EVALUATION IN EXPERIMENTAL RESEARCH ARTICLES

Susan Hunston

Thesis submitted for the degree of PhD

Volume II

Department of English

Faculty of Arts

University of Birmingham

1989

CHAPTER 6

Evaluation of Relevance

6.1 The Notion of Relevance

6.1.1 Evaluation and Relevance in Narrative

Work undertaken by ethnomethodologists and others (e.g. Labov, 1972; Polanyi, 1978; 1979; Schiffrin, 1984; Tannen, 1984) in the field of the study of narrative indicates that evaluation in narrative, as elsewhere, has a uniquely important role. It is fruitful, therefore, to examine in more detail exactly what this role is.

The function of evaluation in oral narrative is frequently described as being to indicate to the listeners the 'point' of the narrative. Labov says that evaluation is

> the means used by the narrator to indicate the point of the narrative, its raison d'etre: why it was told, and what the narrator is getting at.
>
> Labov, 1972, 366

Polanyi refers to evaluation as enabling us

> to understand what the narrator is underscoring as particularly significant in his story.
>
> Polanyi, 1978, 38

She adds that what may count as 'significant' is not universal, but constrained by the culture of the narrative tellers and listeners. The listeners are as important as the teller in negotiating what an acceptable point of a story might be:

> The point of a story often changes in the course of narration, and afterwards, even beyond the confines of the particular conversation in which it was told. Any point which is accepted as the point by all members of a group has to satisfy several constraints: the story must illustrate the point; the point must be of a narratable sort; and the point must be of interest to the members of the community who generate and receive it.
>
> Polanyi, 1979, 226

To the observation that a story may have different points, Schiffrin adds that the re-telling of a story may be motivated by the desire to communicate more than one point (Schiffrin, 1984).

The 'point' of a story, therefore, may be glossed as the reason why the story is narratable to this group of people at this point in the conversation. In other words, the point of the story is its relevance to the culture and to the ongoing conversation. Evaluation highlights this relevance but, in addition, may constitute it, in that the point of the story, as paraphrased by Labov, Polanyi or Schiffrin, frequently sounds like a macro-statement, or summary, of the evaluative elements.

Although Labov places the Evaluation element prior to the Resolution, evaluative features also cluster at the end of the narrative, in the Coda. Many of the Codas identified by Labov are evaluations of the story and paraphrases of the 'point'. A typical example would be: *'That was one of the most important.'* (Labov, 1972, 359). The same is true of an element in the story cited by Schiffrin which she identifies as a potential Coda: *'I realised he did have dry wit'* (Schiffrin, 1984, 317). Even the end of Polanyi's subway story (*'OK that was...that experience.'* Polanyi, 1979, 229), whilst not repeating the point of the story, does indicate that the point has been made, the story is finished, and furthermore, that the story is relevant to the conversational action of recounting experiences.

Evaluation in narrative, therefore, indicates the point or significance of the story, also constitutes or contributes to that point and may also indicate that the point has been made. This function of evaluation may be termed evaluation of *relevance*. It is a metalinguistic function, in the sense that the narrative itself is evaluated as a reportable sequence of events, fitting to the conversation. It is also interactive in that it represents a direct communication between the writer and reader. It may indicate that a unit - the story - has been completed, and also carries information on the significance of the text.

6.1.2 Relevance and Research Articles

We may now apply the insights developed in work on narrative to experimental research articles. It is clear that one of the functions of evaluation - the third in the schema developed here - is to indicate the relevance of the information given. The definition of the relevance in narrative as

- relevance to the preoccupations of the cultural group
- relevance to the ongoing conversation

may be re-written for research articles as

- relevance to (how the information fits into) a schema of knowledge which is defined institutionally and interactively
- relevance to (how the information fits into) the argument being developed by the current writer.

As an illustration of this, consider Example 6.1 below.

Example 6.1

[1]The electric dichroism of chromatin (ref) yields information relating to two structural features. [2]First, the average orientation of the DNA relative to the fiber axis can be estimated from the limiting reduced dichroism. [3]Second, the relaxation rate of the fibers after the extinction of the orientating field can be measured and this depends on the rotational diffusion coefficient and hence on the dimensions and flexibility of the particle. [4]These two parameters taken together form an exacting criterion for the structural state of chromatin (refs). PCHT 16.1-4

In this example, a procedure, electric dichroism, is evaluated positively because the results it gives, an estimate and a measurement, are useful indicators of the structural state of the substance under study, chromatin. Alongside these evaluations of status and value, relevance is also being evaluated. In one sense, of course, simply identifying the estimate and the measurement serves to place them within the context of the scientific community, and assessing them and the procedure as useful also serves to assert their importance. The last sentence of the example, however, explicitly asserts the relevance of the information given in sentences 1-3. The results of the procedure are important to the institutional community because they constitute *an exacting criterion*. They are important to the argument being formulated because electric dichroism, the procedure being used, is thereby vindicated.

Sentences such as S4 above will be referred to here as Relevance Markers. It is with these Relevance Markers, rather than the notion of relevance itself, that this chapter is concerned. Several different types will be identified in Section 6.2. below, but they all have the function of expressing explicitly the relevance function of evaluation. They also, implicitly or explicitly, place the information along an important-unimportant scale. This scale is not the exact equivalent of the certainty scale (status) or the good-bad scale (value), however, in that items can

only be evaluated as +important, not as -important. That is, there are Relevance Markers but no Irrelevance Markers (even a digression has relevance as a digression).

It must be noted again here that the Relevance Marker is meta-discoursal. It does not simply identify information that is relevant, but it marks sections of the text under composition as relevant to the overall argument. This distinction will be discussed further in Section 6.3.5 below. The Relevance Marker may be paraphrased as 'This part of the text is relevant/important because...'.

