-30: **evidence**: results, interpretation of data and received knowledge facts
conclusion: links data and facts derived from received knowledge

It is interesting also to consider what this analysis of status does not show. It shares the shortcomings of all analyses which are based on the clause and which seek to explain a text in terms of the clauses which comprise it.

Firstly, by ignoring the relations between clauses, the analysis does not show how the argument of the text is built up. As an example, consider paragraph 20 of the ONC text, as analysed in Figure 4.6. An account of the clause relations in this paragraph is given in Figure 4.10a. The figure shows that the two main clauses in S1 have a Matching (Contrast) Relation. The contrast is Evaluated in S2, with Grounds for the Evaluation being given in the first clause of S2. S3 forms a Contrasting relation with S2, while S3 and S4 form an Effect-Cause relation. S4 is itself a Preview to a set of Details given in S5-7. The two clauses of S8 are in the relation Concession-Counter-Assertion, and S8 is also the second part of a Cause-Consequence relation, of which the first part is S4-7. Drawing out from this the main thread of the argument, we can say that this consists of a *contrast*, followed by an *evaluation*, followed by a *cause* and a *consequence* (see Figure 4.10b). At this point it is useful to bring in the evaluations of status (also given in Figure 4.10b), which show that the *contrast* consists of cited results whilst the *evaluation* is writer interpretation. The *cause* is writer interpretation and hypothesis arising from cited results and interpretations, and the *consequence* is an interpretation consequent on what has gone before. The bringing together of the two types of analysis can therefore offer an additional insight into the text. It seems to me useful,

however, to offer a status analysis in the first instance without the added complexity of the clause relations. The status analysis then becomes a resource to be used in clause relational studies.

FIGURE 4.10a

(Notations *a* and *b* refer to first and second clauses in sentence.)

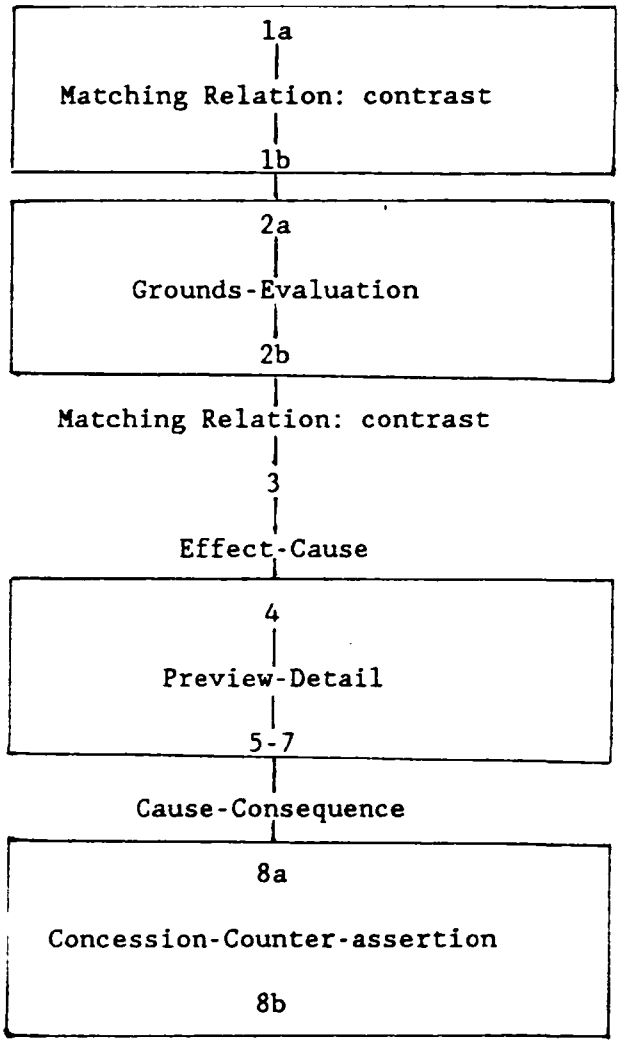


FIGURE 4.10b

Relations		*Status*
Contrast	S1	cited results
Evaluation	S2-3	writer interpretation
Cause	S4-7	writer interpretation/ hypothesis from cited results & interpretation
Consequence	S8	text (logical) interpretation

Secondly, the analysis does not give much information regarding the structure of the discourse. The phase analysis suggested above is a partial explanation of the division of the text into sections, but it does not show the progression of the text or the sense of beginning-ness or completeness. Intuitively, for example, ONC paragraph 20, discussed above, comprises a structural unit beginning with a statement of result (S1-3), continuing with a discussion of the results (S4-7) and culminating in the conclusion or lesson to be drawn from the results (S8). This aspect of analysis will be discussed more fully in Chapter 7.

On a slightly different theme, it should be noted that further delicacy in the assignment of status labels might yield more useful information. For example, the analysis of ONC does not show clearly the progression in the degree of interpretation made by the writers. Furthermore the comparison between that and the analysis of OCM does not make apparent the different degrees of interpretation being used in each text. ONC asserts a very much more external interpretation than OCM. A sub-division of the activity *interpretation* into more types might show these more successfully,

but such a division would be difficult to maintain objectively as interpretation essentially progresses along a cline.

4.6 Status and Anaphoric Nouns

In Example 4.1, the status of the aspect of S1 to which response is made is lexicalised as *extrapolation* in S2. This noun involves a reformulation of the information in S1 in such a way that it then acts as a Given (Halliday, 1967, 204) in a subsequent sentence. As such, it is reminiscent of Francis' (1986) category of anaphoric nouns, which reformulate preceding discourse as a given item of information. In the case of Example 4.1, the reformulation incorporates both deixis and an assessment of certainty, and it has been claimed in this chapter that certainty is the crucial distinguishing feature between status categories, as this term is applied to experimental research articles. A reasonable hypothesis would seem to be, then, that anaphoric nouns, using a definition similar but not identical to Francis' (see below), might be used to identify the parameter upon which status categories should be placed for any given register. In other words, it is possible that one way to ascertain the status categories relevant to a particular set of texts would be to examine nominal reformulations which are used anaphorically, or cataphorically.

In order to examine the relations between the proposed status categories for experimental research articles and the anaphoric and cataphoric nouns used in the texts, I have selected from five experimental research articles all the nouns which have the following features:

a) they refer anaphorically or cataphorically to something outside the clause in which they occur

b) they do not repeat the lexical items used in the presupposed item. In other words, they involve reformulation or reclassification (or advance classification in the case of cataphora).

These nouns will include Francis' categories of anaphoric nouns, but will not be restricted to them as I have omitted the semantic criterion that they must be meta-discoursal (Francis, 1986, 4). I consider it at least possible that Francis' distinction between items which 'exist in the world outside the discourse' and those which are 'labels for the language that has developed in and through the discourse itself' (Francis, 1986, 17) reflects a perception of those potential status labels which are important to the register of argumentation as opposed to those which are not. Some examples of nouns to be considered are:

Example 4.39 Evaluative anaphoric noun in Theme

Indeed this slight and easily explained discrepancy gives us confidence that p_a is a significant description of filament structure. HOSC 10.3

Example 4.40 Evaluative anaphoric noun in Rheme

McGhee et. al. (1980) showed that chromatin fibers are strongly compacted by small amounts of Mg^{2+}, even at very low monovalent ion concentration. We confirm their qualitative conclusion, although the increase in the s value we observed is somethat smaller than they reported. ONC 11.1-2

Example 4.41 Cataphoric Noun

The electric dichroism of chromatin (refs) yields information relating to two structural features. [Following sentences describe features.] PCHT 16.1

Example 4.42 Non-evaluative superordinate noun

For a sample of chain length corresponding to N = 63, an extrapolated reduced dichroism of -0.16 was obtained and a relaxation time of 90 us. The extrapolation was linear (Fig.5c) and both values approached much more closely to the expectations for a solenoid (Fig. 6). PCHT 40.2-3

Example 4.43 Non-evaluative, non-superordinate reformulation

The parts of the histones eliminated by trypsin were degraded to small polypeptides, not detected in an 18% acrylamide gel. In TEP_{80} these fragments do not remain bound to the chromatin and are removed during the subsequent dialysis treatment (data not shown). PCHT 13.4-5

Example 4.44 Re-interpretation

The results show that SPN has a limiting reduced dichroism...With 70_uM Mg++ added...the area tau was 400_us at high fields...The high field area tau [for tryp.SPN] was 610_us. This increase over the SPN sample is also consistent with an unwinding of the DNA. PCHT 19.3-20.6

These examples illustrate my reservations about presupposing that anaphoric nouns, functioning as Francis describes them, should have the semantic property of being meta-discoursal. In each of the above examples, the noun stands as a pro-form for part of the preceding (or subsequent) discourse, comprising the 'given' information about which something new may be said. In each case, some form of reinterpretation or reformulation has taken place in the selection of the required noun or noun phrase. In this way, I would argue, they have the important organising function of Francis' anaphoric nouns without necessarily being meta-discoursal.

The anaphoric and cataphoric nouns identified in the five articles are listed in Figure 4.11, in groups which give some idea of the possible variables. It is interesting now to compare these nouns with the nominalisations of the status categories discussed so far in this chapter, in order to make problematic the notion that status and certainty are necessarily associated with one another.

FIGURE 4.11

Evaluating good/bad

discrepancy
problem
conflict
anomaly
failure

Sub-technical

case	factor	constraint
parameter	criterion	feature
type	direction	step
way	value	phenomenon
procedure	situation	nature
number	set	shape
conformation	organization	structure
state	role	time
pattern	appearance	

Meta-discoursal

example
definition
equation
report
point
objection
argumentation

Interpretation

Change	*Difference*	*Relation*
change	contrast	effect
increase	difference	response
loss	agreement	
replacement	disagreement	
	similarity	
	constancy	

Field-specific Terms

compaction	elasticity	saturation
periodicity	treatment	spacer
bridge	string	fiber
reaction	fragment	stretch
chain		

FIGURE 4.11 (continued)

Experimental Procedure

study	work	result
investigation	analysis	experiment
evidence	sample	protocol
observation	calculation	measurement
data	assignment	

Expression of Certainty

conclusion	view	possibility
model	fact	arrangement
estimate	information	approximation
extrapolation	subject of controversy	ambiguity

It will be recalled that the concept of status was defined in terms of the placing of an item into a category which is itself evaluative and which determines the nature of the evaluation which may follow. In other words, nouns which nominalise status categories will do the following:

a) indicate the attitude of the writer;
b) indicate how the reader should verify or evaluate the information;
c) constrain future evaluation on the part of the writers;
d) be part of a taxonomy, other members of which occur within the register.

Criterion d) above is important because criterion c), by itself, will include every noun, but will lead to an infinite set of categories. Only with criterion d) included can a finite set be generated.

Turning to Figure 4.11, then, we may note that writer attitude is not indicated by the high-generality sub-technical nouns such as *case*, *factor*,

constraint, and *set of dimensions*, or by the low-generality, field-specific nouns such as *compaction*, *elasticity*, *saturation*, *spacer*, *bridge* and *chain*. Therefore, although these items organise the discourse, they are not counted as nominalisations of status.

Those nouns which do show writer attitude may be divided into four groups: meta-discoursal nouns indicating discourse function or clause relation e.g. *definition*, *equation* and *example*; evaluations of good/bad e.g. *discrepancy*, *problem*, *conflict*; nouns which indicate certainty, including *possibility*, *model* and the nouns relating to experimental procedure such as *result*, *investigation*; interpretations of similarity, difference and change, such as *increase*, *contrast*, *agreement*. This suggests that certainty is not the only parameter that should be taken into account when defining status. If other status categories are allowed, however, the possibility of a unified taxonomy disappears. Two solutions to this problem may be proposed. The first, which is the one adopted in this thesis, is that certainty will account for all the nominalised parameters, with other nominalisations being dealt with at a secondary level of delicacy. Rather than adopting a status category of <u>similarity</u>, for example, it is assumed that this may be subsumed under the activity of <u>interpretation</u>. A second strategy would be to propose different types of status, such as certainty, similarity and difference and discourse status (nominalised clause relations).

As a footnote to the concept of anaphoric nouns, it must be noted that there is a requirement of fit between the X-A members (Francis' terminology). This may be illustrated by an example of an infelicitous choice of anaphoric noun:

Example 4.45

McGhee et.al. (1980) showed that chromatin fibers are strongly compacted by small acounts of Mg^{2+}, even at very low monovalent concentration.
We confirm their qualitative conclusion, although the increase in the s value we observed is somewhat smaller than they reported. ONC 11.1-2

In this example there is a lack of fit between the status of the projected clause in the first sentence (KNOWN) and that of conclusion (POSSIBLE), leading to a breakdown in the cohesion between the two sentences. An example, from the same research article, which exhibits a more acceptable choice of X-A members is cited in Example 4.46.

Example 4.46

It has been proposed that in the 10-nm fiber observed at low salt concentration, the nucleosomal disks are arranged with their diameters nearly parallel to the fiber axis.
However, this conclusion is not supported by the flow dichroism studies of Tjerneld and Norden (1982). ONC 1.3-4

4.7 Conclusion

This chapter has presented a description of one of the dimensions of evaluation to be found in experimental research articles. The parameter of evaluation concerned is that of certainty/uncertainty and the function of the evaluation is to bestow 'thingness', that is, to render the parts of the argument into entities that may be further responded to and evaluated. Status categories have been proposed that are not simple but are multi-dimensional. An analysis of a text in terms of status has been presented, and the uses to which such an analysis may be put have been suggested. These are mainly concerned with comparisons between texts and between parts of a single text, in order to show the development of a text and of a discipline.

This presentation of the concept of status shows the importance of Halliday's notion of interpersonal metaphor, but it also challenges the association of certainty, or polarity, with the interpersonal. It may be argued that status contributes to Field rather than Tenor. Field may be defined either simplistically as the subject-matter of the discourse, or more subtly as the activity or goal of which the discourse is a part. Either way, evaluation of status belongs to the perspective of Field. The subject-matter of experimental research articles is the facts, hypotheses, observations, interpretations and so on discussed in this chapter; and the activity in which the discourse is engaged is the assessment of the status of the various statements in the discourse, with the goal of making as high-status a statement as possible. Furthermore, this chapter has shown that certainty is a product of the transitivity system as much as the mood system. In other words, the distinction between the interpersonal and the ideational has been blurred.

FIGURE 4.6

(The notation *a* and *b* refers to main and subsidiary clauses (alpha and beta clauses in Halliday's terminology.)

ONC Introduction

Clause	Activity	Source	Modification	Certainty
1.1a	assert status	rec.kn.	*unknown*	UNKNOWN
1b	state fact	citation	-	KNOWN
2a	narrate event	citation	-	KNOWN
3a) 3b)	hypothesise	citation	*propose*	POSSIBLE
4a	interpret-supp.	writer	-	CERTAIN
5a	state fact	citation	-	KNOWN
5b1	state fact	citation	-	KNOWN
5b2	state fact	citation	-	KNOWN
2.1a	assume	writer	-	CERTAIN
2a	narrate event	citation	-	KNOWN
3a	interpret-mean	writer	-	CERTAIN
3b	state aim	writer	-	FOCUS
4a1	state result	citation	*find*	KNOWN
4a2	state result	citation	*observe*	KNOWN
4b	narrate event	citation	-	KNOWN
5a1	state result	citation	-	KNOWN
5a2	state result	citation	*show*	KNOWN

3.1a)			*report*	
1b1)	state result	data	*show*	KNOWN
1b2)	narrate event	writer	-	KNOWN
2a	state result	data	*find*	KNOWN
2b	state result	data	*observe*	KNOWN
3a	interpret-mean	data	-	CERTAIN
3b	interpret-mean	data	*demonstrate*	CERTAIN
4a	state result	data	-	KNOWN
4b	narrate event	writer	*measure*	KNOWN
4.1a)			*interpret*	
1b)	interpret-mean	writer	*imply*	PROBABLE
2a	postulate	writer	-	PROJECTION
3a	interpret-mean	writer	*imply*	PROBABLE
4a	interpret-mean	writer	*appear*	PROBABLE
5a	interpret-sig.	writer	*probably*	PROBABLE

Materials and Methods

5.1a1	narrate events	writer	-	KNOWN
1a2	narrate events	writer	-	KNOWN
2a	narrate events	writer	-	KNOWN
2b	narrate events	writer	-	KNOWN
3a1	narrate events	writer	-	KNOWN
3a2	narrate events	writer	-	KNOWN
4a1	narrate events	writer	-	KNOWN
4a2	narrate events	writer	-	KNOWN
5a	narrate events	writer	-	KNOWN
6a	narrate events	writer	-	KNOWN
6.1a	narrate events	writer	-	KNOWN
1b	narrate events	writer	-	KNOWN
2a	narrate events	writer	-	KNOWN

7.1a	narrate events	writer	*estimate*	KNOWN
1b	narrate events	writer	-	KNOWN
8.1a	narrate events	writer	*judge*	KNOWN
9.1a	narrate events	writer	*measure*	KNOWN