There are two key identifying features of the Relevance Marker, illustrated by S4 of Example 6.1 above. One is its cohesiveness with the preceding text. In Example 6.1, this is represented by the Noun Phrase *These two parameters taken together*, where *parameters* is cohesive with *two structural features* in S1, and with S2 and 3, which detail those features. The second key feature is the placing of the preceding text, via the cohesive Noun Phrase, into a category of importance. In Example 6.1, the *parameters* are assigned the significance of belonging to the category of *exacting criterion*.

These two features of the Relevance Marker (henceforward RM) represent an overlap of two aspects of the lexico-grammar. Firstly, there is the textual aspect: the movement of the clause from Theme to Rheme, with the preceding text being summarised in the Theme. Secondly, there is the ideational aspect: the semantic roles and the relations between the participants in the clause. How these relations are realised will be discussed in Section 6.2 below.

One of the claims that will be made for Relevance Markers is that they are a way of identifying boundaries in a discourse. In other words, it is claimed that text-producers typically mark the relevance of their discourse at the beginning or at the end of units within the text. Because of this, Relevance Markers may be used as one kind of evidence in establishing text units.

6.2 The Identification of Relevance Markers

6.2.1 Introduction

This section will discuss how the Relevance Markers introduced in the last section are identified. The two features mentioned above are elaborated upon; that is, the assignment of significance and the cohesive item. The assignment of significance will be divided into four RM types, referred to by mnemonics: Token-Value, 'Mean', 'Conclude' and 'Thus'. In the discussion that follows, central or archetypal RMs are identified and less central or borderline cases are noted.

In most of this section, as in Section 6.1, it is assumed that RMs are retrospective: that the cohesion is anaphoric. In Section 6.2.7, however, attention is turned to prospective Relevance Markers. These play a similar role to that of retrospective RMs in that they assign relevance, but to the forthcoming rather than to the preceding text.

Most of the RMs which will be cited comprise independent or main clauses. It must be noted, however, that RMs may be subordinated, as in Example 6.2, where the cohesive item in the underlined RM is el_ided. In other words, the sentence gives both the information and its relevance.

Example 6.2

With 70 $_{u}$M Mg^{++} added...the area tau was -400 $_{u}$s, at high fields, indicating that the sample was in an open extended conformation... PCHT 19.4

I shall now describe the four types of retrospective RM, followed by a discussion of cohesive items.

6.2.2 The Token-Value Type

One of the ways in which the relevance of an item (including a stretch of text) may be marked is by placing the cohesive item in a clause with an identifying relational process, in the pattern Token-Value (Halliday, 1985a, 115ff). An example of this is S4 of Example 6.1, which is analysed in Figure 6.1.

FIGURE 6.1

These two parameters taken together	*form*	*an exacting criterion for the structural state of chromatin.*
TOKEN	PROCESS	VALUE

Clauses of this type must be distinguished from attributive clauses, which they resemble. Halliday (1985a, 115) contrasts the attributive 'John is a poet' with the identifying 'John is the tall one' by claiming that in the attributive clause there is only one entity, 'John', who is assigned to a class ('poets') but is not identified by membership of that class (there are, after all, other poets), whereas in the identifying clause 'John' is identified as 'the tall one'. Further, in the identifying clause, the two

entities involved ('John' and 'the tall one') are distinguished in that 'John' is the Value and 'the tall one' the Token. These terms may be glossed by other oppositions: 'John' is the meaning, 'the tall one' is the sign; 'John' is the referent, 'the tall one' is the name; 'John' is the role; 'the tall one' is the occupant of the role (Halliday, 1985a, 115).

Grammatically, attribution and identity are distinguished in that clauses of the first type are not reversible whereas those of the second type are. For example, reversing 'John is a poet' gives the unacceptable '*A poet is John', but reversing 'John is the tall one' gives the acceptable 'The tall one is John'. To further distinguish between Token and Value it is useful to replace 'is' with 'represents' or 'is represented by' (in order to distinguish between the formally identical active and passive of the verb *to be*). If the active is most appropriate, as in 'The tall one represents John' then the clause is in the Token-Value pattern, but if the passive form is appropriate, as in 'John is represented by the tall one', then the clause is in the Value-Token pattern.

As with any apparently neat distinction, application to real text tends to lead to blurring. Halliday himself comments:

> [Identification and attribution] are part of a single semantic field, so that first having separated them we can bring them together again. This, in fact, is precisely what we often do as speakers of the language: we set up as Value, for identifying purposes, something that is explicitly worded in the form of membership of a class, using the expression *one of the...*, for example *his sister is one of the cleverest people I know*; and on the other hand we tend to interpret an Attribute not just as membership of a list but rather as being in some sense the value of the entity that carries it.
>
> Halliday, 1985a, 128

In fact there is some difficulty in distinguishing between attribution and identity, and the apparent indefinite/definite distinction in the

examples given above ('John is *a* poet'; 'John is *the* tallest one') does not hold universally. For the purposes of this thesis, possible Token-Value clauses will be tested in two ways: firstly they will be tested for reversibility to check that they are identifying clauses not attributive ones; secondly the verb will be replaced by *represents* or *is represented by* to check the voice and therefore the pattern of Token and Value.

Examples 6.3 and 6.4 below illustrate further the concept of the Token-Value type of Relevance Marker. The pivotal verb, highlighted in each case, could be replaced by *represents*.

Example 6.3

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

Example 6.4

This is one of the ways in which our results clearly differ from those of Crothers and coworkers (ref).... HOSC 24.2

The equative process item may, however, be a verb plus nominal, as in Examples 6.5, 6.6 and 6.7, where again the process, the equivalent of *represent*, is underlined.

Example 6.5

The dichroism increase which accompanies fiber compaction in the cross-linking buffer is a reflection of the structural adaptation of the fiber to changing longitudinal stress. ONC 30.3

Example 6.6

The extrapolated intercept, denoted p_a, contains information about the orientation of chromophores within the completely oriented polynucleosomes. HOSC 6.5

Example 6.7

The total removal of the core histone tails by proteolysis with trypsin in vitro may be tentatively regarded as an analogue for this intracellular phenomenon. PCHT 49.10

Example 6.7 illustrates that the identifying process may be modified modally. The identifying process may also, of course, be negated, as in Example 6.8.