Results

10.1a	state aim	writer	-	FOCUS
2a)				
2b1)	state result	data	*find*	KNOWN
2b2)	interpret-supp.	data	*contrast*	CERTAIN
3a	describe fig.	writer	*show*	SELF-REFERENCE
4a	state result	data	-	KNOWN
5a	interpret-mean	writer	*presumably*	CERTAIN
6b1	interpret-mean	data	*reveal*	CERTAIN
6a)			*believe*	
6b2)	interpret-sig.	text		PROBABLE
6b3)	interpret-sig.	writer		
7a1	state result	data	-	KNOWN
7a2	narrate event	writer	-	KNOWN
11.1a)			*show*	
1b)	state result	citation		KNOWN
2a	interpret-supp.	writer	*confirm*	CERTAIN
2b	interpret-supp.	writer	-	CERTAIN
3a	describe fig.	writer	-	SELF-REFERENCE
5a	state result	data	-	KNOWN
5b	interpret-sig.	data	*confirm*	CERTAIN

12.1a	state question	writer	-	FOCUS
2a	describe fig.	writer	*show*	SELF-REFERENCE
3a)			*evident*	
3b1)	interpret-mean	writer		CERTAIN
3b2)	interpret-mean	writer		
4a	state result	data	-	KNOWN
5a)			*clear*	
5b)	interpret-mean	text		CERTAIN
6a	interpret-supp.	writer	-	CERTAIN
13.1a	narrate event	writer	-	KNOWN
2a	describe fig.	writer	*show*	SELF-REFERENCE
3a1	state result	data	-	KNOWN
3a2	state result	data	-	KNOWN
4a)			*mean*	
4b)	interpret-mean	data		CERTAIN
5a	interpret-sig.	writer	-	CERTAIN
5b	state fact	citation	-	KNOWN
6b1	narrate event	writer	-	KNOWN
6a	state result	writer	-	KNOWN
6b2	interpret-sig.	data	*confirm*	CERTAIN
14.1a	describe fig.	writer	*show*	SELF-REFERENCE
2b	narrate event	writer	-	KNOWN
2a	state result	data	-	KNOWN
3a	state result	data	*extrapolate*	CERTAIN
3b	state result	citation	*report*	KNOWN
4a	interpret-sig.	data	*significant*	CERTAIN
4b	state result	citation	*report*	KNOWN
5a	state result	data	-	KNOWN

15.1a	interpret-mean	data	*greatly increase confidence*	PROBABLE
2a	interpret-mean	writer	*probably*	PROBABLE
2b	state fact	citation	-	KNOWN
3a	interpret-mean	writer	-	CERTAIN
3b	interpret-mean	citation	*tentatively*	POSSIBLE
16.1a	state result	data	-	KNOWN
2a	interpret-sig	text	-	CERTAIN

Discussion

17.1a)			*show*	
1b1)	interpret-mean	data		CERTAIN
1b2)	interpret-mean	data	*imply*	PROBABLE
2b	narrate event	writer	-	KNOWN
2a	interpret-sig.	data	-	CERTAIN
3a	interpret-sig.	data	*clearly*	CERTAIN
4a	interpret-sig.	citation	*significant*	CERTAIN
18.1b1	postulate	rec. kn.	-	PROJECTION
1a	state fact	rec. kn.	-	KNOWN
1b2	state fact	rec. kn.	*theoretical*	KNOWN
1b3	postulate	rec. kn.	-	PROJECTION
2a	state fact	rec.kn.	*theoretical*	KNOWN
3a	interpret-mean	text	*imply*	PROBABLE
4a1	interpret-supp.	writer	-	CERTAIN
4a2	postulate	rec.kn.	*should*	PROJECTION
4b1	assume	rec.kn.	-	CERTAIN

19.1a	interpret-sig.	writer	*complicate*	CERTAIN
2a	interpret-sig.	writer	*allow evaluation*	CERTAIN
3a	narrate events	citation	*estimate*	PROBABLE
4a1	state result	citation	*find*	KNOWN
4a2	state result	citation	*show*	KNOWN
5a	interpret-supp	writer	-	CERTAIN
6b1	state fact	rec.kn.	-	KNOWN
6a) 6b2)	hypothesise	text	*possible*	POSSIBLE
20.1a1) 1b1)	state result	citation	*estimate*	PROBABLE
1a2) 1b2)	state result	citation	*estimate*	PROBABLE
2b	interpret-sig.	writer	*uncertainty, insensitivity, difference*	CERTAIN
2a	interpret-sig.	text	*probably*	PROBABLE
3a	interpret-sig.	writer	*dramatically*	CERTAIN
4a	interpret-sig.	writer	*possibly*	POSSIBLE
5a	narrate events	citation	*measure*	KNOWN
5b	narrate events	citation	-	KNOWN
6a1) 6b)	interpret-sig.	citation	*report clearly*	CERTAIN
6a2	narrate event	citation	-	KNOWN
7a	hypothesise	writer	*could*	POSSIBLE
8b	interpret-sig.	text	-	PROBABLE
8a	interpret-supp.	text	-	PROBABLE

21.1a	interpret-mean	data	*show*	CERTAIN
2b	assume	writer	*ignore*	CERTAIN
2a	interpret-supp.	data	-	CERTAIN
3a)			*plausible*	
3b)	interpret-sig.	text		PROBABLE
22.1a)			*dangerous*	
1b1)				UNTRUE
1b2)	assume	citation		
2b	narrate events	writer	-	KNOWN
2a	interpret-sig.	citation	-	CERTAIN
3a	focus	writer	*instructive*	SELF-REFERENCE
4a1	state result	citation	*report*	KNOWN
4b1	narrate events	citation	-	KNOWN
4a2)			*conclude*	
4b2)	interpret-mean	citation	-	POSSIBLE
5a	state result	citation	*find*	KNOWN
5b1	narrate events	citation	-	KNOWN
5b2	interpret-supp.	citation	-	POSSIBLE
6a1	assert status	writer	-	UNKNOWN
6a2)			*plausible*	
6b1)	interpret-sig.	data		PROBABLE
6b2)	interpret-sig.	data		
23.1a	state question	writer	*clearly*	FOCUS
2a)			*believe*	
2b1)			*requirement*	CERTAIN
2b2)	assume	writer		
2b3	describe fig.	writer	*show*	SELF-REFERENCE
3a	interpret-sig.	writer	*evidence*	CERTAIN
3b	narrate events	citation	-	KNOWN
4a	interpret-supp.	writer	-	CERTAIN

24.1b	narrate events	citation	-	KNOWN
1a	assert status	writer	*ambiguity*	UNKNOWN
2a	focus	writer	-	SELF-REFERENCE
2b	focus	writer	-	SELF-REFERENCE
3a	postulate	writer	*ascribe*	POSSIBLE
3b	assume	writer	-	POSSIBLE
4a) 4b)	state fact state formula	citation	-	KNOWN
5b1	state fact	rec.kn.	-	KNOWN
5a	postulate	text	-	PROJECTION
5b2	postulate	text	-	PROJECTION
6a	postulate	writer	-	PROJECTION
7a	postulate	writer	-	PROJECTION
8a	state fact	writer	-	KNOWN
25.1a	postulate	writer	-	PROJECTION
1b	postulate	writer	-	PROJECTION
2a	state fact	rec.kn.	-	KNOWN
3a	postulate	writer	-	PROJECTION
4b	state fact	citation	-	KNOWN
4a	interpret-sig.	text	*unacceptably*	CERTAIN

26.1a)		rec.kn.	*assume*	
1b1)	postulate			PROJECTION
1b2)	postulate			
1b3	narrate events	citation	-	KNOWN
2a)			*approximate*	
2b1)	state formula	citation		PROBABLE
2b2	describe equation	citation		SELF-REFERENCE
3b1	postulate	writer	-	PROJECTION
3a)			*yield*	
3b2)	state result	text		KNOWN
4b1	postulate	writer	-	PROJECTION
4a)			*get*	
4b2)	state result	text		KNOWN
5a	interpret-mean	text	-	CERTAIN
5b	interpret-sig.	text	-	CERTAIN
27.1b	state fact	writer	-	KNOWN
1a	state result	data	-	KNOWN
2a)			*note*	
2b1)	interpret-sig.	writer		CERTAIN
2b2)	interpret-sig.	writer		
3b1	postulate	writer	*were*	PROJECTION
3a	postulate	writer	-	PROJECTION
3b2	postulate	writer	-	PROJECTION
4a1	interpret-sig.	text	-	CERTAIN
4a2	interpret-sig.	text	*difficult*	CERTAIN
4b	interpret-sig.	text	-	CERTAIN
5a	interpret-supp.	text	-	CERTAIN
5b	narrate events	text	-	KNOWN

28.1a	assert status	writer	-	UNKNOWN
1b	state aim	writer	-	FOCUS
2a	state question	writer	*appropriate*	FOCUS
3a	describe fig.	writer	-	SELF-REFERENCE
3b	describe fig.	writer	-	SELF-REFERENCE
4a	describe fig.	writer	-	SELF-REFERENCE
5a	assume	writer	-	CERTAIN
5b1	narrate event	writer	-	KNOWN
6a)			*find*	
6b2)	interpret-sig.	data	*no reason*	PROBABLE
29.1a	state fact	rec.kn.	-	KNOWN
1b1)				
1b2)			*recognise*	
1b3)	state fact	rec.kn.		KNOWN
1b4)	state fact	rec.kn.		
2a	interpret-mean	data	*indicate*	CERTAIN
2b1	narrate events	writer	-	KNOWN
2b2	state result	data	-	KNOWN
3a)			*imply*	
3b1)	interpret-sig	data		PROBABLE
3b2	state result	data	-	KNOWN
4a1)			*seem*	
4b)	interpret-sig.	text		PROBABLE
4a2	interpret-sig.	text	-	PROBABLE
30.1a	state fact	rec.kn.	-	KNOWN
1b	state fact	rec.kn.	-	KNOWN
2a	state fact	rec.kn.	-	KNOWN
3a	state fact	rec.kn.	-	KNOWN
4a	interpret-sig.	writer	-	CERTAIN

FIGURE 4.7

(The notation *a* and *b* refers to main and subsidiary clauses (alpha and beta clauses in Halliday's terminology.)

OCM Discussion

Clause	Activity	Source	Modification	Certainty
13.1a)			*conclusion*	
1b)	interpret-mean	data		CERTAIN
2a)			*demonstrate*	
2b)	interpret-mean	data		CERTAIN
3b1	state fact	data	-	KNOWN
3a)				
3b2)	interpret-mean	data	*not rule out*	POSSIBLE
4b1	narrate event	writer	-	KNOWN
4a)			*suggest*	
4b2)	interpret-mean	data		PROBABLE
5a1	state result	data	-	KNOWN
5a2	interpret-sig.	writer	*likely*	PROBABLE
6a1	assess	writer	-	KNOWN
6a2	state fact	rec.kn.	*quite likely*	PROBABLE

14.1a	assess	writer	-	KNOWN
2a	interpret-sig.	writer	*primarily*	CERTAIN
2b1	state result	data	-	KNOWN
2b2	state result	data	-	KNOWN
3a	state result	data	-	KNOWN
4b1)			*believe*	
4b2)	state fact	rec.kn.		CERTAIN
4a)			*imply*	
4b3)	interpret-mean	text		PROBABLE
5a	assert status	data	-	UNKNOWN
6a	interpret-mean	data	*could*	POSSIBLE
7a	recommend	writer	-	RECOMMENDATION
7b	state aim	writer	-	FOCUS
15.1a	narrate events	writer	-	KNOWN
1b1	state aim	writer	-	FOCUS
1b2	state aim	writer	-	FOCUS
2a	narrate events	writer	-	KNOWN
2b	narrate events	writer	-	KNOWN
3b1	narrate events	writer	-	KNOWN
3a)			*reveal*	
3b2)	interpret-mean	data		CERTAIN
3b3	assert status	data	-	UNKNOWN
4a	narrate events	writer	-	KNOWN
4b1	state aim	writer	-	FOCUS
4b2	state aim	writer	-	FOCUS
5a)			*demonstrate*	
5b)	interpret-sig.	data		CERTAIN
6a)			*show*	
6b)	interpret-sig.	data		CERTAIN

CHAPTER 5

Evaluation of Value

5.1 Introduction

Section 4.1 above included a series of observations about Example 4.1, which is reproduced below as Example 5.1, for convenience.

Example 5.1

The dichroism, p, is plotted vs 1/E, and the lines represent our estimates of the best linear extrapolation to obtain the intercept, p_a.
Other functional forms of the extrapolation will be considered below and will be shown to have negligible effect on our estimates of p_a. HOSC 8.2-3

Those observations focused on the first sentence of the example, which was identified as the Situation member of a Situation-Evaluation pair, and it was suggested that Sentence 1 is in itself evaluative. That evaluation was further discussed under the heading of *Status*. It is time now to turn to the second sentence of the example and to note the features of this sentence which may be described as features relating to the evaluation of *Value*. These features are:

1) the sentence is retrospective. That is, it treats as given information which was presented as new in S1, and says something new about it.

2) the sentence evaluates along a good-bad scale. The extrapolation of S1 is evaluated as good (reasonable), on the grounds that other calculations yield the same result.

3) the sentence is in a sense predicted by the status of extrapolation in S1. (This has been discussed in the previous chapter.)

It may appear from this that I am substituting a Status-Value relation for the Situation-Evaluation relation proposed by Winter and Hoey. This is not, however, the case, since in fact both sentences in Example 5.1 have both status and value. The second sentence has the status of interpretation, while the first sentence contains the word *best*, which assesses the value of the extrapolation. It is not true, then, that status and value form a sequence, as Situation-Evaluation do. In other words, they are not mutually exclusive categories in either a paradigm or a syntagm. Rather they represent two different functions of evaluation, which operate simultaneously. Analysis for status or for value gives two different perspectives on the same information.

In this chapter I shall first of all present some of the problems connected with identifying value (Section 5.2), then propose some partial solutions to those problems (Section 5.3). I shall then discuss and present analyses of texts in terms of value (Sections 5.4 and 5.5). The chapter ends with a brief conclusion (Section 5.6).

5.2 The Problems

5.2.1 Introduction

This section (5.2) seeks to make problematic the notion of evaluation of value, so that the partial solutions proposed in the remainder of the chapter may be seen in context. In doing so it will point out difficulties in the application of two theories: Halliday's notion of attitudinal language (Halliday, 1985a, 163), which relates to the lexico-grammar, and the syntagms proposed by Hoey (1983) and Sinclair (1987) which have

Evaluation as a concluding element. Some of these issues have been raised briefly in Chapters 1 and 3.

Before discussing these problems in relation to experimental research articles, I shall, in this introduction, look at them in relation to less specialised texts. This will illustrate that the difficulties I examine are products of evaluation itself and of theories of evaluation, rather than of the features of a particular register. As a focus for this discussion I shall refer to Example 5.2, which is a text taken from Hoey (1983, 145).

Example 5.2

[1]In the Netherlands, there is a continuing need for economical ways of taking care of the situation that arises when a dyke fails. [2]What is required is something that can be brought into action very quickly to prevent flooding, but does not constitute a great expense or physical obstruction during the long years between emergencies. [3]The North-Holland Provincial Water Authority has developed an ingenious solution in the form of an inflatable dam made of steel sheets and rubber-nylon fabric.
[4]When out of use, this 'shell' dam lies almost flush with the bottom of the canal: a long, shallow steel box, set into a concrete base. [5]The top surface of the box, or shell, is a pair of steel lids, hinged to the sides of the shell at the outer edges. [6]The inner edges of the lids meet, and are joined to opposite edges of a sheet of the rubber-nylon fabric. [7]This sheet lies folded inside the shell.
[8]When a dyke breaks, releasing water from the canal, the correct emergency action consists of simply pumping the shell full of water. [9]The lids open, and the fabric sheet emerges to form a half-cylindrical roof. [10]The whole thing becomes a gigantic steel and rubber sausage.

Taken from Hoey, 1983, 145

There are three items of attitudinal language here: *ingenious* and *solution* in S3 and *simply* in S8. These are attitudinal in Halliday's terms because the words *ingenious* and *simple* do not identify the *solution* and the *procedure* in the same way as a word such as *mathematical* would, and a *solution* is not the identifiable entity that *surface*, for example, is. (See the discussion of attitudinal language in Chapter 3.) There is more evaluation here than is contained in these three words, however. For one thing, there are lexical signals of evaluation of the situation as problem

(Hoey, 1979), such as *fails* (S1) and *prevent* (S2). These items are not attitudinal in Halliday's sense, that is, in the sense that they do not objectively identify the things they describe, but they are (negatively) evaluative in the sense that they represent an undesirable situation. Not every situation is uncontroversially desirable or undesirable, however, and there are some items which are only instantially evaluative, that is, they are evaluative only because the text itself sets them up to be. For example, *simply* in S8, although it is non-defining and therefore certainly attitudinal, is not unambiguously positive or negative (either would be possible in different contexts) unless one takes into account the requirement established in S2 that the dam be erected *very quickly*. If *simply* is assumed to be a paraphrase for *quickly* then there is a warrant for taking *simply* as positive evaluation. Similarly, S2 establishes a requirement that the dam *does not constitute a...physical obstruction during the long years between emergencies*. The description of the rubber dam in S4 - *almost flush with the bottom of the canal* - therefore gives a positive value to the dam, and this without any lexical repetition, replacement or use of paraphrase, unless *flush* is held to be an antonym of *obstruction*. It may also be the case that *steel sheets and rubber-nylon fabric* (S3) fulfill the requirement of economy (S1), but this cannot be verified without recourse to the unacceptably vague notion of 'background knowledge'.

Turning to the clause relational view of evaluation, we note that Hoey mentions no Evaluation element in this text (Hoey, 1983, 145). In spite of the apparent lack of concluding Evaluation element, however, the reader is left in no doubt as to the value of the inflatable dam. This is not simply the result of a default condition: assume unless told otherwise that evaluation is positive. Rather, it is the result of the accumulation of

evaluation of value throughout the Response element, as detailed above. It may be argued that the fact that evaluation is present in terms of the information content of the text does not affect the lack of the discourse category Evaluation as an element within a syntagm. On the other hand, it is the presence of value evaluation within the Response element that obviates the need for an otherwise obligatory Evaluation element.

In this text, then, we see the essence of the problem in identifying evaluation of value. There is very little attitudinal language and there is no discrete evaluative discourse element. In spite of this, value judgements pervade the whole text. It must be stressed that although this may be seen as two problems - a lexico-grammatical one and a discourse one - it is in fact one problem with many facets. Identifying evaluation of value is difficult partly because attitudinal language is so difficult to define, so that lexico-grammatical clues are not always recognisable, and partly because it pervades a whole text rather than being confined to a single element, so that position within a structure or pattern is not a reliable way of solving the lexico-grammatical ambiguities. The all-pervasiveness in turn means that value may not be given in a single chunk, but may accumulate gradually, again allowing more indirect expression of attitude. The various facets of this problem will be illustrated in relation to experimental research articles in the following sub-sections.

5.2.2 The Problem of Attitudinal Language

The systemic approach to the interpersonal in general and to attitudinal language in particular has been discussed in Chapter 3 and in Section 5.2.1 above. I shall here relate the discussion of interpersonal

language to the identification of evaluation of value in experimental research articles. Discussing the nominal group, Halliday (1985a) identifies four ways in which interpersonal meaning may be realised in this essentially experiential structure. These are: (i) the 'person' system (*I*, *your* etc.); (ii) attitudinal as opposed to experiential epithets (e.g. *mighty* as opposed to *long*); (iii) 'the connotative meanings of lexical items' and (iv) voice quality and swear words (Halliday, 1985, 169). Only the first three of these are relevant to the study of written texts. As discussed in Section 5.2.1 above, the definition is not without problems for the analyst.

Halliday is, of course, identifying the interpersonal in lexis, not evaluation per se, so it comes as no surprise that his definition is in some respects too broad to be used in identifying value. Taking the issue of personal pronouns, the use of *We/us*, for example, may coincide with evaluation of value, as in Example 5.3, but this is not necessarily the case. Example 5.4, for instance, illustrates explicit interaction between writers and reader, but is not in any way evaluative.

Example 5.3

Indeed this slight and easily explained discrepancy gives us confidence that p_a is a significant description of filment structure. HOSC 10.3

Example 5.4

In the present paper we report that unfixed erythrocyte and calf thymus chromatin sample in Mg2+ and low ionic strength show identical limiting dichroism values of -0.09 if correction is made for a nondichroism signal that becomes significant above 15kV/cm. ONC 3.1

This distinction between evaluative and non-evaluative realisations of interpersonal meaning breaks down, however, in examples such as 5.5. Example 5.5 appears to be a clear parallel to Example 5.4 above, and therefore unevaluative. It will be argued below (Section 5.2.4), however, that this

sentence (Example 5.5) can in fact be perceived as part of a cumulative evaluation. What is not clear is whether the use of the personal pronoun is relevant to this perception.

Example 5.5

As will be discussed in detail below, we do not observe this pulse-associated absorbance change. HOSC 15.5

Turning to examples of non-identifying modifiers (discussed in Chapter 3), we note several that are indisputably evaluative. Example 5.6 shows a non-identifying adjective while Example 5.7 illustrates a similar phenomenon in an adverb (highlighting added in both cases).

Example 5.6

An analysis of factors governing the equilibrium between the solenoid and the extended chain of chromatin is an important step towards an understanding of the mechanisms of transcriptional control. PCHT 1.7

Example 5.7

With this background material removed, the general organization of the sub-chromosomal fibers is more easily discerned. OCM 9.8

Not all non-identifying modifiers are clearly evaluative, however. Example 5.8 contains three judgements which do not seem to give value. In other words, there are three sets of lexical items which, although they are non-identifying, and therefore reflect writer attitude, do not necessarily reflect a perception of goodness or badness. The items, underlined in the example, are: *materially alter*, *striking* and *basic*.

Example 5.8

Large increases in counterion concentration, both univalent (Na^+, up to 230mM) and divalent (Mg^{++}, up to 200_uM), did not materially alter the properties of the complexes between tryp.SPN and H1. On the other hand, the introduction of a 94-residue polypeptide derived from the COOH-terminal end of calf thymus H1 (ref) produced a striking result. This fragment (CH1) is very basic, containing as it does 40 lysine residues but no arginines (ref). PCHT 33.1-3

It must be stressed, however, that the comment that the writer attitude reflected here is not an evaluative one cannot be made in a categorical way. This example illustrates clearly a recurrent problem in investigating evaluation of value in experimental research articles: the presence of a cluster of attitudinal items which do not appear to denote good or bad but which cannot with any objectivity be distinguished from items that do so. Furthermore, they may indeed turn out to have relevance to such evaluation and so cannot be absolutely dismissed from consideration.

In the above examples, Halliday's definition of attitudinal language is too broad to be taken over as a definition of evaluation of value. What is in a sense more troubling, however, is that it is in many ways also too narrow. In the articles under discussion, for example, notions of agreement and consistency between results, and between results and theory, denote positive value, while notions of disagreement and inconsistency denote negative value. In this sense, the evaluation is register-specific. It is not, however, so specific that only an expert in that register can identify it. This suggests that familiarity with the register, rather than specific academic training, is sufficient to enable the reader to identify register-specific evaluation. This issue will be discussed with reference to Examples 4.9 and 4.10, and as the problem of attitudinal language is part of a larger problem whose other facets are cumulativeness and all-pervasiveness (see below), the same examples (Examples 4.9 and 4.10) will be used later to illustrate subsequent arguments regarding these factors (Sections 5.2.3 and 5.2.4).

Examples 5.9 and 5.10 follow.

Example 5.9

24.[1]As expected for well behaved particles in which the dichroism originates from overall orientation and not from internal distortions, all of our chromatin samples showed no overall absorbance change induced by the electric field. [2]This is one of the ways in which our results clearly differ from those of Crothers and coworkers (refs) who correct their high-field dichroism measurements by subtracting a pulse-associated "nondichroism signal" (an actual overall absorbance decrease). [3]We now demonstrate that we find no such overall absorbance change.

25.[1]The two symbols used for Figure 2 represent reduced dichroism measured with the instrument polarizer oriented either parallel or perpendicular to the direction of the electric field. [2]The two measurements are essentially identical. [3]It is straightforward to demonstrate (see legend to Figure 2) that this agreement can only occur if there is no overall absorbance change, originating either from the instrument or from the sample, associated with the electric pulse. [4](This experimental approach is preferable to setting the instrument polarizer at 54^{o} since, with most optical systems, it is difficult to ensure that light polarized parallel and perpendicular have identical intensities.) [5]Thus we find no evidence in any of our chromatin samples for the field-induced absorbance decrease that forms such a large fraction (up to 40%) of the dichroism signal observed by Lee and Crothers (1982) and Yabuki et.al. (1982) and that has been explained as a twisting of the DNA helix.

26.[1]The chromatin solenoids used for our dichroism measurements have been uncoiled by dialysis to low ionic strength and then recondensed by divalent ions. [2]It is an obviously important question how accurately these refolded structures represent in vivo chromatin thick fibers. [3]As a partial answer to this question, we have prepared soluble chicken erythrocyte chromatin by extended dialysis of digested nuclei against 50mM NaCl (rather than against the usual 0.25 mM EDTA, which produces higher yields). [4]By dilution of the chromatin into dichroism buffer containing 1-2 Mg^{++}/phosphate, we obtained solenoids that have never been disrupted. [5]The measured dichroism, p_a, for these nondisrupted solenoids was--0.1, compared to an average value of -0.18 for our usual chicken erythrocyte solenoids. [6]However, this "native" value of p_a=-0.1 is probably an underestimate, since the overall dichroism signal now also contains a component with positive dichroism. [7]This positive component has a very long relaxation time (in the millisecond range) and an amplitude that increases over the next few days, strongly suggesting aggregation. [8]We are thus reasonably confident that our measurements on recondensed solenoids accurately reflect the structure of in vivo chromatin fibers. [9]The same conclusion has been drawn from electron microscopy (refs) and sedimentation (refs). HOSC 24-26

Example 5.10

8.[1]To investigate the organization of mitotic HeLa cell chromosomes under the least disruptive conditions, mitotic cells were directly fixed in growth medium with glutaraldehyde, after cooling the cells on ice to disassemble the microtubules. [2]High concentrations of mitotic cells were obtained by treating suspension cultures of HeLa cells with colchicine for 12 h. [3]The mitotic cells were treated with osmium tetroxide, embedded in Spurr medium, and then sectioned for electron microscopy. [4]The typical appearance in the electron microscope of thin sections of mitotic HeLa cells is shown in fig.1. [5]The chromosomes are seen as densely staining areas with diameters of the order of 0.8$_u$m and greater. [6]Although some variation in the patterns of staining can be observed, especially in the electron micrographs at a higher magnification, it is not possible to distinguish the path of folding of the nucleosome-containing DNA fibers. [7]Most of the densely staining areas are circular or slightly oblong in shape, as would be expected for random sections through particles with the characteristic morphology of chromosomes. [8]The chromosomes are also seen to be fairly evenly distributed throughout the region they occupy.

9.[1]To follow the path of folding of the nucleoprotein fibers in mitotic HeLa cells, the cells were hypotonically swollen with a buffer that would also maintain the chromosomes in a condensed state with divalent cations. [2]The buffer also contained the non-ionic detergent NP40. [3]With this procedure it was hoped to substantially separate the chromosomes from surrounding electron-dense material that might obscure the detailed organisation of the chromosomes, especially toward their peripheries. [4]The mitotic cells were thus resuspended in 10 mM NaCl; 5 mM PIPES, pH 6.8; 1.5 mM $MgCl_2$; 0.1 mM PMSF; 0.1% NP40. [5]The samples were then kept on ice for 30 min before fixing the mitotic cells with glutaraldehyde and osmium tetroxide, and preparing thin sections for electron microscopy. [6]Fig.2 shows thin sections of mitotic HeLa cells treated in this way. [7]It is readily seen that, except for the chromosomes, much of the cellular material has been extracted from the hypotonically swollen cells. [8]With this background material removed, the general organization of the sub-chromosomal fibers is more easily discerned. [9]In particular, the low magnification electron micrographs of fig.2 reveal that mitotic HeLa cell chromosomes consist of densely staining central areas which extend along the chromatid arms. [10]These areas are surrounded by regions where the nucleosome-containing DNA fibers are less tightly packed so that individual fibers can be distinguished....

10.[1]High magnification electron micrographs of such hypotonically swollen cells reveal the organization of the nucleoprotein fibers in greater detail...[11]The chromosomes themselves were found to have widths of around 0.8$_u$m which is very similar to the dimension that was measured from thin sections of mitotic cells which were not hypotonically swollen (fig. 1). [12]This indicated that the chromosomes of hypotonically swollen mitotic cells are not expanded to any great degree. [13]Therefore the differing appearance of the chromosomes in swollen and unswollen cells would seem to be due mainly to the removal of background material that masks the organization of the nucleoprotein fibers in unswollen cells....

12.[1]A widely used procedure for the isolation of metaphase chromosome is the hexylene glycol technique of Wray and Stubblefield....[4]Fig. 5 contains thin sections through metaphase chromosomes in these cells. [5]The chromosomes are more condensed than those shown in figs 2 and 3, and have diameters of around 0.6$_u$m (compared with a value of about 0.8$_u$m for mitotic cells in medium or in aqueous buffer containing 1.5 mM $MgCl_2$). [6]In addition to the

condensed nature of hexylene glycol chromosomes, the peripheries of the chromosomes are seen to consist of radially oriented fibers with diameters of about 500-600A. [7]Electron-dense material is also seen to pass through the transverse sections of chromosomes, with no large, internal, open areas. [8]So although the chromosomes in hexylene glycol buffer are quite condensed, the general morphological features of chromosomes in this buffer are consistent with the thin sections using aqueous buffer. OCM 8-12

In these examples, the features noted by Halliday, particularly non-identifying epithets and connotative lexis, account for the identification of some of the evaluation of value. In other words, some evaluation is straightforwardly signalled i.e.

Example 5.9

distortion 24.1

straightforward 25.3

preferable 25.4

difficult 25.4

important 26.2

accurately 26.8

Example 5.10

disruptive 8.1

not possible 8.6

obscure 9.3

easily 9.8

If the presence or absence of consistency, the register-specific criterion mentioned above, is included in connotative lexis, the list becomes longer, including the following:

Example 5.9

results differ 24.2

we find no + repetition 24.3

no evidence 25.2

same conclusion 26.9

Example 5.10

differing appearance 10.13

consistent with 12.8

On the other hand, the same signals will incorrectly identify 'correct' in Example 5.9, 24.2 as positively evaluative. The verb *correct* always presupposes a negatively-evaluated object that stands in need of correction (Hoey, personal communication). In this case, however, because the correction is performed by those with whom the writers disagree, the presupposed object cannot be taken as negatively evaluated and the action of correction does not, for these writers, have positive value. This illustrates the context-sensitive nature of even the apparently most clearcut of evaluative signals.

Much of the most important evaluation of value in these two examples is, however, left unexplained by the above approach. This is because the criteria for evaluation are not external to the text, but are set up by the text itself. In Example 5.9 the criterion of closeness to the in vivo situation is established in 26.2. This means that *solenoids that have never been disrupted* in 26.4 and *reflect the structure of in vivo chromatin fibers* in 26.8 in effect give positive value. Furthermore, 26.5-7 have the same effect, but without even the clue of lexical repetition or replacement. Rather, the evaluation is done indirectly, through a series of steps which may be paraphrased as follows:

The p_a for non-disrupted solenoids looks lower than that for refolded solenoids, suggesting that the refolded solenoids are not like in vivo ones. (26.5)

However, the p_a for non-disrupted solenoids is probably actually higher because it contains a positive element. (26.6)

The positive element can be discounted because it is due to aggregation (26.7).

Therefore, the refolded solenoid is in fact like the in vivo one.

(Intertextual evidence tells us that aggregation is a form of distortion and the things it causes should be discounted.)

Another example of instantially-created value is 25.2, which is interesting because it is only seen to evaluate 25.1 in retrospect, that is, after 25.3. At the point in the text at which 25.2 occurs, the value of identicality is not obvious, but it becomes so in the following sentence (25.3). The evaluation of identicality is essential to the writers' argument against Crothers. Finally, *partial* in 26.3 becomes a negative evaluation of what follows because a question has been set up (26.2) which requires a complete answer.

Similarly, in Example 5.10, much of the evaluation of value is created instantially by the text itself. A value system is established by the problem identified by the negative in 8.6. To state this informally, anything which enables the path of folding of DNA fibers to be discerned evidently has a positive value. The action taken in 9.1 is therefore good, as is explained in 9.3. The success of the experiment is evaluated in 9.7, 9.8, 10.1 and 10.13. The linguistic means by which this value system and its associated evaluations are achieved (and recognised) depend partly on

lexical repetition and reformulation. Figure 5.1 sets out six lexical chains which join together the sentences mentioned above. What is equally important, however, is that these chains are instantially given value. For example, the items in chain (5) (*background material*) are bad or problematic because of their links with the negative items in chain (6) (*obscure*). On the other hand, the items in chains (1), (2) and (3) are established as good in that their absence creates a problem to be overcome (8.6 and 9.1). For this reason, items in chain (4) (*remove*), when combined with (5) and (6), constitute positive value. The mechanics of this instantial creation of value will be discussed further below under the topic of goals (Section 5.4).