Example 6.8

In themselves, these experiments are not sufficient proof for a critical role of H4 in stabilizing the higher order structure... PCHT 47.6

6.2.3 The 'Mean' Type

The second type of Relevance Marker identified here is the 'Mean' type. I would claim that there is an underlying semantic similarity between this and the Token-Value type. Returning to Examples 6.3 and 6.4, repeated here, I suggest that they may be paraphrased using a formulation like *The above text means that..*, as shown in Example 6.3a and Example 6.4a below.

Example 6.3

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

Example 6.3a

The contrast expressed in the above text means that histone H1 in thymus chromatin is replaced by H5 in erythrocytes.

Example 6.4

This is one of the ways in which our results clearly differ from those of Crothers and coworkers (ref).... HOSC 24.2

Example 6.4a

The above text means that our results differ from those of Crothers and coworkers in at least one way.

The most central realisation of the 'Mean' type is with the projecting verb *mean*, as in Example 6.9.

Example 6.9

Saturation of the signal means that orientation is essentially complete at voltages above 10kV/cm. ONC 13.4

The verb *mean* may be replaced by verbs with a similar role, as in Examples 6.10 to 6.12 below.

Example 6.10

This indicated that the chromosomes of hypotonically swollen mitotic cells are not expanded to any great degree. OCM 10.12

Example 6.11

Taken together, the results argue strongly for angular placement of nuclesomes relative to the fiber axis. ONC 4.3

Example 6.12

Such a response, not found for rodlike molecules such as short pieces of DNA, implies that the length of the fiber is readily adjusted to changes in electrostatic stress. ONC 29.3

It is also possible that the verb may be nominalised, where the cohesive item is el‿ided, as in Example 6.13 (ellided item reconstructed in square brackets).

Example 6.13

The implication [of the above argument] is that chromatin structure is in some manner rendered more accessible to the nuclease by acetylation. PCHT 49.6

In the above examples, the strength of *mean* is modified along the certainty scale. How far continued modification should be accepted within the category of Relevance Marker is debatable. Example 6.14, for instance, seems to be a borderline case, in the sense that one might argue for or against Example 6.14a as a true paraphrase.

Example 6.14

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

Example 6.14a

This result means that the fiber compacts.

6.2.4 The 'Conclude' Type

This third type of Relevance Marker makes explicit the interpersonal aspect of relevance. It may be paraphrased as *The above text leads us to the conclusion that....* The semantic features might be represented as

cohesive item + cause + mental process + writers as Senser.

These will not necessarily, of course, be realised as discrete items. In Example 6.15, for instance, the Senser is unrealised, but is clearly intended to be the writers, while the phrase *greatly increases confidence* may be unpacked as meaning *causes to believe*. The Senser is present in Example 6.16.

Example 6.15

The observed saturation of the dichroism at about 13 kV/cm greatly increases confidence in assigning the signal to overall orientation of the particle. ONC 15.1

Example 6.16

These two observations reassure us that we could indeed have detected field-induced distortions in the fully condensed solenoid structures if they had occurred. HOSC 18.5

Moving away from the 'central' notion of the 'Conclude' type of RM, we find examples where the Mental Process is one of doubt or certainty, and the Senser is less restricted to the writers, as in Examples 6.17 and 6.18.

Example 6.17

Thus the greatly increased rotational and translational frictional coefficients...would seem to leave no doubt that the removal of the core histone tails..leads to a loss of structural contraints... PCHT 22.5

Example 6.18

The data of Figure 3D...make it apparent that our dichroism signal arises from overall orientation of a rigid particle... HOSC 20.6b

In addition, there are a few examples of the modal *must*, meaning 'inferred from the preceding text', which must be included here. Example 6.19 is one such example (although it also exemplifies the 'Thus' type, see Section 6.2.5).

Example 6.19

Since the overall nucleosome repeat length varies from 160 to 250 bp, depending on the chromatin source (ref), the spacer DNA, defined here as reaching between neighbouring 166 bp chromatosomes, therefore must vary between 0 and 80 bp. HOSC 1.4

6.2.5 The 'Thus' Type

The final type of retrospective Relevance Marker identified here is defined as containing one of a small class of words: *hence*, *thus*, *therefore*, *so*, *then*. These words mark a conclusion drawn from the preceding text. The type is different from the others in that it does not require a cohesive item, although some RMs of this type do have such an item. The 'Thus' word is taken to be paraphrasable as *As a result of the above text*. In other words, there is cohesion by ellipsis. This type of RM may co-occur with other types, as in Examples 6.17 and 6.19 above, or the 'Thus' word may be the only signal of the RM, as in Example 6.20.

Example 6.20

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. OCM 10.13

However, a 'thus' word does not signal a Relevance Marker if the process is material rather than relational, in other words, if an action rather than a conclusion is the consequence of the preceding text items, as in Example 6.21.

Example 6.21

Hence all CHO and HeLa chromatins were treated with ribonuclease prior to sucrose gradient fractionation.... HOSC 22.5

6.2.6 The Cohesive Element

The information in a retrospective Relevance Marker must be shown to derive from (and so give relevance to) the preceding text. Cohesiveness with the preceding text is therefore crucial to the identification of the RM. How that cohesiveness may or must be realised, however, depends on the RM type.

In the 'Thus' type, the 'thus' item is itself cohesive with the preceding text, and no further cohesive item is necessary, although one may of course be present. In Example 6.20 above, for instance, the noun phrase *the differing appearance of the chromosomes in swollen and unswollen cells* is not cohesive with any single item in the preceding text, although it does interpretatively reformulate contrasting descriptions of chromosomes.

The semantics of the 'Conclude' type, like those of the 'Thus' type, include an explicit or implicit reference to the preceding text. It is therefore not necessarily the case that an item superordinate to the

preceding text is used in the RM, although this may happen, as in Example 6.16. It is sufficient that, as in Example 6.15, an item is selected from the previous text and used in the RM.