These examples illustrate some of the difficulties inherent in trying to apply a theory of attitudinal language to the identification of 'good' and 'bad' evaluations in discourse. The problems may be summarised in three groups. Firstly, what counts as a non-identifying epithet, or as lexis with evaluative connotations, may be seen to be register-specific. The problematic nature of *difference* when applied to results, is specific to experimental research articles, for example, whereas the negative value of *aggregation* is specific to articles on particular topics. Rather than suggesting that some value-words are 'universal' and others are 'register-specific', however, it maybe more profitable to deem all evaluation register-specific, but to note that many registers share sets of value judgements. In other words, if evaluation of value realises the ideology within which the text has been produced, then very pervasive ideologies will produce similar values, even in different types of texts. Secondly, much of what counts as value is established by the text itself. This type of text-

FIGURE 5.1 Lexical Chains in Example 5.10

	1	2	3
8.6	distinguish	path of folding	nucleosome-containing DNA fibers
9.1	follow	path of folding	nucleoprotein fibers
9.3		organisation	chromosome
9.8	discern	organisation	sub-chromosomal fibers
10.1	reveal (cause to discern)	organisation	nucleoprotein fibers
10.13		organisation	nucleoprotein fibers

	4	5	6
9.3	separate	surrounding electron-dense material	obscure
9.7	extract	cellular material	
9.8	remove	background material	
10.13	removal	background material	mask

specificity makes the definition of evaluation very difficult but the explicitness enables the non-expert reader to identify value. Thirdly, it is possible for a writer to convey evaluation of value without having it lodge in any one clause or lexical item. Any clausal or lexical system of identification of evaluation will therefore be inadequate. The following sections will examine the notion of evaluation as a terminating element and note the problems inherent in defining evaluation in this way.

5.2.3 The Problem of All-Pervasiveness

Halliday notes that

> Since expressions of attitude tend to be strung throughout the clause, rather than being associated with one particular place, there are very few words that serve only an attitudinal function.
>
> Halliday, 1985a, 163

This is true not only of the clause but of discourse. Identifying an evaluative element in a structure or pattern is problematic because items which indicate value tend to pervade texts and to co-occur with ideational meaning. The problem then lies not in finding evaluation so much as in finding items which carry no value meaning at all. This may be illustrated by Example 5.9 above. The various evaluations of value in these three paragraphs are set out in Figure 5.2. It may be seen that of 17 sentences, only two (25.1 and 26.1) do not give value. In many of the remaining sentences, an item is presented and evaluated in the same sentence (e.g. the *chromatin samples* in 24.1; the *demonstration* in 25.3; the *question* in 26.2). Even if these are ignored and the term evaluation is reserved for retrospective evaluation, however, a problem remains. Consider paragraph 26 of this example. We may propose a unit here consisting of three elements: a question (S1 and 2), an answer (S3-7) and an evaluation (S8-9). However, although these elements may be distinguishable, it is not the presence of evaluation of value which distinguishes them, as S5-7 give value to the recondensed solenoids just as much as S8-9 do. If evaluation of value is not confined to discrete evaluative elements within a unit, then it is not possible to use a notion of element and unit to identify evaluation of value.

FIGURE 5.2 Value Evaluation in Example 5.9

Item in	Sentence	Evaluation in	Sentence
chromatin samples	24.1	+ (not distorted)	24.1
results	24.2	- (disagree with other works)	24.2
work of Crothers	24.2	- (results not corroborated)	24.3
measurements	25.1	+ (identical)	25.2
demonstration	25.3	+ (straightforward)	25.3
demonstration	25.3	+ (preferable approach)	25.4
work of Crothers	25.2	- (results not corroborated)	25.5
question	26.2	+ (important)	26.2
preparation with NaCl	26.2	+ (answers questions)	26.3
dilution with $1\text{-}2Mg^{++}$	26.4	+ (no disruption)	26.4
value of p_a	26.5	- (different from chicken)	26.5
value of p_a refolded structures	26.5	+ (underestimate)	26.6
value of p_a	26.5	+ (difference due to aggregation)	26.7
method	26.8	+ (reflects in vivo fibers)	26.8
method	26.8	+ (corroborated by Thoma etc.)	26.9

5.2.4 The Problem of Cumulation

Although the evaluation in Example 5.9 was pervasive, individual sentences could be found which had the function of giving value. In many cases, however, no clause or sentence may be said to give value by itself, but rather the effect of evaluation is given by a series of low-level (that is, non-attitudinal) evaluations. This may be illustrated by Example 5.11.

Example 5.11

[1]Due to the typical saturation properties of polyelectrolyte dipole moments (ref), we only reach 85% of p_a at the highest field strengths available to us. [2]In contrast, Crothers and coworkers (ref) claim actually to reach p_a at field strengths similar to ours. [3]Additionally, they report that solenoids orient with a classical induced (non-saturating) dipole moment, unlike polyelectrolytes of similar lengths. [4]We note that this saturation of the dichroism reported by Crothers and coworkers is obtained only after correcting for a large field-induced absorbance decrease, which is assumed to be isotropic. [5]As will be discussed in detail below, we do not observe this pulse-associated absorbance change. HOSC 15.1-5

Here the work of Crothers and his coworkers is being given a negative value. For convenience' sake, S5 may be labelled 'evaluation', but in fact the sense of negativeness is not confined to the final sentence, nor is it particularly strong in that sentence. Rather, it is the result of the cumulative effect of:

- *claim* in S2, which predicts negative evaluation (see Chapter 4)
- *only* in S4
- *assumed* in S4 (Other people's assumptions, like claims, predict negative evaluation)
- *we do not observe* + repetition in S5

Example 5.11 represents a fairly typical situation for the problem of evaluation by accumulation to occur, that is, where professional ethics prevent an outright negative evaluation of someone else's results. Another typical setting for cumulative evaluation is in the evaluation of the

experimental method. It is, of course, essential that the reader is convinced that the experiment has been carried out accurately, with all possible distorting effects avoided. This may be summarised in the phrase 'the experimental method was accurate', but it is rarely possible to isolate any one segment of the text which explicitly states this value or its paraphrase. As an example of this, I shall take the entire Results section of the text OCM (Example 5.10). This section has two functions: to present the results of the experiment in a series of figures and to evaluate the method of the experiment. This evaluation is not the focus of the section and is not confined to any one part of it, but occurs throughout, the cumulative effect being of positive value. The items which give value have been discussed above (5.2.2), and it suffices here to note that, just as the evaluation is not explicitly stated in any one part of the text, so the thing being evaluated, the experimental method, is rarely explicitly identified as such.

Interestingly, Hasan (1985) makes similar observations regarding the cumulative and context-dependent nature of evaluation of value when discussing how offers may be differentiated from threats on the basis of the desirability or otherwise of the action predicated. Rejecting criticisms that such judgements are unavailable to the analyst, and that therefore the threat/offer distinction cannot be made with any certainty, Hasan appeals to a notion of context and of cumulative effect:

> I would suggest that there are many things that in themselves are neither good nor bad: in this respect they are essentially neutral. But these things will be heard as bad, if they are embedded in an interaction where the addressee is subjected to non-cooperation and /or to consistent prohibition. These same things will be heard as good - i.e. possibly desirable to the addressee - if the offer-maker has not by word or deed indicated a prohibitive and/or non-cooperative stance toward the addressee.
>
> Hasan, 1985, 19

5.2.5 The Problem of Dual Evaluation

Another major problem concerned with a view of evaluation of value as an element in a linear sequence is that it is not always as easy as might be expected to identify which item is being evaluated. In many cases, it is clear that more than one item is being given value by the clause or sentence in question. There is therefore no one to one relation between evaluating sentence and evaluated item, which renders problematic the notion of sequential elements. Three aspects of this issue will be discussed here: the possibility of evaluation being of an item in a preceding, subsequent or the same sentence; the implicit evaluation of one item through the explicit evaluation of another one; the occasional indeterminacy in the status of the item being given value.

Turning to the first aspect, we note that it is easy to identify three different configurations of relation between evaluated and evaluator:

1. The evaluation is retrospective, the evaluated item being referred to in the evaluating clause by an anaphoric noun or pronoun, as in Example 5.1, quoted above. The evaluating item is often contiguous to the evaluated one, but may not be, as when two items are evaluated simultaneously (see Example

5.12, where both the *discrepancy* and p_a are given positive value, and where the discrepancy but not p_a is found in the preceding sentence).

Example 5.12

Indeed this slight and easily explained discrepancy gives us confidence that p_a is a significant description of filament structure. HOSC 10.3

2. The evaluation is prospective, the evaluated item being referred to in the evaluating clause by a cataphoric noun, verb or pronoun, as in Example 5.13. This is most commonly found when the value category being employed is that of importance.

Example 5.13

On the other hand, the introduction of a 94-residue polypeptide derived from the COOH-terminal end of calf thymus H1 (ref) produced a striking result. PCHT 33.2

3. The sentence or group of sentences evaluates an item within itself. This is typically the case when an experimental method is being evaluated as useful, as in Example 5.14. It also occurs where an item is presented and evaluated in the same sentence, either through modification (Example 5.15) or equivalence (Example 5.16). Highlighting has been added in all three examples.

Example 5.14

To clarify the structural basis for the requirement of core histone tails for higher-order structure, we have attempted to regulate the electrostatic balance within the chromatin complex in other ways. PCHT 32.1

Example 5.15

With the further reasonable assumption that... HOSC 3.4

Example 5.16

A good fit to the data is also obtained by the "ion flow analysis" developed by Hogan et.al. (1978) for DNA. HOSC 14.9

The second aspect of the dual evaluation issue (implicit and explicit evaluation) may be illustrated by reference to Example 5.17 below. In this example, the values of two conflicting experimental results are evaluated. The evaluation and resolution of the conflict present ethical problems for the writers, in that the status of the results must be KNOWN and therefore cannot subsequently be evaluated as + or -true. In other words, the writers cannot conclude that either their own or Tjerneld et. al's results were wrong in the sense that they did not really happen. The conflict must be resolved in some other way, but the resolution can never be neutral with respect to both parties. Both sets of results may be accurate but they cannot both be valid, in the sense of being generalisable. The resolution of the conflict will therefore give negative value to either McGhee et.al. or Tjerneld et.al. and simultaneously give positive value to the other.

Example 5.17

[1]As can be seen from figure 1, the dichroism measured for the filament form of all chromatins studied is strongly negative. [2]This agrees with electric dichriosm measurements made on oligonucleosomes (Houssier et.al., 1981). [3]On the other hand, Tjerneld et.al. (1982) have reported that the flow dichroism of unfractionated rat liver chromatin at low ionic strength is positive. [4]Both Tjerneld et.al. (1982) and Yabuki et.al. (1982) have attempted to resolve this discrepancy by suggesting that the chromatin filament could be distorted by the applied electric field. [5]We have reported previously (ref) that we could find no evidence that the electric field induced any chromatosome reorientation relative to the adjacent spacer DNA. [6]Furthermore we observe negative dichroism at low electric field strengths where the orienting force is of the same order of magnitude as in the reported flow experiments. [7]Finally, our own flow experiments on chicken erythrocyte, sea urchin sperm, and rat liver chromatin filaments give negative dichroism (ref) and, in a separate apparatus, negative birefringence (ref). [8]We have atttempted to mimic the results of Tjerneld et.al (1982) by working at high chromatin concentrations or by addition of polyamines or even RNA, but the sign of the flow dichroism has remained consistently negative. [9]It has been suggested that a positive chromatin dichroism is often associated with aggregation (ref). [10]We note that the filament model dictated by our dichroism measurements is in agreement with electron microscopy (ref) as well as neutron scattering (ref). HOSC 23.1-10

The paragraph falls neatly into a Problem-Response pattern, which is presented here as Figure 5.3. A key sentence is S4 which organises the

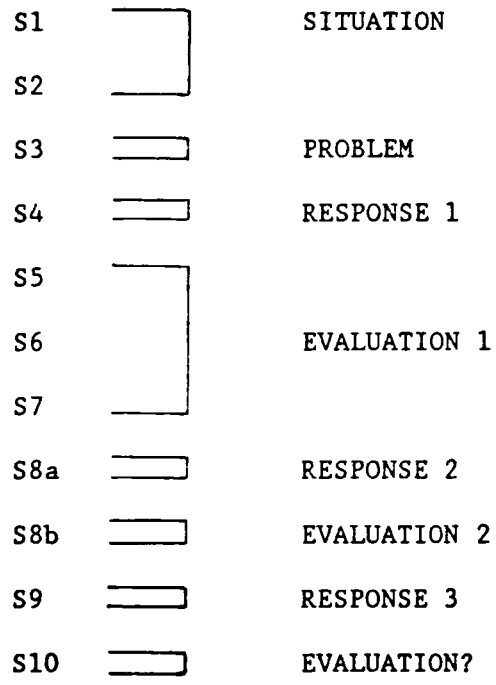
preceding text into a chunk - the problem - by the word *discrepancy* as well as giving the first response to the problem. This representation, accurate though it is in terms of the linear progression of the paragraph, expresses the evaluative elements (S5-7, S8b and S10) as giving value only to the various responses to the problem of the discrepancy. That is, what is deemed by this representation to have been given value is

a) the suggestion that the chromatin filament could be distorted by the applied electric field (S4, evaluated by S5-7)

and

b) the attempt to mimic the results of Tjerneld et. al. (S8a, evaluated by S8b).

FIGURE 5.3



Clearly, however, the paragraph most saliently evaluates the writers' results and, by way of dealing with a potential challenge, those of Tjerneld

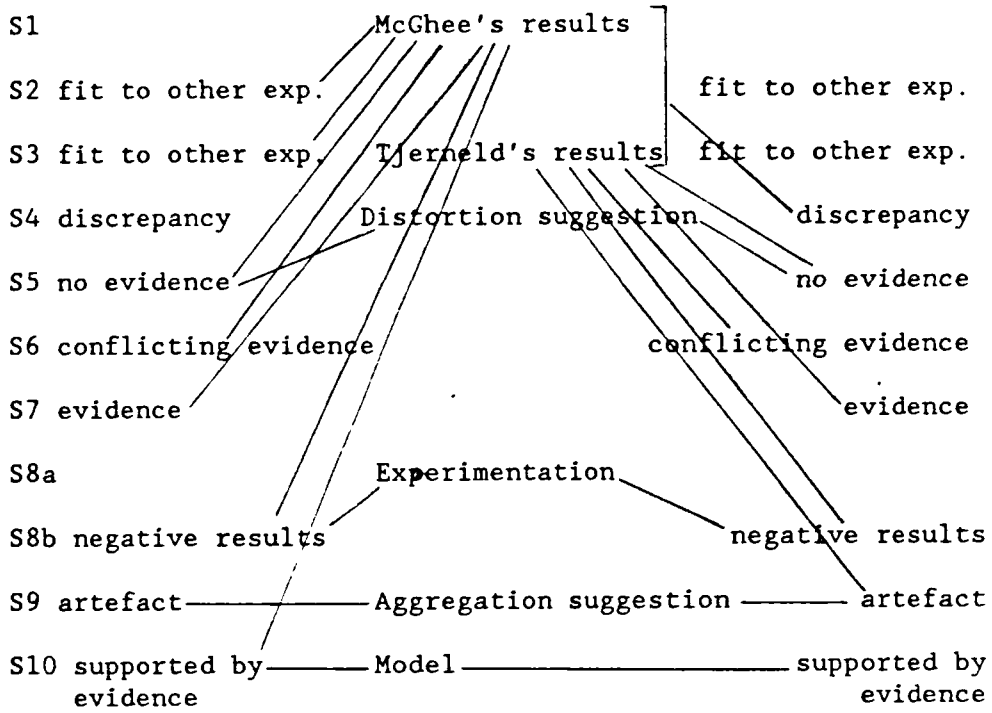
et. al. The writers' results (negative dichroism) are evaluated positively by stating that they agree with other measurements carried out (S2) and with other forms of experiment (S7). In addition, the model which the negative dichroism supports has been supported by other experimental methods as well (S10). Furthermore, a possible objection to the results, that they could arise out of a distortion of the filament, is discounted on the grounds of lack of evidence (S5) and the uniformity of the result under less distorting conditions (S6).

Tjerneld et. al.'s results (positive dichroism) are evaluated negatively by the accumulated account of lack of supporting evidence (S5) and presence of conflicting evidence (S6,7,8), and by the suggestion that aggregation may be responsible for the positive dichroism result (S9). Figure 5.4 represents these two sets of evaluations. Also included in Figure 5.4 is the filament model which is evaluated as supported by evidence in S10.

FIGURE 5.4

	McGhee's results	*Tjerneld's results*	*Filament model*
S1	status		
S2	+ value		
S3	- value	status	
S4			
S5	+ value	- value	
S6	+ value	- value	
S7	+ value	- value	
S8a			
S8b	+ value	- value	
S9		- value	
S10	+ value		status + value

FIGURE 5.5



Putting the two figures together, we get the more complex but more complete picture of Figure 5.5. The figure shows that a sentence like S5, for instance, evaluates the suggestion of distortion negatively, McGhee's results positively and, because McGhee's and Tjerneld's results are mutually exclusive, Tjerneld's results negatively. This demonstrates that dual evaluation leads to substantial subtlety and complexity of meaning.

A similar case occurs where one item, evaluated explicitly, relates to a previous argument which is thereby evaluated implicitly. It is instructive to consider Example 5.18 in this light. The clearest, that is, the most lexically-realised, evaluation in this extract occurs in 25.4, with the lexical item *unacceptably*. What this immediately evaluates is the *change* described in 25.3 only. The unacceptability of this change, however, is grounds for the evaluation of the model proposed in 24.3. There is a logical

chain linking 24.3 to 25.3, with the result that the negative evaluation at the end of the example casts doubt on the beginning.

Example 5.18

24.[3]First, w consider the case in which the entire dichroism change (-0.09 to +0.05 fro low-salt plus Mg^{2+} to cross-linking conditions) is ascribed to change in the angular orientation of the linker DNA, which we take to be 32 base pairs out of the 200 total base pairs in the repeat (ref). [4]The dichroism p_{linker} of an ideal DNA rod, with bases perpendicular to the DNA axis and with the l nker DNA axis at an angle B_{linker} to the field, is (ref) [EQUATION]. [5]Since he linker DNA constitutes only 32/200 of the total DNA, its dichroism would have to change by (200/32)x0.14=0.88 to account for the observed dichroism increase of 0.14. [6]The minimum angular change that could account for this di-hroism change occurs in the neighborhood of the magic angle B=54°: a cha-ge of at least 24° would be required. [8]For example, changing B_{linker} fr m 43° to 68° changes p_{linker} from -0.44 to +0.44.
25.[1]Change of the . nker DNA angle B_{linker} from 43° to 69° would have a large effect of fiber length if there were no compensating structural change. [2]The projection of a 32 base pair linker DNA segment along the fiber axis is 100 cos B_{linker} (A). [3]The change from B_{linker}=43° to 68° would change the projection by 36A from 73 to 37 A/nucleosome. [4]Since the average fiber length per nucleosome in our cross-linked fibers is only about 15A (ref), the change of 36A is unacceptably large in view of the small change in length and apparent morphology on cross-linking. ONC 24.3-25.4

Turning to the third aspect of dual evaluation (indeterminacy of evaluated item), this arises because of the indeterminacy between procedures and results. There is an overlap which may be perceived in the discussion of event or procedure and that of result, the interpretation of which involves, not the following of a line of reasoning, but an 'unpacking' of the meanings realised. Consider Example 5.19 as an illustration of this. The discussion here centres on a comparison between methods of extrapolating a result. Curves on a graph are being compared.

Example 5.19

The DNA curve is obviously a very good quantitative fit to the chromatin data. (HOSC 14.8)

On the face of it, it appears that the result, the DNA curve, is being evaluated here as +accurate. I would suggest, however, (following Figure 5.7

p.215
below), that only an event or a procedure may be evaluated for accuracy. If this is so, then in this example it must be the method of extrapolation that is being evaluated, indirectly, as being accurate in the sense of producing a result which fits other data. In other words, Example 5.19 demonstrates the need for an unpacking of meanings.

5.2.6 The Problem of Value and Status

The final problem to be considered in this section is one which is particular to the theory of evaluation propounded in this thesis. I have proposed a distinction between evaluation of certainty, which I have called status, and evaluation of goodness, which I have called value. In Chapter 4 it was mentioned that certain status items might in themselves confer value, and it is appropriate here to raise this issue again. In the discussion of Example 5.11 (5.2.4), it was noted that some of the items that contributed to the accumulation of value in that text were status evaluations (*claim* and *reported assumption*). These status items represent a meeting-point of certainty and good-bad evaluations, in that they give negative value to another writer's certainty. At this point, then, the distinction between the two types of evaluation becomes fuzzy.

Another point of distinction between status and value, which so far has remained largely implicit in my argument, is that status is noun-like and value is predicate-like. In other words, in the (invented) sentence:

The hypothesis is supported by the data.

the hypothesis is the status item to which the value of support is given. The ambiguity surrounding nominals like this but which do not evaluate certainty has been discussed in Chapter 4. A further illustration of this

point may be found in Example 5.20, in which key items, including those indicating status, are underlined.

Example 5.20

[1]Trypsin treatment results in the removal of the exposed terminal regions or tails of the histones that make up the octamer of the nucleosome core in chromatin. [2]Previous work on trypsin-treated mononucleosomes has led to conflicting conclusions as to whether the core histone tails are necessary to maintain the structural integrity of these particles. [3]On the one hand, a ten base-pair ladder of DNA fragments, extending up to 146 base pairs, is found after DNase I digestion of trypsin-treated core particles (refs) and, as such, demonstrates that contact between all of the DNA and the remaining protein in these particles is maintained. [4]On the other hand, trypsin treatment of core particles also leads to a reduced sedimentation coefficient (refs), a change in the circular dichroism spectrum towards that of free DNA (ref), a reduced thermal stability (ref) and an increase in overall susceptibility to both micrococcal nuclease and DNase I(refs). [5]Mainly on the bases of these latter observations, Lilley and Tatchell (ref) concluded that removal of the core histone tails leads to a release of DNA from the confines of the core particle. [6]Neverthless, on the strength of the above mentioned DNase I pattern it is generally accepted that the core histone tails are not essential for maintaining the integrity of the core particle (refs> [7]From the results presented here, with H1-stripped polynucleosomes, it appears that after trypsin treatment the length of DNA in the linker sements between the cores is increased by up to 80 base pairs, leaving only one superhelical turn around the octamer. [8]No other mechanism by which the DNA may be generated can easily be envisaged, since the DNA repeat length remains unchanged. [9]These results should not, however, be taken as providing evidence for the role of the tails in maintaining core particle structure, for, in the assays we have performed (sedimentation, electric dichroism, and electron mcroscopy), shearing forces will be encountered, for example during spreading for microscopy, which may substantially disrupt the structure of a long chromatin fiber (weakened by the absence of the core histone tails) but might have little effect on the stability of a core particle. PCHT 43.1-9

Here the value of the various arguments depends largely on their status and, again, there are two items which are borderline between status and value: *conflict* (S2) and *evidence* (S9). Whereas *claim* and *assumption* are held to be primarily status, however, *conflict* and *evidence* are, according to my distinction, primarily value. In this text, however, they arguably behave like status labels. *Evidence* is a noun, again existing potentially as a status item which would support a theory in much the same way as observations do. *Conflicting* is used as a modifier of *conclusion*,

potentially indicating a sub-class of conclusions. While I think it is reasonable to maintain the present distinction between status and value, these examples show how the two may overlap, and suggest that status and value may represent two ways of looking rather than a distinction between two types of phenomenon. (See Chapter 8 for a reprise concerning the distinction between status and value in other genres.)

5.3 Some Solutions

5.3.1 Introduction

For the linguist, then, the notion of value presents specific types of problem. A definition of linguistic method would include the establishment of units of analysis (word, clause, sentence, discourse element etc.) and the propounding of specific criteria for the identification of categories. The identification of value seems to resist both aspects of this definition. Unlike status, the analysis of which may be associated with a string of clauses, value seems to spread out amorphously. It is difficult if not impossible to separate from non-evaluative language. Secondly, there is a problem in trying to formulate a general definition of value that will cover all instances of a particular register. Such a definition cannot depend in its entirety on the lexico-grammatical signals proposed by Hoey (1979), since these signals, as demonstrated above, may be text-specific rather than register-specific. On the other hand, value is the aspect of experimental research articles that is most easily recognised by the non-expert reader. (These difficulties become apparent when evaluation is taken as a parameter of text meaning alongside other such parameters. In Hunston, 1982, for

example, my attempt to distinguish an evaluative sub-text from descriptive and narrative ones led to quite different techniques being used.)

Such difficulties may be summarised as follows: it is easy to see what kind of value a writer is attaching to the statements that s/he makes, but it is difficult to see how this perception may be represented in a linguistic analysis. What form would such an analysis take?

As a preliminary to answering such a question, and as a bridge from the problems posed in the last section and the analytical method to be proposed later, I shall consider some concepts which are crucial to an understanding to a notion of value. These concepts do not describe the structure of a discourse. Rather, they are concepts which explicate the social construction of value and as such examine some of the ways in which that value may be represented.

In order to do this, two terms need to be introduced in addition to the status and value already being used. These terms are *basis* and *grounds*. Again it must be emphasised that these are categories of information, not of discourse. I shall illustrate their usage here briefly by means of Example 5.21.

Example 5.21

It has been proposed that in the 10-nm fiber observed at low salt concentration, the nucleosomal disks are arranged with their diameters nearly parallel to the fiber axis. However, this conclusion is not supported by the flow dichroism studies of Tjerneld & Norden (1982). ONC 1.3-4

The item to be evaluated here, the proposal concerning the arrrangement of nucleosomal disks at low salt concentration, has the status of reported hypothesis. For any item of this status, there is a limited set of bases upon which it may be judged. That is, assessment of value must be

made concerning one of a particular set of properties or relations belonging to the item. In this case, the basis for the evaluation of the hypothesis is its degree of supportedness by other research. A hypothesis which is well-supported will be judged more positively than one which is less well-supported. Using this basis, the value accorded to the hypothesis in this example is negative. This judgement is made on certain grounds, or citing certain reasons, namely, the results of Tjerneld and Norden. A simulated dialogue will hopefully clarify the terms:

What is the Status of the item to be evaluated?

It is a reported hypothesis: a proposal that in the 10 nm fiber, the nucleosomal disks are arranged with their diameters nearly parallel to the fiber axis.

Upon what Basis is the item evaluated?

The basis of its supportedness by data.

On that Basis, is the item given positive or negative Value?

Negative value.

Upon what Grounds is that Value decided?

The grounds of Tjerneld and Norden's studies.

The nature of this description, as pertaining to information rather than discourse, is apparent from the fact that only the status and the grounds elements actually appear in the text, while the rest are merely inferences.

5.3.2 Goals: The Basis for Evaluation

In the discussion of Example 5.10 above (Section 5.2.2, p.181), it was noted that a text itself may instantially create attitudinal language. In the example quoted, for instance, the clause *much of the cellular material has been extracted from the hypotonically swollen cells* (OCM 9.7) gives value to the experimental procedure undertaken, and yet there is nothing in the clause that could be considered attitudinal or evaluative outside this particular context.

One way to explicate this phenomenon is to invoke the notion of goals (cf Hunston, 1985). The writers of the text cited in Example 5.10 establish as a goal the following:

- *to distinguish the path of folding of the nucleosome-containing DNA fibers*. (8.6)

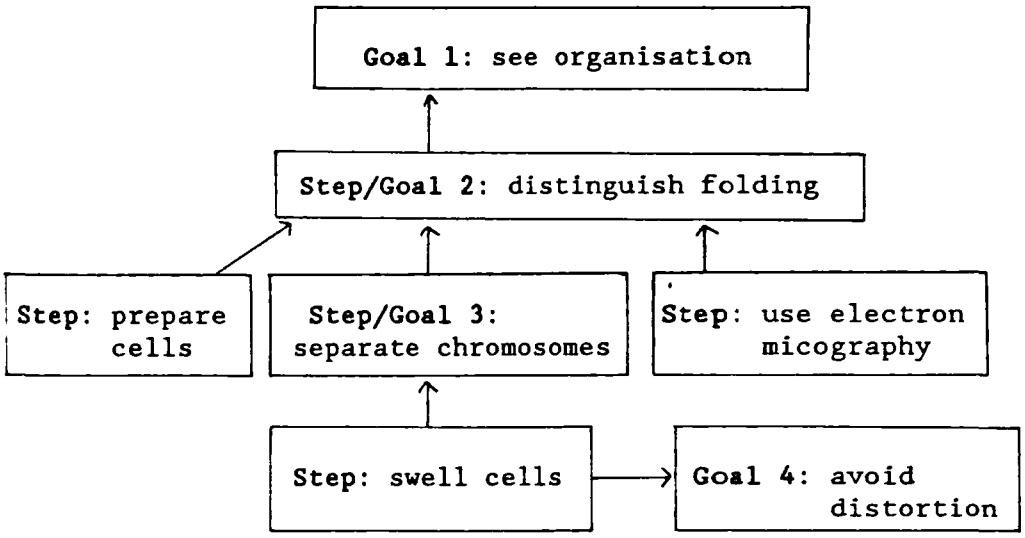
(The mechanism of the establishment of a goal will be discussed below.) Subsequently, as a step towards the achievement of this goal a sub-goal is established:

-*to substantially separate the chromosomes from surrounding electron-dense material*. (9.3)

Anything which helps towards the achievement of these goals therefore has a positive value, whilst anything which detracts from that achievement has a negative value. Thus, the procedure described in 9.1-2 has a positive value in that it is designed to achieve the sub-goal and therefore the main goal also. Similarly, the procedure in 9.4-6 is evaluated as achieving the sub-goal (9.7) and therefore the main goal (9.8). In the next paragraph a further step towards the achievement of the main goal is described (10.1). A potential hindrance to the achievement (the distortion of the fibers) is

described as having been avoided (10.12-13), and this again is of positive value. This arrangement of goals and steps may be represented diagrammatically as in Figure 5.6.

FIGURE 5.6



It is necessary now to consider by what linguistic means the writers indicate their goals, the achievement of their goals, and therefore the value of the statements they are making. Two signals of goal are:

1) *to + verb*, as a variant of *in order to*

2) the lexical items *hope* (n,vb), *aim* (n,vb) *object* (n), *intend/intention* and similar.

S9.1 therefore signals a goal plus the step towards a goal and S9.3 redefines that step as a sub-goal. To explain how the achievement of the goal is signalled, it is necessary to recall the lexical chain set out in Figure 5.1 (Section 5.2.2 above, p.186), as it is largely by repetition and paraphrase that goal-achievement is signalled. The evidence that 9.8, 10.1 and 10.13 signal the achievement of the main goal lies in the repetition or

reformulation of *follow*, *path of folding* and *nucleoprotein fibers*, with the verbs in a factual (achieved) aspect. Similarly, 9.7, 9.8 and 10.13 signal the achievement of the sub-goal through the repetition or reformulation of *separate*, *electron-dense material* and *obscure*, again with the verbs in a factual aspect.

Two further items in this example need explanation. Firstly, it was stated above that S8.6 of Example 5.10 establishes the writers' goal, yet it contains neither of the two sets of signals mentioned above (the *to* not standing in this case as a variant of *in order to*). In fact, 8.6 contains a signal of problem, that is, a non-achievement of a goal: *'it is not possible'*. From the existence of this problem it is possible to infer the goal which the problem is blocking. The inference is then confirmed in 9.1. Secondly, I have stated that 10.13 signals the non-occurrence of a potential problem. The reasoning for this involves the negative in 10.12. Negatives normally indicate the absence of an alternative, which may be better or worse than the actuality. In this case, lack of possible expansion reaffirms the achievement of the goal (10.13), it may be assumed that the alternative would be of negative value, that is, a problem.

The specific example of Example 5.10 may be generalised as follows. Firstly, the explicit statement of a goal may make it possible for subsequent sentences, which do not apparently contain attitudinal language, to be interpreted as giving value. Repetition and paraphrase play a significant role in such an interpretation of value. It is worth noting that antonymy or incompatibility also plays a role in signalling negative value. An interesting example is Example 5.22, where the number mentioned in the third sentence is clearly incompatible with (and therefore in a sense 'antonymous to') the actual value of p_a *(-0.26)* cited in the Table 1.

Example 5.22

Chromatosome tilt angles calculated for this model are listed in Table 1. This model is *not* compatible with our dichroism data for either chicken erythrocyte or sea urchin sperm chromatin. For example, in sea urchin sperm chromatin, a parallel chromatosome (y_c=0) and a perpendicular spacer would predict p_a=+0.03. HOSC 31.1-3 (original emphasis)

(For additional examples of this use of antonymy, see Hunston, 1985). Secondly, explicit expressions of value allow the reader to reconstruct the writers' goals. This second point is of course dependent on the first one, as it is only necessary to invoke the concept of goals at all in order to explain evaluation which is not explicit.

Certain goals are so common to a particular register that they require neither explicit statement nor explicit allocation of value for their maintenance. The evidence for their existence, therefore, comes from sociological studies of science rather than from textual evidence. From the linguist's point of view, the argument is circular. Items are claimed to be evaluative because they express achievement of goals, and goals are claimed to exist because of the presence of this evaluation. Because of this circularity, the presence and significance of goals cannot be proved. The most that can be said is that the occasional occurrence of an explicit goal and explicit value motivates the identification on those occasions where either the goal or the value remain implicit. In addition, goals do offer an explanation for the presence of certain types of argumentation. As this point is concerned more with philosophy than with linguistics, I shall not go into details here, but as an example it may be noted that the putative goal 'Relate your work to that of others' would explain the presence of Move 2 in Swales' four-move model of Introductions.

In Chapter 4, I noted that the status of an item to be evaluated places restrictions on the kind of value it may subsequently be given. This maybe rephrased as the observation that the status of an item restricts the basis (or bases) upon which it may be given value. This point was illustrated negatively in Chapter 3 by noting that a KNOWN or an UNKNOWN may not have truth as the basis for evaluation. To take further positive examples: a hypothesis may be given value on the basis of its consistency with experimental results and its explanatory power; an experimental result may be given value on the basis of its generalisability, its fit with existing theory, its freedom from observer bias. (More detail of this will be given in Section 5.4.2 below.)

In this section I have made the further suggestion that the basis for evaluation may be seen in terms of the writers' goals. Reinterpreting the above examples, then: if the writers posit a hypothesis, their goal must be to establish its consistency with experimental results, and if results are given, the goal must be to prove their independence etc. It should be borne in mind, of course, that such goals do not necessarily represent the writers' true state of mind. It is by no means unusual to find a 'straw-man' hypothesis, for example, where the goal is apparently to find support for the hypothesis, but when that fails an appeal can be made to the writers' own preferred hypothesis.