The most central examples of 'Mean' type and Token-Value types of RM have as subject a pronoun or nominal which is superordinate to the preceding text. Examples 6.3 and 6.4 illustrate a nominal and a pronoun respectively. In more borderline cases, such as S3 of Example 6.22 below, the cohesive item (underlined here) is selected from (or may be a reinterpretation of a selected item from) the preceding text, and doubt therefore remains in these cases as to whether this genuinely marks the relevance of the preceding text as a whole.

Example 6.22

[1]Electric dichroism results for the complex of tryp.SPN with H5 at two molecules per nucleosome are shown in Fig. 5c. [2]As for tryp.SPN, a nonlinear profile was obtained, but, even allowing for the uncertainty in the estimated extrapolated limiting value of -0.58, it is clear that the average orientation of the DNA relative to the direction of induced orientation is markedly different from that in native or reconstituted chromatins. [3]The rather large negative value suggests the presence of an increased proportion of linear DNA, which orients itself in the direction of the applied field. PCHT 30.1-3

The cohesive item may, of course, be cohesive with a single clause or with a whole paragraph or longer. In this way, relevance may be assigned to longer or shorter stretches of text. In Example 6.23, for instance, two items are given relevance: *this slight and easily explained discrepancy* and p_a. They constitute the 'Conclude' type and the Token-Value type of RM respectively, with the Token-Value type being subordinated. The first cohesive item is cohesive with the previous two sentences only, but the second item is first mentioned four paragraphs earlier, and so gives relevance to a whole section of the text. This example is part of an extract discussed further in Section 6.5.3

Example 6.23

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

Many Relevance Markers are 'Janus-like', looking both backwards and forwards. More formally, if a Relevance Marker is seen as having the semantic structure:

$x = y$,

in the 'Janus' Relevance Marker, x or y is cohesive with what has gone before, while y or x is cohesive with what follows. A commonly occuring example of this is the opening sentence of Discussion sections, where the Results section typically is summarised, and closed, by a Relevance Marker which in turn is cohesive with the whole of the Discussion section. A simple way of examining this in more detail is to look at the same phenomenon in miniature. Example 6.24 comprises a summary, in the Introduction section, of the results and conclusions of the paper in question.

Example 6.24

3.[1]In the present paper we report that unfixed erythrocyte and calf thymus chromatin samples in Mg^{2+} and low ionic strength show identical limiting dichroism values of -0.09 if correction is made for a nondichroism signal that becomes significant above 15 kV/cm. [2]Furthermore, after this correction one finds saturation of orientation at about 15 kV/cm, as observed for cross-linked samples. [3]However, even in the presence of Mg^{2+}, chromatin samples at low ionic strength are not as compact as samples at more nearly physiological salt concentration, as demonstrated by a 25% increase in the s value upon increasing the NaCl concentration to the 100 mM level used for cross-linking. [4]Accompanying this compaction is a change of the dichroism from -0.09 to +0.05, the latter measured after cross-linking.
4.[1]We interpret the dichroism changes as implying an increase of the tilt of the nucleosome diameters relative to the fiber axis, from about 50^{o} in the presence of Mg^{2+} at low salt to about 38^{o} 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. [4]Furthermore, the structure appears to be rather flexible, without a single strongly preferred disk orientation angle. [5]This elasticity is probably required for further coiling of the 30 nm fiber into structures with even greater degrees of DNA compaction. ONC 3.1-4.5

In this example, 4.1 is an RM (ret) for the preceding paragraph, but it is also a topic sentence for the following paragraph. One of its lexical items, *dichroism changes* is cohesive with the preceding paragraph, while others - *tilt*, *nucleosome*, *fiber axis*, *compact form* - are cohesive with the following paragraph. The second paragraph (paragraph 4) is in its turn terminated by an RM (ret) which begins in 4.3 and is extended to 4.4 and 4.5. Another illustration of the same phenomenon is Example 6.25, which is an RM(pros) (see below) introducing the subsequent section of text (giving evidence for the truth of the proposition), but is cohesive with the preceding one (describing Figure 2).

Example 6.25

Figure 2 shows that this is indeed true. HOSC 14.5

6.2.7 Prospective Relevance Markers

The importance or relevance of a text unit may be assigned in advance as well as retrospectively, that is, at the commencement rather than at the end of the unit. These prospective Relevance Markers share the two features essential to all RMs: they assign relevance and they are cohesive. However, the cohesion is with the subsequent, rather than with the preceding text. Below I shall consider the different ways that relevance may be assigned, and then the types of cohesion that are found.

Two types of prospective RM, the T-V type and the 'Mean' type, are similar to the retrospective RMs described above. They are illustrated in Examples 6.26 and 6.27.

Example 6.26 (The T-V Type)

This paper is an electron microscopy study of thin sections of chromosomes in mitotic HeLa cells. OCM 2.1

Example 6.27 (The 'Mean' Type)

The dichroism results that follow are consistent with a modest structural change of the Mg^{2+}-containing fiber when NaCl is added. ONC 12.6

No examples of the 'Conclude' type or the 'Thus' type have been found. This is not surprising, as those two types are essentially non-mobile: a conclusion cannot be drawn before the evidence has been considered. There are, however, three types of relevance assignment which appear to be unique to prospective RMs. These are the Self-reference type, the 'Importance' type and the V-T type.

The Self-reference type of prospective RM is illustrated in Example 6.28. It contains a meta-discoursal verb (*take*) and a meta-discoursal deictic (*here*). Other such verbs include *consider* (ONC 24.3), *report* (PCHT 18.7), *list* (HOSC 5.2), *show* (HOSC 13.3), *demonstrate* (HOSC 24.3), while deictics include *now* (HOSC 24.3) and *first* (ONC 24.3)

Example 6.28 (The 'Self-reference' Type)

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

Examples of the 'Importance' type of Relevance Marker contain one of a small group of words which explicitly evaluate the relevance or importance of the preceding or subsequent text. Words in this group which have been identified so far are: *relevant*, *important*. There seems no reason why this type of RM should not be retrospective as well as prospective, but all the examples which have been found are prospective. Example 6.29 illustrates this type of RM.