Reinterpreting basis as *goal* in this way emphasises the intentionality of the writers' work and therefore the (inter-) personal nature of evaluation of value. Things have value to a person, or to a social group, because of the goals of that person or group. On the other hand, it may over-emphasise the importance of actions carried out by the writers and make other less action-centred texts more difficult to interpret.

Thus, it is possible to see the basis of evaluation most profitably in terms of goals, particularly where a set of procedures is being described. In general, however, it is useful simply to note that basis provides the link between status and value, and that it may or may not be explicitly stated. Example 5.23 illustrates explicit statement of basis, while Example 5.24 illustrates basis expressed in terms of an unachieved goal.

Example 5.23

The accuracy with which electric dichroism can be used to determine details of chromatin conformation depends in part upon the accuracy with which the p vs 1/E plots can be extrapolated to $1/E = 0$, to obtain the p_a characteristic of the fully oriented molecule. HOSC 13.1

Example 5.24

One of our objectives upon initiating this study was to compare the dichroism properties of calf thymus and avian erythrocyte chromatin, both with cross-linking and without cross-linking. We found, however, that maximal reaction of erythrocyte chromatin with dimethylsuberimidate did not produce exclusively high molecular weight cross-linked protein aggregates, in contrast to the results we reported earlier for calf thymus chromatin. ONC 10.1-2

5.3.3 Grounds: The Realisation of Value

The last section began with a second look at Example 5.10 and attempted to solve the difficulties inherent in explaining the evaluation of value in it by appealing to a concept of basis of evaluation, relating this to a notion of goals and their achievement. In this section I shall in a similar way attempt to solve the problems raised by Example 5.11. In this example, it was noted that the option of a clear 'statement of value' was not taken up by the writers, but that the effect of value was cumulative. If we assume that what is being evaluated primarily are the results of Crothers et.al., then what is being offered in S4-5 are the grounds for a negative

evaluation, rather than that evaluation itself. The fact that reported assumptions, and a conflicting set of observations can act as evidence, or grounds, for negative value is dependent on the status of Crothers et.al.'s work as a claim.

This practice of giving the grounds for an evaluation instead of the evaluation itself is extremely common in experimental research articles and goes some way towards explaining the common judgement of them as 'objective'. Some further examples are given below. In Example 5.25, an item with the status of model is given the value of reasonableness on the grounds of the small adjustment needed to achieve the goal (*explain the dichroism difference*).

Example 5.25

The alternate limiting model we can take assumes, as we did earlier (ref), that the linker DNA continues on the same local superhelical path as the core DNA and that the total nucleosome contains an integral number of half turns of DNA....Hence, the angular orientation of the nucleosomal disks need change by only 8^0 to explain the dichroism difference between our unfixed and cross-linked chromatin samples. ONC 26.1,4

In Example 5.26, an item with a different status, that of event, is evaluated for accuracy on the grounds of sufficient time lapse. (The means by which such grounds are identified will be discussed below.)

Example 5.26

Reconstitution was carried out in TEP_{80} as previously described (ref). For complexes containing CH1, an incubation of at least 1h with this fragment alone was allowed before subsequent additions were made. PCHT 8.1-2

In the above examples, it is argued that a statement of grounds is standing in for a statement of value, rather than that value is simply being expressed in a rather oblique way. As evidence for this, consider the following examples (Example 5.27 and 5.28), in which both value and grounds

appear in sequence. In each case, the value statement is underlined and the statement of grounds follows it.

Example 5.27

Recent experiments by McGhee et al (1980) and in our laboratory (refs) have used electric field orientation to obtain the dichroism of the fiber. The results of those studies left some unresolved discrepancies, which we seek to clear up in this paper. Specifically, McGhee et al. (1980), working with unfixed erythrocyte chromatin at low ionic strength in the presence of Mg^{2+}, found a limiting dichroism of about -0.2 and did not observe saturation of the orientation at increasing electric field. Our experiments (ref) characterized calf thymus chromatin fixed by dimethylsuberimidate cross-linking in 100 mM NaCl and showed a limiting dichroism of +0.06, with saturation of orientation at voltages above 15 kV/cm. ONC 2.2-5

Example 5.28

28.[1]A relatively popular model for the solenoid geometry stipulates that the spacer DNA runs up and down the interior of the particle, parallel to the solenoid long axis.....29.[1]There are strong objections to such a lengthwise spacer model. [2]With sea urchin sperm chromatin as the extreme example, an 80 bp spacer running parallel to the solenoid axis would predict a more than 10-fold greater rise per nucleosome than is expected from solenoid dimensions. [3]Thus lengthwise spacer models require abrupt, and probably unlikely, direction changes in the spacer DNA. HOSC 28.1, 29.1-3

It may be noted that the last two sentences of Example 5.28 (S29.2-3), that is the grounds, are themselves ranked, in that 29.3 summarises 29.2. In other words, 29.2 provides grounds for the judgement in 29.3, which in turn is grounds for the value statement in 29.1. This might be termed a value-grounds 'ladder'.

The advantage of a theory of grounds, like that of goals, is that it explains how non-attitudinal language can nonetheless be evaluative. What still needs to be explained, of course, is how the reader, even the non-expert reader, recognises the grounds for evaluation. The next section will deal with this question in greater detail, but for the moment it may be instructive to examine the examples of grounds that have been given in this section (i.e. Examples 5.11 and 5.25 to 5.28). In summary, items are

perceived as likely to be giving grounds for evaluation of value if they diverge from a 'normal' pattern of information-giving (cf Labov's (1972) definition of evaluation in narrative as a divergence from the basic narrative clause). The most common type of divergence is the use of comparators, including *only*, (see Examples 5.11, 5.25). Also included as a comparator by Labov is the negative (see Example 5.11). Another indication of grounds is lexical repetition or contrast, as in Example 5.27. Once again it must be stressed, however, that the identification depends not on individual signals but on their combination. Consider, for example, the following sentence from Example 5.26, repeated here as Example 5.29.

Example 5.29

For complexes containing CH1, an incubation of at least 1h with this fragment alone was allowed before subsequent additions were made. PCHT 8.2

It must be emphasised here that the inclusion of this sentence in the category Grounds does not rest upon the elusive 'background knowledge', since for a lay-person there is nothing self-evidently of value in leaving these particular complexes for this particular length of time. Rather, the perception of value results from the combination of the following items: the comparator *at least*, the unnecessary (from the point of view of conveying information) addition of *with this fragment alone*, the lexical item *allow*, and the combination of *allow* with the *before-* clause. As a result of this, the sentence quoted can stand as an evaluation of value of an event.

A final point which may be made about grounds is that a single signal of grounds remains essentially a potential, rather than an actual signal. It is the accumulation of such signals, or the assertion of value, that turns that potential into actuality.

5.4 Analysing Value

5.4.1 Introduction

The previous two sections have shown how difficult it is to record all the evaluations of value in a text. The difficulties arise partly from the fact that value may be given by different strengths of statement; a subtle hint may give value as effectively as an outright declaration, but identifying such hints is by no means simple. In addition, the reliance of the perception of value on the perception of the writers' value-system makes independent observations less than adequate. An attempt has been made to solve these problems by reference to the goal-centered nature of the information in the text, and by reference to the basis and grounds of evaluation. In this section, a description for the analysis of value will be set out. That is, the categories and signals proposed for use in an analysis will be described. It must be borne in mind, however, that in an analysis based upon this description, some of the nuances and intricacies of evaluation will inevitably be missed.

The study of value-judgements within a particular register - in this case, in research articles dealing with a specific topic - serves to reveal the social and ideological norms which the register realises. These may be observed directly by noting the bases for evaluation which are invoked. Thus, Figure 5.7, which shows the categories of value used in this register, reveals the ideology of the register in the sense of showing what may be used to judge the validity of the information given. The table shows that in this register, the bases for evaluation are concerned with the fit between various aspects of the topic: between models and data; between different sets of data; between laboratory data and the non-laboratory world; between

models or data and other aspects of scientific knowledge. None of these aspects is really seen as prior, as the yard-stick against which other aspects are judged, because none is actually directly observable. Rather, the relationship may be viewed using the metaphor of a jig-saw puzzle (except that the pieces of the jig-saw are not pre-cut and represent items at different levels of abstraction (Hoey, personal communication)). This sub-discipline (the study of chromosomes) is based upon the juggling of the pieces of the puzzle. The comfortable fit of the pieces defines the picture produced as correct, until such time as the discovery of more pieces distorts it (cf Kuhn's concept of normal and revolutionary science (Charlesworth, 1982, 32)). Thus the ideology of the sub-discipline is reflected in the value categories created by its discourse.

5.4.2 The Categories of Value

Figure 5.7 sets out the categories of value evaluation found from analysis to be needed to label the texts under discussion. The table consists of three columns. The first column gives the status category to which each value category is applicable. These categories follow the activity types posited in Chapter 4. The activity types predict the basis of the value evaluation that may follow. It must be borne in mind, however, that what cannot be predicted by this is the degree of likelihood of positive or negative evaluation. It is the level of certainty which predicts this. For example, something that is PROBABLE will be evaluated positively, something that is UNLIKELY will be evaluated negatively, while a POSSIBLE may be evaluated positively or negatively.

FIGURE 5.7

Status	Value		Example
	Name	*Definition*	
Question	importance	relevance, significance, appropriateness	ONC 28.2
	answerability	satisfactory answer found	OCM 2.5
Aim	achievability	goal may be achieved	ONC 12.3-5
Self-reference	not evaluated		
Event/ procedure	accuracy	freedom from distortion, artefact etc.	HOSC 22.1-6
	consistency	fit to other methods	HOSC 13.3
	verity	closeness to non-lab conditions	HOSC 26.2-9
	simplicity	ease of performance	ONC 19.1
	usefulness	goal-achieving	HOSC 4.2
	independence	fit to observation, not theory	HOSC 19.1-2
Result	reasonableness	fit to expectation, other facts, projections etc.	HOSC 10.1-3
	reliability	certainty	OCM 13.5
	consistency	fit to other data, repeatability	HOSC23.5-10
	supportiveness	fit to theory	ONC 12.6
	usefulness	ability to evaluate theory	HOSC 1.6
	importance	relevance, significance	ONC 14.1
Fact	importance	relevance, significance	PCHT 2.1
	usefulness	goal-achieving	PCHT 47.3
Unknown	Always negative. May be evaluated as question		

FIGURE 5.7 (continued)

Assumption	accuracy	fit to data	ONC 15.1
	reasonableness	fit to expectation, other knowledge etc.	HOSC 3.4
Conclusion/ hypothesis	accuracy	fit to data	OCM 13.1
	applicability	fit to range of data	HOSC 4.3-5
	usefulness	explicatory power	HOSC 39.5-8
	reasonableness	fit to expectation, other knowledge etc.	ONC 26.4
Estimate	consistency	fit to other estimates	ONC 20.2
Recommendation	usefulness	goal-achieving	OCM 14.7

Some further points need to be made about individual entries in the first column. The category self-reference has not been found to be given value. The same is true of the category UNKNOWN, but in this case the reason seems to be that an UNKNOWN always in itself constitutes a problem. It may also be interpreted as a question, and evaluated as such. Finally, the status categories of hypothesis, and those concerned with drawing conclusions from experimental results, have been conflated. Although their prediction in terms of positive or negative, and their position in the text, is different, they represent the same mental process of inference-drawing, and are evaluated on the same grounds.

The second column gives a mnemonic name to each value category, and also a more precise semantive definition. This is necessary because a term such as 'accuracy', for example, actually refers to something quite different depending on the status category of the evaluated item. An accurate event in an experiment, for example, is one that is free from

distortions, artefacts and so on, while an accurate model, on the other hand, is one which is consistent with the available data. It will be noted that the value categories generally fall into three types: the 'fit' types, such as accuracy, reasonableness, verity, which evaluate the fit of the 'jigsaw puzzle' discussed in Section 5.4.1; the 'usefulness' types which related the information to the writers' more specific goals; and the 'importance' types, which are frequently meta-linguistic. As suggested in Chapter 4, some of these evaluations have the effect of raising the degree of certainty of some status categories. A reported hypothesis, for example, which begins as a POSSIBLE, may be evaluated as +true, and therefore 'pushed up' the certainty scale, by a positive evaluation in the category accuracy.

The third column gives a reference to one example of each value category.

5.4.3 The Signals and Units of Value

The difficulty of identifying attitudinal language in experimental research articles has been discussed in detail above (Section 5.2.2). In this section, however, an attempt will be made to categorise and exemplify signal types.

1. Lexical Signals

Because so many of the value categories are concerned with 'fit' of various kinds, there is a small set of lexical items related to this concept which always indicate value. Those identified so far are:

support	*discrepancy*
confirm	*ambiguity*
consistent	
bear out	

and their negatives. In addition, items such as *same* and *different*, along with other comparisons such as *smaller than* and *larger than* may give value, but only if they are comparing two items for which consistency is desirable, such as experimental results.

Other lexical items may be identified which belong to a particular one of the value categories e.g.

Importance:	*important*	*unusual*
	relevant	*remarkable*
	appropriate	*striking*
Reasonableness:	*reasonable*	*acceptable*
Independence:	*independent*	
Simplicity:	*straightforward*	

2. Goal signals

As discussed in Section 5.3.2 above, lexical repetition, paraphrase or contrast can be used to signal goal-achievement. An item may also be given value as goal-achieving (that is, useful) if it incorporates a signal of goal-directedness. Some signals of this are:

allow	*(in order) to*	*problem*
need	*make possible*	*difficult*

In addition, even without lexical or other signals, where a goal is inferrable it may also be inferred to have been achieved, as in Example 5.30, where it is assumed that the purpose or goal of the first two

sentences cited is to collect fractions of a reasonable length, something which is evaluated as having been achieved in the last sentence.

Example 5.30

For un-cross-linked preparations, the solubilized material was immediately fractionated on a 10-30% sucrose gradient....For cross-linked samples the solubilized fraction was dialyzed.... In both cases, fractions containing 50-75 nucleosomes were collected. ONC 5.3-6

3. Certain status categories

Some status categories carry with them an evaluation of value. An UNKNOWN, for example, always signals a problem, and an UNLIKELY also carries negative value. Other categories have value in certain combinations. For example, the results which follow a hypothesis will evaluate that hypothesis for value.

4. Comparators

As Labov (1972) points out, comparators point out what might be in contrast with what is. They therefore imply an evaluation of what is as better or worse than the alternative. Examples of comparators are *only* and *not*.

A further problem in analysis is the isolation of precise units, which is difficult because of the amorphous nature of value evaluation. Consider, for instance, Example 5.18 (p 198). In this example a model, described in 24.3, is evaluated negatively in 25.4 on the grounds of a fairly complex line of reasoning followed through 24.4 to 25.3. It apears that there are two possible ways of coding this, with two possible unit-types. One way would be to label each sentence as either neutral or giving +/-value. Such a labelling might give the result shown as the first option in Figure 5.8. In this option the sentence is the unit, but the distinction between neutral and value, taking each sentence in isolation, is difficult to sustain. It

seems more sensible to take units larger than a sentence, as in the second option shown in Figure 5.8, which also indicates the relationship between unit parts. The problem really arises from the fact that there is a gradual shift from neutral presentation of a model to its evaluation of value, or what Martin (1986) would call a wave-like movement (see Chapter 7). This resists a satisfactory division into discrete units.

FIGURE 5.8 Unit Options in Example 5.18

	Option 1	Option 2
24.3	neutral	Evaluated
4	neutral	
5	- value	
6	- value(?)	
7	- value	
8	neutral	Value
25.1	- value (?)	
2	neutral	
3	neutral	
4	- value	

5.5 Sample Analyses

5.5.1 Options in Setting Out the Analysis

The question to be raised in this section is that of what an analysis of evaluation of value will actually look like. It is clear what such an analysis should contain: the evaluating item(s), the evaluated item(s), the category of value used and the plus or minus weighting. It is also true, however, that an analysis should if possible be an iconic representation of the information it gives (Butt, personal communication). The amorphous and cumulative nature of value makes a list-type analysis less acceptable than it is for status. Halliday notes this when he comments that an analysis of the interpersonal meaning of a text in terms of 'particles', or discrete segments, is less than satisfactory (Halliday, 1982). Unfortunately, it is not at all clear what analytical representation will accurately portray the complexity of evaluation of value. In this section and the next, therefore, various options will be used in order to illustrate in different ways how an analysis of value may be used to characterise a text. In this section the text HOSC (McGhee et.al., 1983) is used as an example. The figures referred to (Figures 5.9 to 5.14) may be found at the end of the chapter.

The first concept which may be illustrated diagrammatically is that of **value as highlighter**. The argument here is that since everything can be evaluated but not everything is, an evaluation of value serves to make something important relative to the other information around it. Figure 5.9 shows an analysis of the sample text (HOSC) which demonstrates this by selecting from the text retrospective evaluation of value and indicating with arrows the connection between evaluator and evaluated. A further selection has been made, in order to keep the figure within readable

proportions, of those items which are evaluated in more than one sentence. This diagrammatic representation shows two things: firstly, how the text is bound together by evaluation of value and secondly, how certain motifs are highlighted. The highlighted information may be used to construct a representation of the goals of the text (see Figure 5.10).