Example 6.29 (The 'Importance' Type)

As monitored by electric dichroism, there are three important criteria that characterize the transition of native chromatin from an open, extended form to a compact, folded structure. PCHT 18.1

In the discussion of T-V type Relevance Markers above, these clauses were distinguished from those with a V-T pattern. This was because summarising the text as a noun in the Value role and then relating it to a Token does not assign that text relevance. To state the same argument in reverse, if a stretch of text is to be followed by a clause with the roles Token and Value, in which the Token role summarises the preceding text, then it is most likely that the Token element will occur first in the clause. Where the assignment of relevance occurs prior to the text with which it is cohesive, however, the Relevance, or V(alue) role, is just as likely to come first as second. In other words, as well as RMs of the T-V type exemplified in Example 6.26 above, we also find RMs in a V-T pattern, as in Example 6.30 below, where the Token element is cohesive with the text that follows.

Example 6.30 (The V-T Type)

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

Having examined the various ways in which relevance may be assigned prospectively, it is necessary now to look at the different types of prospective cohesion which help to identify a clause as a Relevance Marker. These types are distinguished on the basis of the degree of their prospection or predictiveness, that is, how certain a reader is on reading a sentence that what follows will be cohesive with it. Three examples are given in illustration of the possibilities here: Example 6.27 above and repeated here, Example 6.31 and Example 6.32. In each case the cohesive items are underlined.

Example 6.27

The dichroism results that follow are consistent with a modest structural change of the Mg^{2+}-containing fiber when NaCl is added. ONC 12.6

Example 6.31

Figure 5 shows a crucial result of this study. ONC 14.1

Example 6.32

Whether all the tails act together in a concerted fashion, or whether different groups perform separate functions, remains to be determined. PCHT 47.1

These examples are ranked in order of the extent to which they predict what will follow. In Example 6.27, it is certain that an account of the dichroism results will follow, in Example 6.31 it is very likely that a result will follow, which will be shown to be crucial, while Example 6.32 could very well stand by itself, with no elaboration following. It is only possible in retrospect to see that the underlined clauses are in fact cohesive with what follows. In other words, it is certain that 6.27 opens a new unit, it is likely that 6.31 does so, but 6.32 can only be seen to do so once the rest of the unit has been identified. In terms of assigning relevance, however, there is no difference between them. In each case it can be said that if the subsequent text is cohesive with this sentence, then the sentence has assigned relevance to the text.

Describing the examples in more formal terms, it is noted that Example 6.27 contains a deictic reference to the immediately subsequent text, Example 6.31 contains a general term that requires greater specificity and that Example 6.32 contains neither of these features. Examples 6.27 and 6.31 may be described as Focusing. Focusing may therefore be considered a special type of Relevance Marker.

6.3 A Comparison with Non-Relevance Markers

6.3.1 Introduction

The purpose of this section is to illustrate how clauses which constitute RMs are different from those which, while sharing certain features, cannot be so classified. The aim is to sharpen the definition of the Relevance Marker by contrasting it with other clauses with which it has some affinity, and also to show how the function of the Relevance Marker is different from the function of other similar clauses. It is necessary at this point to recall the function of the Relevance Marker: to summarise, 'clinch', give import to and close a preceding section of text. Three types of similar clauses will be discussed here: clauses which assign significance but which are not cohesive; identifying relational clauses in the pattern Value-Token instead of Token-Value; attributive clauses. The relevance-assigning role of clause relation signals will also be discussed.

6.3.2 Non-cohesive Clauses

The first comparison with clauses which are not Relevance Markers is with clauses which assign relevance but where the item being so assigned is not cohesive with the preceding text. Example 6.33 illustrates this. In the example, potentially- but non-cohesive items are in italics and the Relevance Marker is underlined.

Example 6.33

[4]*Thin-section studies of interphase nuclei* also reveal the chromatin to be organized into threads of around 300 A (ref). [5]*Other studies with water-spread chromosomes* strengthen the evidence for the existence of a fundamental chromosome fiber of around 250 A, which is formed by the coiling of a subfiber (refs). [6]These and other investigations strongly support the concept of various levels of substructure in chromosomes (refs). OCM 1.4-6

The example comes from a paragraph summarising previous work, and in the sentences cited the importance of previous studies is assessed. In a sense, then, these sentences are intertextual Relevance Markers. Within this text, however, only the final sentence of the example (S6) is a Relevance Marker, as only the Noun Phrase *these and other investigations* is cohesive. As far as the discourse function of the clauses under discussion is concerned, there is a clear difference between the final sentence, which summarises and closes a unit in this text, and the other sentences which constitute that unit.

As a further example of this contrast between RMs and other clauses, consider S4 of Example 6.34 below. If the subject Noun Phrase of this sentence were cohesive with the preceding three sentences, this sentence would be a Relevance Marker. As it is, however, the sentence merely adds information, the implication of which is left unstated, to be inferred by the reader. The implication might be glossed as 'These results do not detract from the conclusion that it is the NaCl which induces compaction of the fiber'.

Example 6.34

[1]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, implying further compaction by addition of NaCl to the Mg^{2+}-stabilized fiber. [2]Once correction is made..., the orientation vs field curves are very similar for cross-linked and un-cross-linked samples. [3]However, the limiting dichroism values are clearly different...[4]Our earlier results (refs) showed no significant effect on the limiting dichroism of adding Mg^{2+} to the cross-linking buffer or to the low-salt measurement buffer for fully cross-linked samples. ONC 17.1-4

Finally, the second sentence of Example 6.35 illustrates another potential RM type - the 'Conclude' type - which in this example is not an RM because the writers' conclusion does not arise out of the preceding text.