Another feature which is partly revealed by Figure 5.9 is that of **accumulation of value**. An item acquires value by a process of accumulation as the text progresses. This is shown iconically by the arrows in Figure 5.9, but may be more strikingly illustrated by Figure 5.11. Here, the central hypothesis of the text is shown as acquiring more and more positive value and thereby becoming more and more 'solid' as a hypothesis, although it can never, of course, attain the status of a fact.

Figure 5.11 shows how an individual item acquires value, and therefore illustrates one aspect of **value as movement**. Another aspect of this phenomenon, seen from the point of view of the text rather than of the information, may be demonstrated by marking where in the text evaluation of different types occurs. The crosses in Figure 5.12 show a movement from evaluation of method (sub-goals 1, 2 and 4) to evaluation of hypotheses (Goal 1 and sub-goals 3 and 5).

5.5.2 A Comparison of Two Research Articles

Figures 5.13 and 5.14 represent two somewhat simpler texts than HOSC, and in them an attempt is made to show all instances of evaluation of value, for the purposes of comparison. In these figures, the item evaluated is shown in bold type, and the parameter of evaluation in italics. Arrows are

used to connect the two, and boxes are used where either the evaluated or the evaluator takes up more than one sentence. One of the tests of any method of analysis is that it should make clear observable differences between texts. Here I hope to show how Figures 5.13 and 5.14 explicate the differences between the sample texts. The texts are the same as those used in Chapter 4, and some of the observations concerning the contexts of the two texts are repeated here.

The texts used are those analysed in Section 4.5 above: ONC (Yabuki et.al., 1982) and OCM (Adolph, 1980). The characterisation of the two articles which was discussed in Chapter 4 may be summarised as follows. OCM has a simple argument. Essentially the paper simply describes and evaluates the method of experimentation. The readers must be convinced that what was seen under the electron microscope was what was intended, but that being so, there is nothing else for them to be convinced of. This is the type of persuasion referred to by Fahnestock as 'forensic' (Fahnestock, 1986, 278) and claimed by her to be typical of experimental research articles. The result pictures stand by themselves. In Pinch's terminology, these are 'more proximal' results, the product of direct observation (Pinch, 1985, 9). In addition, there is little intertextuality. ONC, on the other hand, has a much more complex argument. The results are not directly observable (cf Pinch, 1985), and argument is needed to support the need for some of the calculations made. In other words, the results cannot simply be presented, but must be argued for, before they can be used to support a model. Some of the arguments need several steps, as in Example 5.18. In addition, intertextuality is more important to this text than to OCM. The crucial differences, as intuitively observed, then, are that 1) in OCM observation and laboratory method are important whereas in ONC the 'jig-saw puzzle' fit

between data and theory is important; 2) OCM has a simple argument whereas that in ONC is more complex; 3) intertextuality plays a more important role in ONC than in OCM.

These differences are matched by observation of the value analyses presented in Figures 5.13 and 5.14. In OCM (Figure 5.13), of thirty-three instances of evaluation of value, no fewer than twenty-four are self-evaluation (that is, an entity is presented and evaluated in the same sentence). In all but one of these, it is events - experimental procedures - that are being evaluated, usually in terms of usefulness (i.e. goal-directedness), although occasionally in terms of accuracy. There is only one brief asessment of fit between conclusions and data and two assessments of data reliability (consistency with other methods). Looking at intertextuality, we find that models are mentioned in the Introduction but not in the main body of the paper. The results presumably provide grounds for assessing those models, but this is not done explicitly. Therefore, the article may certainly be described as 1) based on what is KNOWN, especially events; 2) simple in that there is little cross-referencing i.e. little evaluation between sentences and paragraphs; 3) low in intertextuality.

Turning to the analysis of ONC (Figure 5.14), we may note that the figure is clearly more complex, with more evaluative items, substantial chunking of the text and considerable accumulation of evaluation. There is little self-evaluation, but much of the evaluation refers to items several sentences or even paragraphs earlier in the text. Many of the evaluating sentences evaluate two items simultaneously, a phenomenon that has been referred to in this chapter as 'dual evaluation'. One of the functions of such evaluation is to provide a link between the stages in an argument, and the predominance of such a feature demonstrates the complexity of the

argument that is being constructed in this research article. Furthermore, out of forty-seven instances of evaluation of value (excluding the two UNKNOWNS), only six evaluate the experimental procedure, while twenty evaluate the results, nine evaluate the conclusions, four are evaluations of models and eleven are intertextual. It may be concluded that 1) the article is built around entities which have the status of models, and therefore the certainty category PROBABLE, rather than around facts, with the certainty category KNOWN; 2) it is complex in that there is a lot of cross-referencing between sentences and paragraphs; 3) it is high in intertextuality. What we have here, in short, is an article which belongs to an advanced phase of development in the sub-discipline, when an article takes as its grounding the models and theories current in the thinking of the relevant community and seeks to modify such models and theories. An analysis of evaluation of value demonstrates the features of this phase quite explicitly.

5.6 Conclusion

This chapter has presented the type of evaluation which is most in accord with the traditional view of evaluation as the assignment of quality to entities. That quality is personal, in the sense that its truth-value is not independently verifiable, and is aligned along a good-bad scale.

From the discussion in this chapter it is clear that the identification of evaluation of value presents many problems, whether the approach taken is via the lexico-grammar or via a syntagm of discourse elements. Signals of value tend to be extremely context-dependent, and the evaluation is rarely confined to particular sections of the text. Rather, value is all-pervasive and its effect is cumulative. This is not a product

of the peculiarities of scientific writing, but is inherent in the nature of evaluation. Such an amorphous phenomenon is bound to pose problems for analysis. As a partial solution to these problems, I have proposed a notion of goals, or a value system against which items in the texts are measured or evaluated. These goals represent both a personal and an institutional ideology. I have also proposed categories of value which reflect the notion of fit which is central to scientific practice.

One of the greatest problems that remain in a discussion of evaluation of value is the representation of analysis. Through different representations, I have shown the highlighting function of evaluation of value, the accumulation of value throughout a text and how two texts may be compared in terms of value to reveal a greater complexity of argument in one text than in the other. The representation problem remains, however, because value works essentially as movement, or as a series of movements, rather than as a succession of segments.

FIGURE 5.9 **Analysis of HOSC: Value as Highlighter**

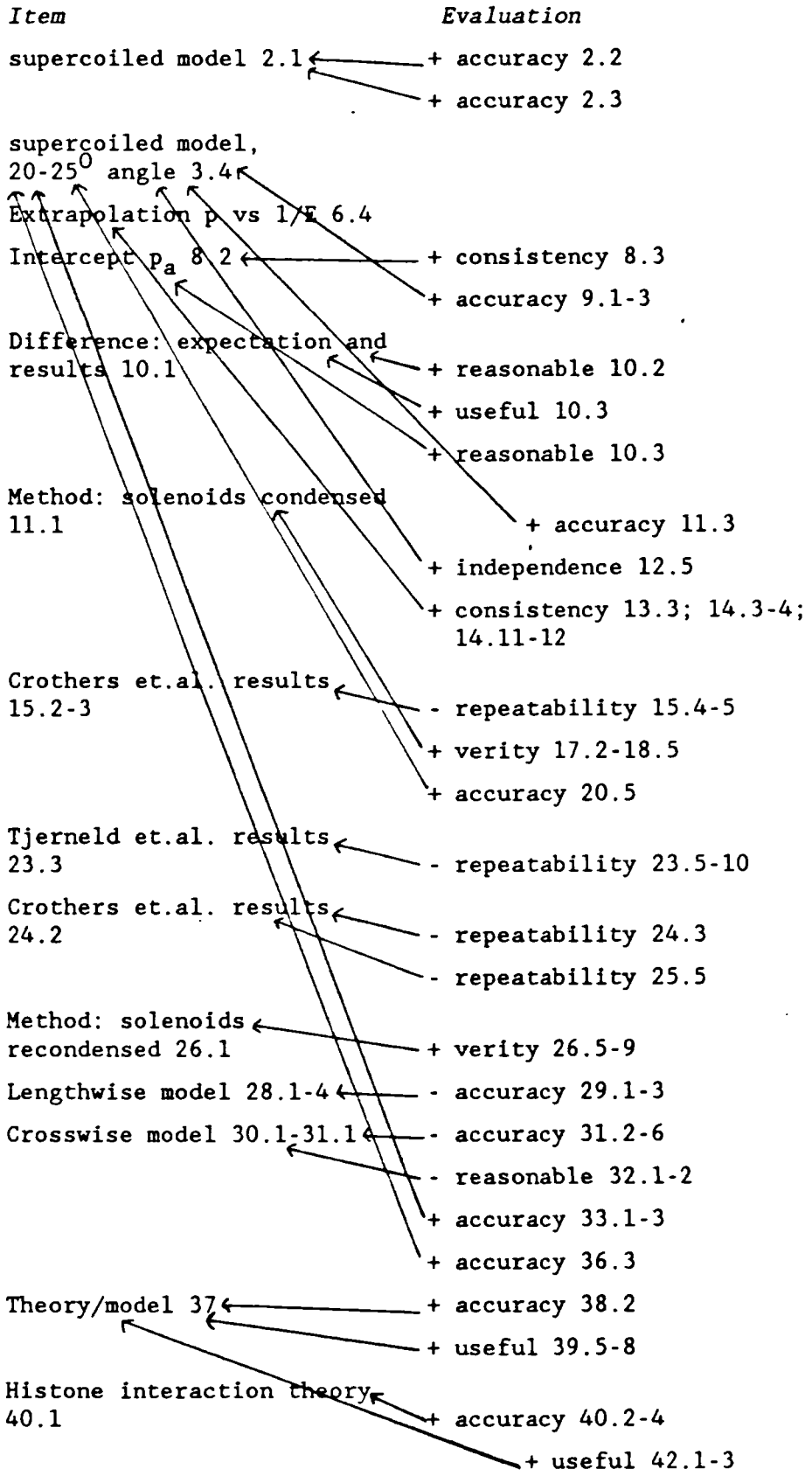


FIGURE 5.10 Goals in HOSC

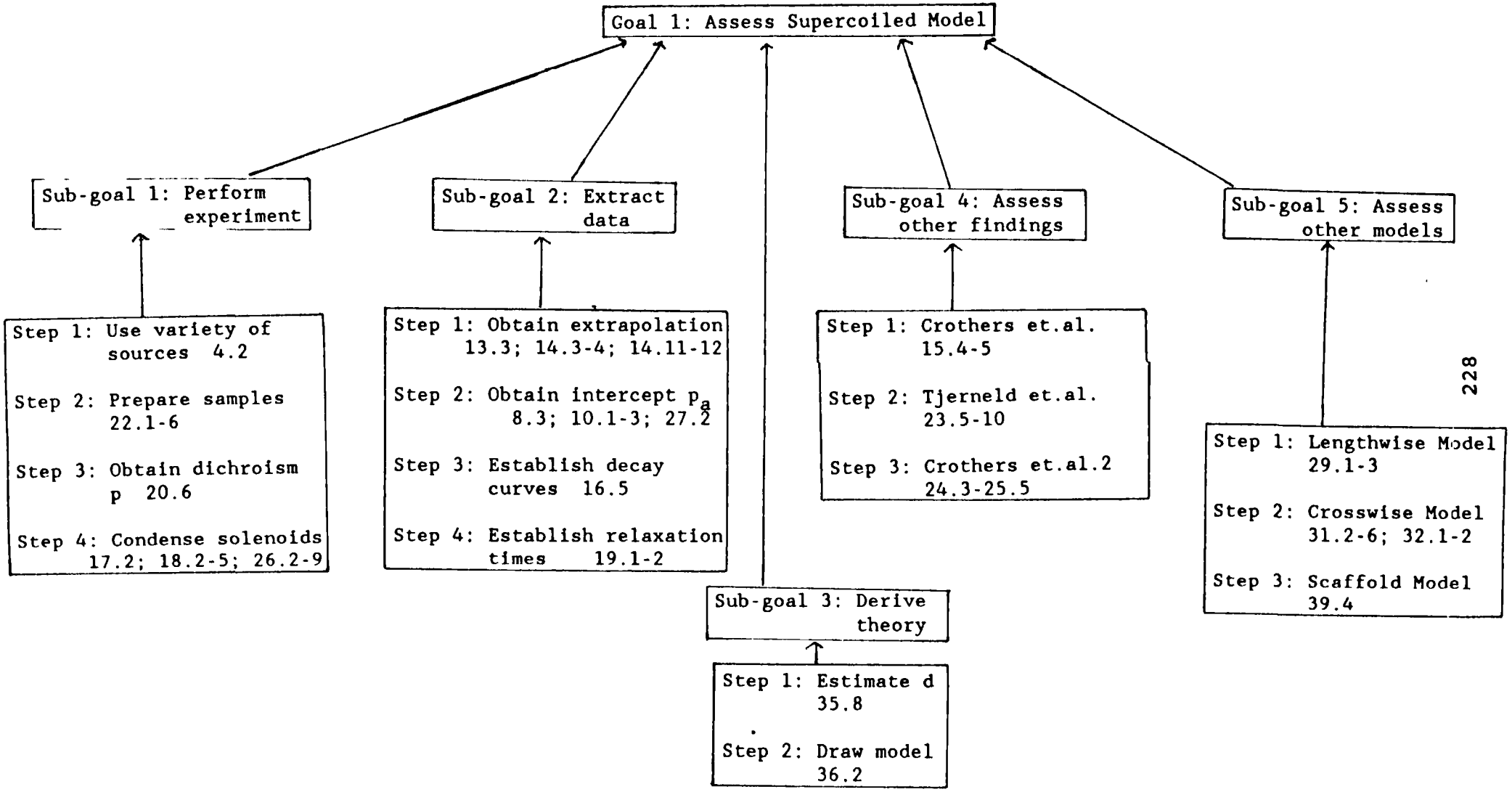


FIGURE 5.11 The Hypothesis in HOSC: Accumulation of Value

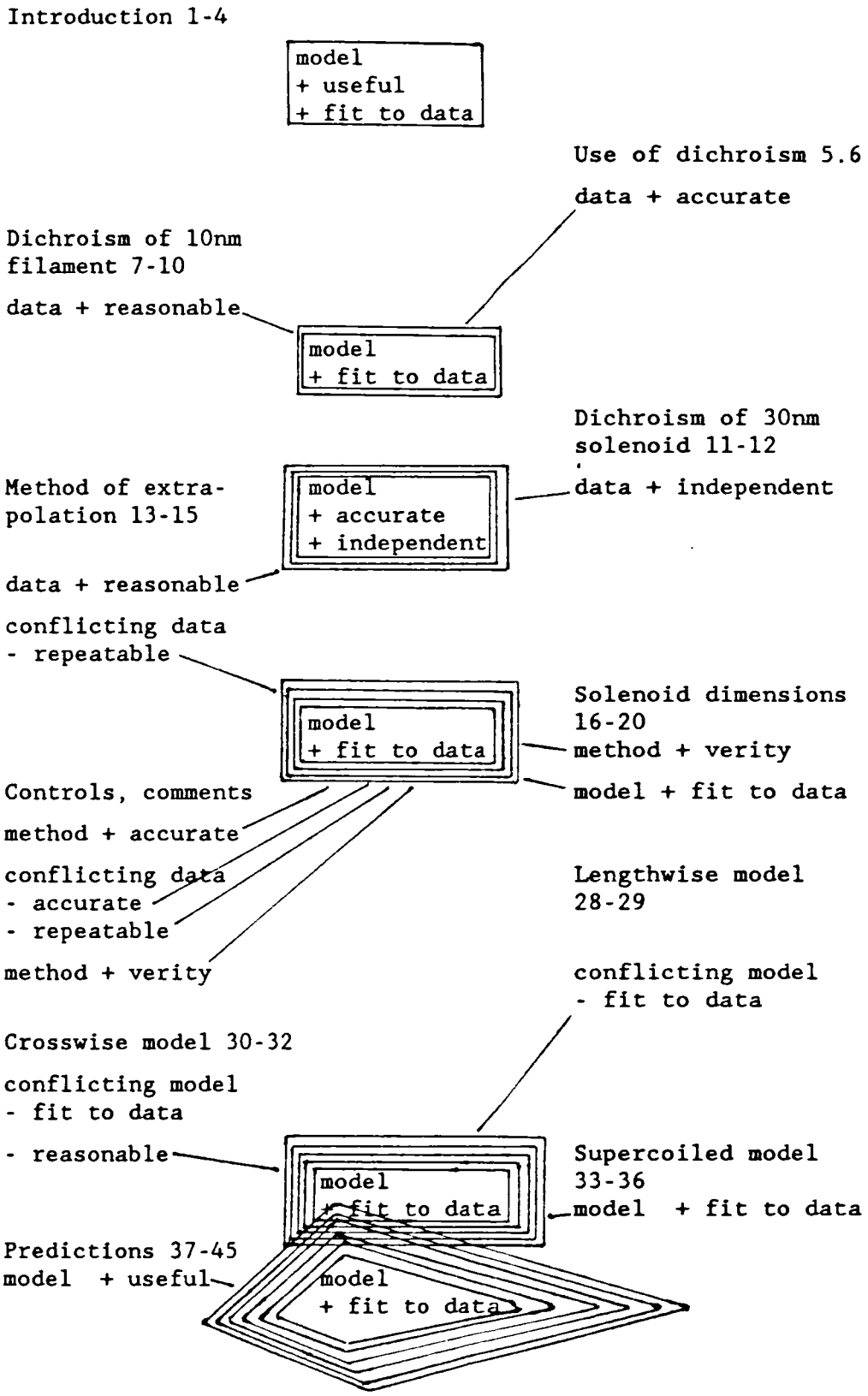
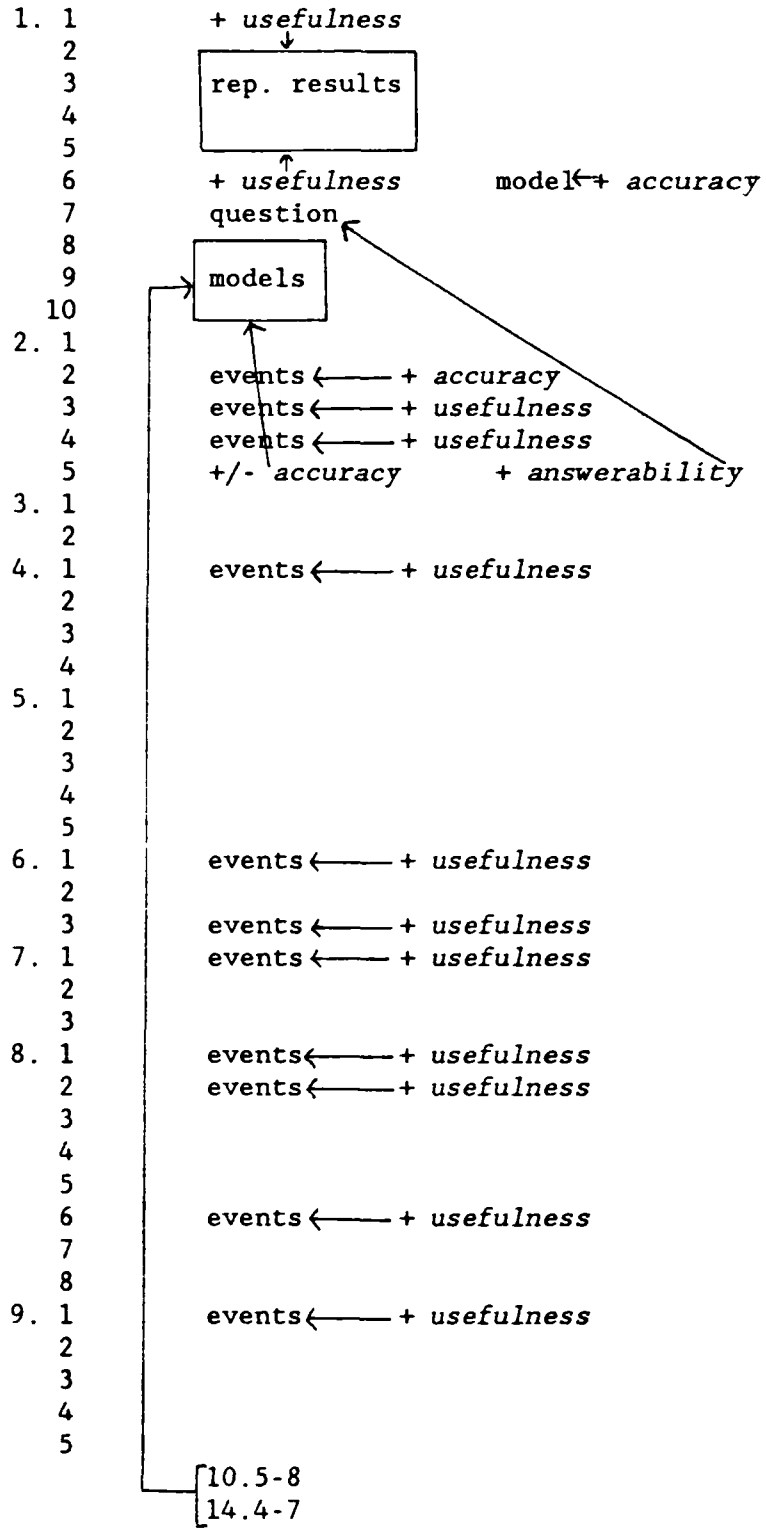
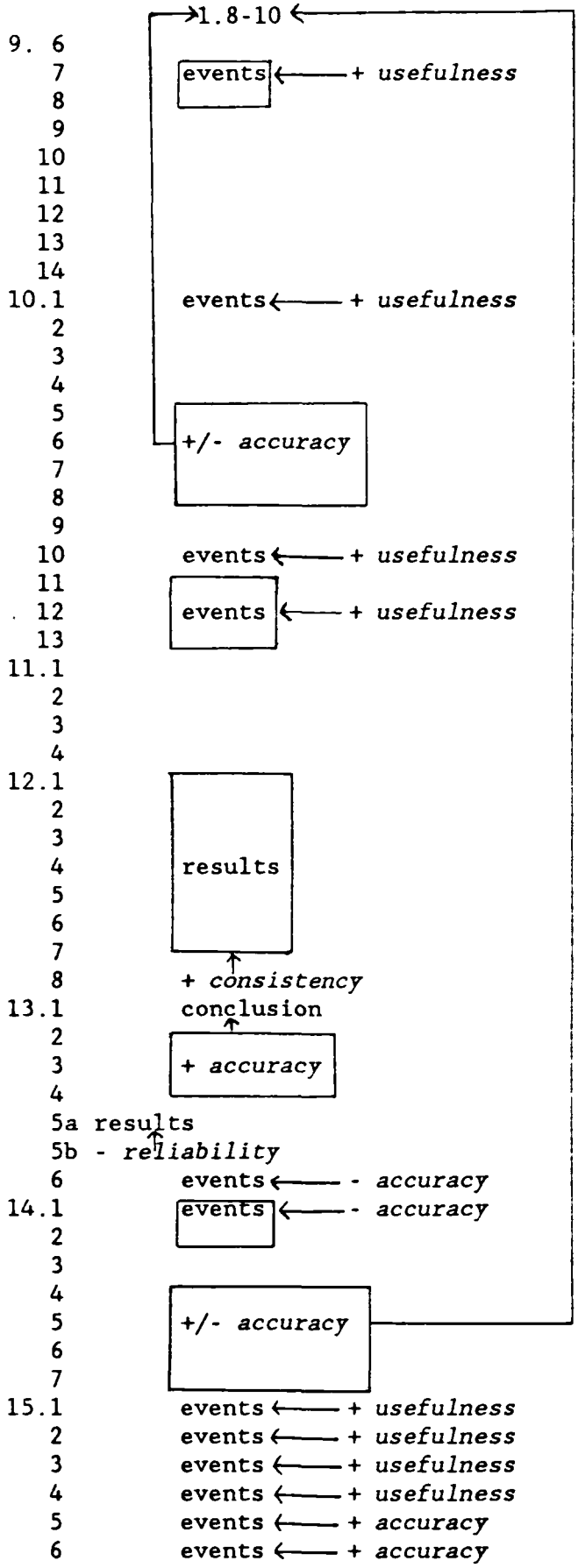


FIGURE 5.12 HOSC: Value as Movement

Paragraph	Goal 1	S-G 1	S-G 2	S-G 3	S-G 4	S-G 5
1	-	-	-	-	-	-
2	-	-	-	-	-	-
3	-	-	-	-	-	-
4	x	x	-	-	-	-
5	-	-	-	-	-	-
6	-	-	-	-	-	-
7	-	-	-	-	-	-
8	-	-	x	-	-	-
9	-	-	-	-	-	-
10	-	-	x	-	-	-
11	x	-	-	-	-	-
12	x	-	-	-	-	-
13	-	-	x	-	-	-
14	-	-	x	-	-	-
15	-	-	-	-	x	-
16	-	-	x	-	-	-
17	-	x	-	-	-	-
18	-	x	-	-	-	-
19	-	-	x	-	-	-
20	x	x	-	-	-	-
21	-	-	-	-	-	-
22	-	-	-	-	-	-
23	-	x	-	-	-	-
24	-	-	-	-	x	-
25	-	-	-	-	x	-
26	-	-	-	-	x	-
27	-	x	-	-	-	-
28	-	-	-	-	-	-
29	-	-	-	-	-	-
30	-	-	-	-	-	x
31	-	-	-	-	-	-
32	-	-	-	-	-	x
33	x	-	-	-	-	x
34	-	-	-	-	-	-
35	-	-	-	x	-	-
36	x	-	-	-	-	-
37	-	-	-	x	-	-
38	x	-	-	-	-	-
39	x	-	-	-	-	x
40	x	-	-	-	-	-
41	-	-	-	-	-	-
42	-	-	-	-	-	-
43	-	-	-	-	-	-
44	-	-	-	-	-	-
45	-	-	-	-	-	-

FIGURE 5.13 Value in OCM




1.8-10
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5a
5b
6
14.1
2
3
4
5
6
7
15.1
2
3
4
5
6
events
+ usefulness
events
+ usefulness
+/- accuracy
events
+ usefulness
events
+ usefulness
results
+ consistency
conclusion
+ accuracy
results
- reliability
events
- accuracy
events
- accuracy
+/- accuracy
events
+ usefulness
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+ usefulness
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+ usefulness
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events
+ accuracy

FIGURE 5.14 Value in ONC

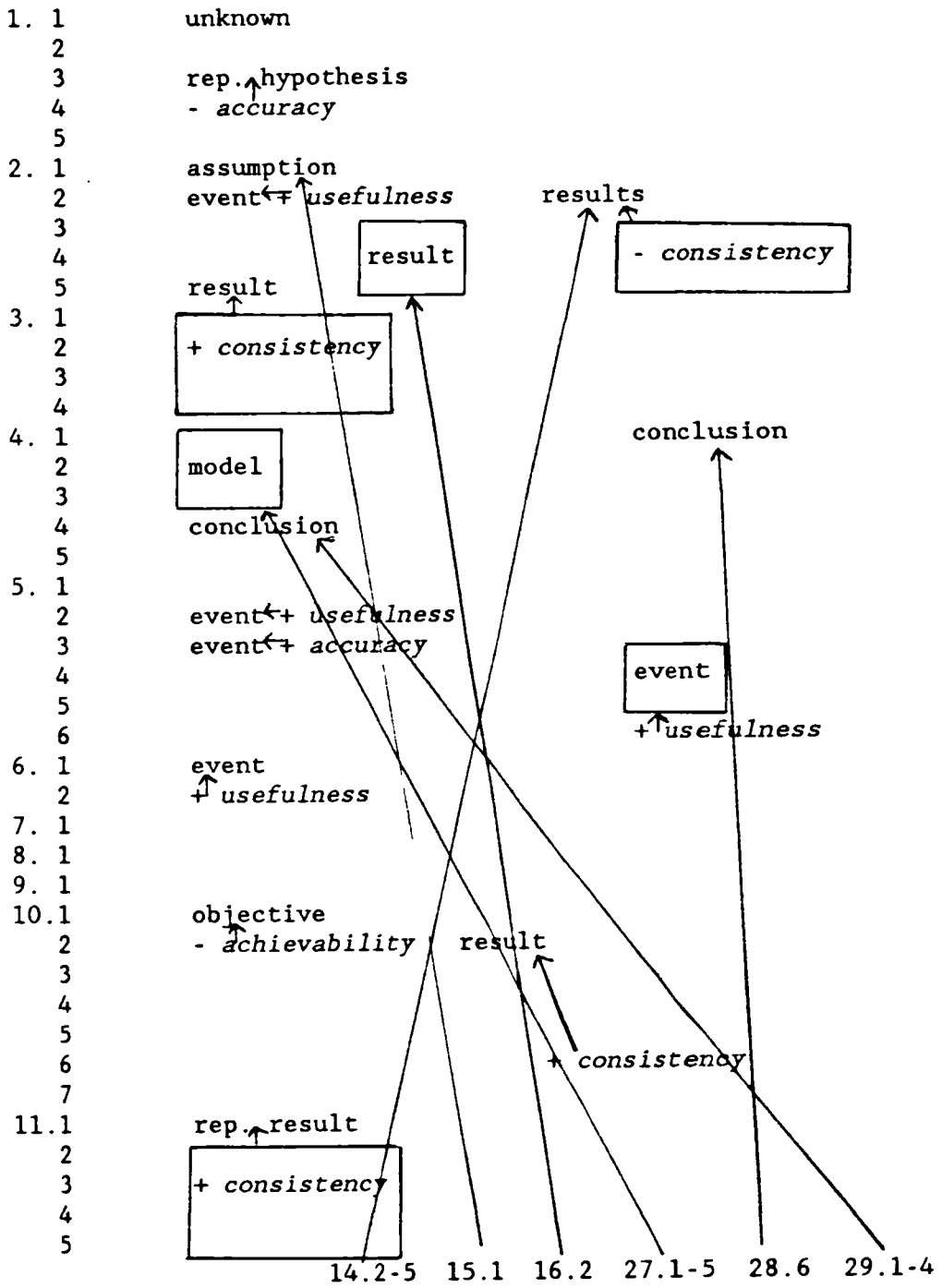

FIGURE 5.14 (continued)

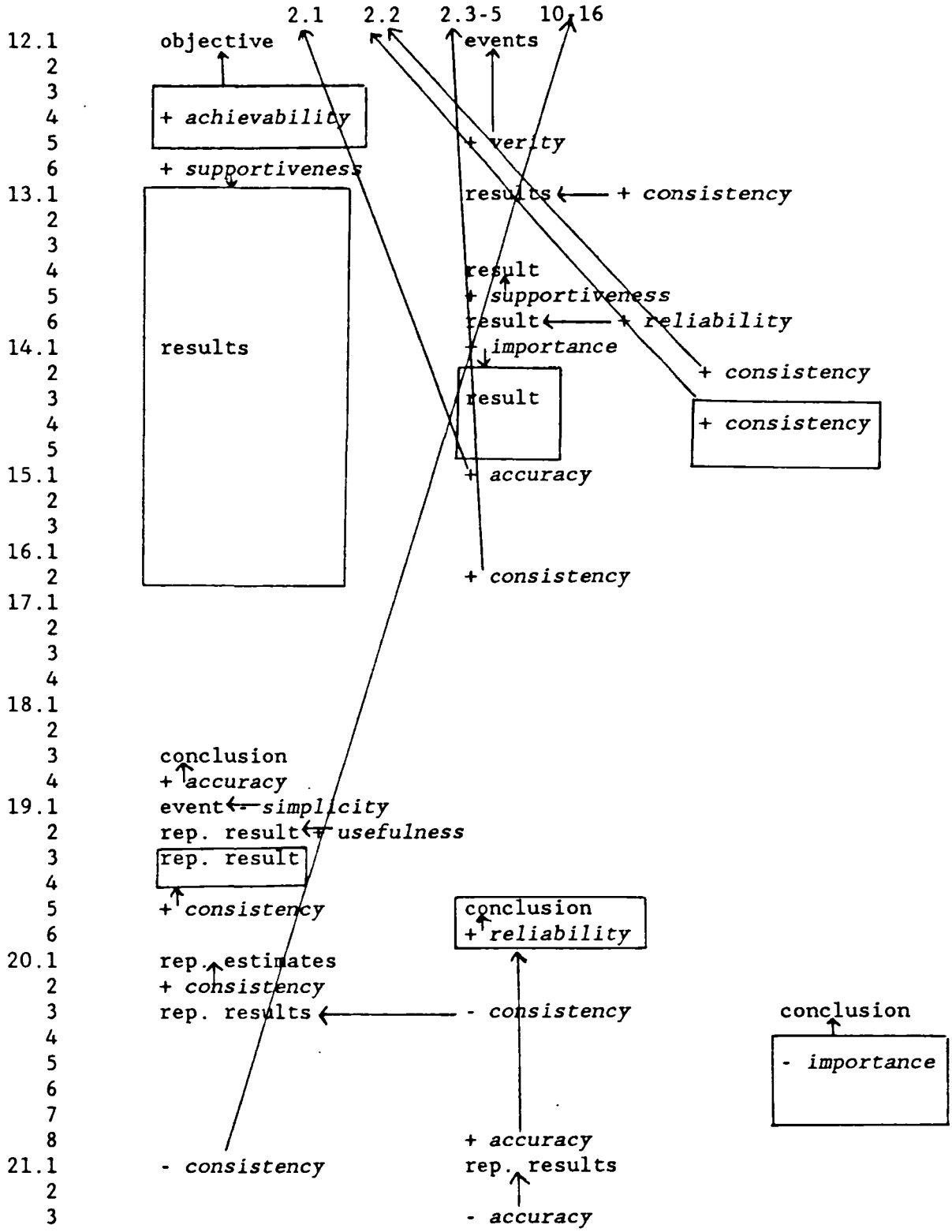

FIGURE 5.14 (continued)