Example 6.35

[1]Adequate experimental criteria are clearly needed to assess the contribution of overall orientation to observed electric dichroism signals. [2]We believe that a minimum requirement for a large DNA-containing chromatin fragments [sic] is that overall orientation should saturate at low values of the field...as shown in Figures 4 and 5. ONC 23.1-2

6.3.3 Value-Token

The second phenomenon to be considered is clauses which occur in the pattern Value-Token rather than Token-Value. The argument that these do not constitute Relevance Markers finds corroboration in the fact that they are frequently found at the beginning and middle of paragraphs which end with a T-V Relevance Marker. A brief example of this is cited in Example 6.36, where S1 is in the pattern V-T and S3 is in the reverse pattern.

Example 6.36

[1]The next higher level of chromatin coiling appears to be best described by a winding of the 10 nm filament into a shallow supercoiled "solenoid" (refs)....[2]The overall dimensions of the structure have been derived from an impresive variety of evidence...[3]This 30 nm solenoid appears to be identical with the thick chromatin fiber seen in nuclei... HOSC 2.1-3

Genuine corroboration of the claim concerning T-V and V-T, however, can only be found where a clause cohesive with the preceding text and in the pattern V-T is found at the conclusion of a unit and can still be claimed not to be a Relevance Marker. While such clauses are actually rare, consider Example 6.37, which occurs at the end of the Introduction section of a research article, and in which S5, the concluding sentence, is in the pattern V-T.

Example 6.37

[1]This paper is an electron microscopy study of thin sections of chromosomes in mitotic HeLa cells. [2]Mitotic cells were studied...to minimize any distortions...[3]It was found that ...it was difficult to define the arrangementof the chromosome fibers. [4]But when the cells were hypotonically swollen...the organization of chromosomes became easier to describe. [5]The fundamental organization of the nucleosome-containing DNA fibers was seen to be a radial distribution of fibers (probably loops) which extend from the centers of the chromatid arms. OCM 2.1-5

Note that the writer here has chosen the V-T pattern in S5 in place of the equally plausible 'The study suggests that the fundamental organization....', as in the rewritten version Example 6.37a.

Example 6.37a

[1]This paper is an electron microscopy study of thin sections of chromosomes in mitotic HeLa cells. [2]Mitotic cells were studied...to minimize any distortions...[3]It was found that ...it was difficult to define the arrangementof the chromosome fibers. [4]But when the cells were hypotonically swollen...the organization of chromosomes became easier to describe. [5]*This study suggests that the fundamental organization of the nucleosome-containing DNA fibers is a radial distribution of fibers (probably loops) which extend from the centers of the chromatid arms.*

In this latter version, the study described in the preceding four sentences is the Theme of S5, and the final sentence gives the study (and the first four sentences of the paragraph) relevance by indicating their meaning within the general context of scientific research. The study is important because of what it suggests. In the original version, what is said about the

fundamental organization does not give it any further importance or relevance but only adds information. I would contend that the impression given by the original version is of something less complete, less closed and more impersonal.

6.3.4 Attributive Clauses

S2b of Example 6.38 below illustrates a configuration which is very close to that of the Relevance Marker. It is cohesive with the preceding text, places that text into a category (of 'sameness') and could arguably terminate a unit. The category, however, is one of attribution rather than identification (in Halliday's terms, the semantic roles are non-reversible), so that the clause is outside the existing category of RM. In this case (Example 6.38), excluding such an attributive clause is unproblematic, since S2b can also be argued not to be the end of a unit. It can with justice be said, then, that S2b of Example 6.38 adds further information to S1 but does not explicitly give it relevance.

Example 6.38

[1]The hydrodynamic diameter of the chromatin fiber in high salt was estimated by Lee et.al. (1981) to be 33 nm (after cross-linking) and by Fulmer and Bloomfield to be 40 nm. [2a]Given the uncertainty of the measurements, the insensitivity of the measured parameters to fiber diameter, and the difference in hydrodynamic models, [b]the two numbers are probably not significantly different. ONC 20.1-2

Some doubt as to whether attributive clauses should be discounted as RMs remains, however, and this is exacerbated by the underlined clause in Example 6.39 below.

Example 6.39

Since the average fiber length per nucleosome in our cross-linked fibers is only about 15 A (ref), the change of 36 A is unacceptably large in view of the small change in length and apparent morphology on cross-linking. ONC 25.4

This appears to close a unit discussing one possible (but unacceptable) model, but because it is an attributive clause it is not an RM. In the text, a further, more acceptable model is then described, in a unit terminated by a 'Thus'-type Relevance Marker (Example 6.40).

Example 6.40

Hence, the angular orientation of the nucleosomal disks need change by only 8^{o} to explain the dichroism difference between our unfixed and cross-linked chromatin samples. ONC 26.4

My argument is that while both these examples are clearly evaluations of value, only the *Hence* of the latter example turns the clause into an RM. In other words, the sentence quoted as Example 6.40 explicitly organises the discourse, whereas the sentence quoted as Example 6.39 does not. This line of argument has the advantage of avoiding expanding the category of RM to include most evaluations of value. Its reasonableness or otherwise must be left to the judgement of the reader, but some corroboration is found in the surely non-coincidental fact that it is the first of these conjoined units which is lacking an RM.

6.3.5 Clause Relations

Finally, mention must be made of the evaluation of relevance which goes on throughout a text in the form of the signalling of clause relations. Placing one clause in a specific relation to another (as in the two clauses of Example 6.39 above) asserts these clauses' relevance to each other. A

clause-relational analysis of a text is therefore an analysis of the relevance of the text. Enough work has been done on clause relations elsewhere (Hoey, 1979; 1983; Winter, 1982) to make it superfluous to labour this point.

What does need to be considered here, however, is whether in the light of the above, clauses which use vocabulary 3 items (Winter's term) should be included in the category of Relevance Markers. Consider, for instance, S2 of Example 6.41 below.

Example 6.41

[1]In this paper we measure the electric dichroic properties of chromatin isolated from a variety of sources ... [2]The main reason for measuring the dichroism for a range of chromatin types is to introduce a more or less independent variable-spacer length with which different solenoid models can be tested and model geometries can be refined. HOSC 4.1-2

This sentence gives value to the preceding text, is cohesive with it, but is in the configuration Value-Token. Its only claim to be an RM, therefore, lies in its explicit labelling of relevance via the vocabulary 3 item *reason*. The clauses in this example are in the pattern **fact + reason**. Clause pairs of this type, whether or not they fit the V-T pattern, give relevance to the **reason** rather than to the **fact**, that is, to the information in the second clause itself rather than to the preceding text. They therefore do not have the unit organising role of the RM. Where the relation is reversed to **reason + fact**, the clause pattern is likely to be T-V, and there will probably be an RM.

6.4 The Sample Analyses

Four texts have been analysed to show Relevance Markers and a preliminary attempt to identify units with the help of these RMs. The analyses are shown in Figures 6.2 to 6.5 at the end of this chapter. In the analyses, retrospective and prospective Relevance Markers are marked, arrows are used to show the extent of text with which each Relevance Marker is cohesive, and tentative unit boundaries are drawn. (Where units are not identifiable by RMs, no boundary is drawn.)

6.5 Relevance Markers and Units

6.5.1 Introduction

Relevance Markers represent a progressive chunking of text, largely retrospectively, and are therefore a form of interaction between writer and reader. In one sense, they demonstrate an ad hoc patterning of text. It is also to be expected, however, that RMs may mark boundaries to chunks which might on other evidence be identified as units with an internal structure (see Chapter 7). This section, without pre-empting Chapter 7, examines some issues surrounding the units so marked. At this stage, it will simply be assumed that the units identified in Figures 6.2 to 6.5 with the help of RMs will have some other, corroborating, form of identification and description.

6.5.2 The Place of the RM in the Unit

It might be expected from what has been said so far that Relevance Markers act as the opening and closing moves in discourse units. Prospective

RMs will open units, retrospective RMs will close units. A simple possible model for units would therefore be:

RM (prospective)	
unit cohesive with RM	UNIT 1
RM (retrospective)	
RM (prospective)	
unit cohesive with RM	UNIT 2
RM (retrospective)	
etc.	etc.

An example of a section of text which fits this model as it stands is shown as Example 6.42. The analysis in terms of Relevance Markers may be seen in Figure 6.5 (paragraph 18). (After this example, whole units will not be quoted for reasons of length.)

Example 6.42

[1]As monitored by electric dichroism, there are three important criteria that characterize the transition of native chromatin from an open, extended form to a compact, folded structure. [2]The extrapolated, infinite field dichroism at 260 nm, p_{oo}, decreases from about -0.54 to -0.21 (ref), reflecting a change in the orientation of the DNA with respect to the long axis of the chromatin. [3]Secondly, as chromatin folds up with added Mg^{++}, for example, there is a dramatic decrease in the relaxation time of the decay. [4]Just as significantly, the character of the kinetics also changes substantially. [5]The decay of dichroism for the open form is not described by a single exponential but rather consists of a large spectrum of relaxation times. [6]This is the expected behavior if the open form is flexible and not rigidly held in a particular conformation. [7]The average relaxation times we report here are calculated from the area under normalized decay curves and represent the average relaxation time as weighted by each component's contribution to the dichroism. [8]For open chromatin, the longest relaxation time observed in a semilog plot is 4-5 times largerthan the area average. [9]Once the chromatin folds up into a compact structure, however, 90-95% of the total decay can be well described by single exponential kinetics, which is consistent with the formation of a rigid structure with very little internal motion possible. PCHT 18.1-9

The above configuration is, however, only one of three possibilities. An RM may occur only at the beginning of a unit, as in OCM 1.7-10. Here, the RM takes the role of 'Topic Sentence' and the clause relational pattern

within the unit is General-Particular. Alternatively, the RM may occur only at the end of a unit, as in ONC 12.1-5. Here the RM summarises the implications of the information in the unit. In this example, the RM answers the question raised in the first sentence of the unit.

In addition, it is not the case that prospective RMs always occur at the beginning of units. Whereas this is normally the case, where an RM refers to the whole of the subsequent section or even paper, it may close the preceding unit rather then open the following one. Example 6.43, an 'Importance' type prospective RM which occurs as the final sentence in a paragraph unit, is an example of this.

Example 6.43

An anaylsis 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

Similarly, retrospective RMs may begin rather than end units, again especially where the RM summarises a whole section, as in the first sentence of Example 6.34 above, reproduced here as Example 6.44.

Example 6.44

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

Two other factors must be mentioned in passing here. Firstly, RMs may be extended to include the following clause, even if that clause does not fit the formal criteria set out in Section 6.2 above, provided that continuance with the RM is shown. In Example 6.45, for instance, S7 is an RM, but S8 is a continuation of it, the continuance marked by *neither*.

Example 6.45

[7]Since H1 restores the compact shape of the individual nucleosomes, the lack of higher order structure in the fibers is not simply a question of steric hindrance experienced in attempting to fold an unusually extended polynucleosome chain. [8]Neither is the native structure recovered when the concentrations of either monovalent or divalent cations increased, as might be expected if the function of the tails were simply to afford electrostatic shielding of the DNA backbone. PCHT 44.7-8

Secondly, RMs may be extended by recursion. In Example 6.46, for instance, the preceding information is given significance in S5, then the whole block S1-5 is given further significance in S6.

Example 6.46

[5]Presumably this contrast reflects the replacement of histone H1 in thymus chromatin by H5 in erythrocytes. [6]Given the similar dichroism properties....we believe that the cross-linking difference originates simply in the relative availability of suitably placed imidate-reactive sites in the two materials and does not reflect a substantial structural difference between them. ONC 10.5-6

6.5.3 Unit Hierarchy

It is not surprising that while some units identified by RMs form a string of discrete items (e.g. PCHT 13-16), others show a hierarchical organisation. As an illustration of this, it may be noted that the cohesive item in the RM may be cohesive with anything from a single clause to a major text section. As extreme examples, consider Example 6.47, where the second clause of the sentence is a RM giving relevance only to the first clause, contrasted with Example 6.44, repeated here, where *Our results*, occurring in the first sentence of the Discussion section, is cohesive with the whole of the Results section.

Example 6.47

The diameters of the fibers in figs 2 and 3 are about 200 -250 A, but this range of values is likely to be an underestimate. OCM 13.5

Example 6.44

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, implying further compaction by addition of NaCl to the Mg^{2+}-stabilized fiber. ONC 17.1

The kind of embedding that arises from such differences leads to an assumption of hierarchical organisation.

To see the effect of this phenomenon upon analysis, let us consider HOSC 7-10, which may be argued to comprise one unit, although there are three Relevance Markers, at 8.2b, 9.3 and 10.3. The argument that it is one unit rests largely on the characteristics of 10.3 (Example 6.23 above). This sentence in fact embeds one RM inside the other i.e.

(1) This slight and easily explained discrepancy gives us confidence that...

This assigns relevance to *this...discrepancy*; it is the 'conclude' type; *discrepancy* is cohesive with *difference* in 10.1.

(2) p_a is a significant description of filament structure

This assigns relevance to p_a; it is the T-V type; p_a is cohesive with the same item in 8.2 and 8.3.

Paragraph 7 is included in the unit largely on the grounds that the unit then follows a common semantic pattern (see Chapter 7): Method + Result + Implication. Paragraph 7 has relevance for this section of the text (Results) only insofar as it acts as a preamble to the Figure.

The unit is then divisible as follows:

constituent 1 - 7.1-7.3 No RM

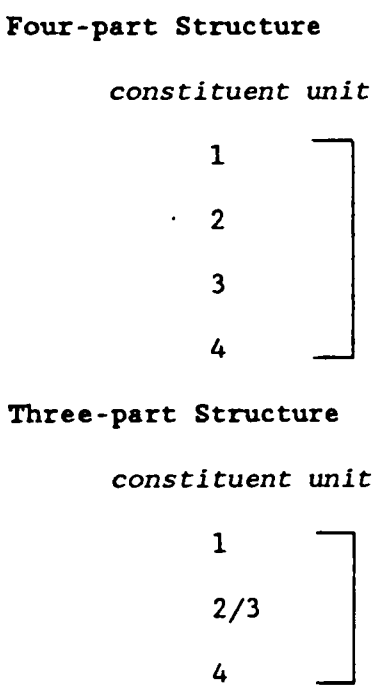
constituent 2 - 8.1-8.3 RM at 8.2; 8.3 is a parenthetical comment

constituent 3 - 9.1-9.3 RM at 9.3

constituent 4 - 10.1-10.3 RM at 10.3

The constituents may be arranged hierarchically in either of the two ways illustrated in Figure 6.6. That is, the unit is a three- or four-part one. This choice will be discussed further below (Chapter 7).

FIGURE 6.6



There seems to be no upper limit to the number of units that may be made the consituents of other units. In PCHT 32-42, for example, paragraph 42 is the RM for a stretch of text which begins in paragraph 32 and comprises at least seven other units (the exact number cannot be determined

because of the lack of Relevance Markers in some cases). Even more remarkably, HOSC 42 acts as a Relevance Marker to the whole paper.

6.5.4 Overlapping Units

A complicating factor in any analysis based on discrete units is that discourse producers tend to pull units together, to emphasise the coherence between them, rather than push them apart, emphasising their separateness. Eggins (1987) has noted the premium placed in 'dinner-table talk' on keeping the flow of conversation going, on opening up rather than closing down 'compartments' of the discourse, in short, on fudging the boundaries between units of discourse. A conversationalist who acts like the traditional teacher in the classroom and closes each exchange with an F move which merely acknowledges and terminates the exchange, will not contribute to the desired flow of conversation. A more successful speaker will simultaneously close one exchange and open another. (Observation suggests that this is not a peculiarity of casual conversation, as even teachers, excepting perhaps the most formal, use the same strategy, with varying frequency. Another everyday example is the radio continuity announcer who finds connections, however arcane, between items, thereby asserting their togetherness rather than their separateness.) Wells et.al (1979; 1981) found this phenomenon so common that they have proposed a concept of overlapping exchanges, with a process of continuous reclassification of utterances by the conversation participants. The abandoning of the three-part exchange by Wells et.al. appears to lose more than it gains (for a discussion, see Francis and Hunston, 1987), but the conclusion is inescapable that speakers frequently

exploit the framework of the system of discrete units to produce exchanges which overlap.

Returning to the written mode, it seems that writers too assert the connectedness between units at the expense of their separateness. For example, retrospective Relevance Markers, even those marking the end of a unit, are frequently placed at the beginning rather than the end of a paragraph. Example 6.48 illustrates this unexpected placing.

Example 6.48

[1]The evidence of electron microscopy then bears out the conclusion drawn from the sedimentation data that CH1 can replace the core histone tails. [2]There remains the apparent conflict with the electric dichroism observations, which could be most simply explained in terms of disruption of the compact structure under the perturbing effect of the orienting field. PCHT 39.1-2

S1 of the example is an RM to the preceding unit, whilst S2 begins a new unit. What is significant here is that the writer chooses to emphasise orthographically the close association between the units, based on their similarity (they both explain the implications of various of the reported results), rather than the separateness based on their difference (the implications are contrasting).

The 'pulling together' of units appears to be one of the functions of lexis in general, and of anaphoric nouns in particular. For example, S3 of Example 6.49 is not an RM. In Figure 6.4 it is analysed as a new unit constituent, that is, separate from S1-2. The phrase *this type of dipole*, however, draws the constituents together.

Example 6.49

[1]Both the extended 10 nm filament and the compacted 30 nm solenoid behave as typical polyelectrolytes; [2]that is, the dipole moment is dominated by the polarization of the surrounding ion atmosphere, and is inversely dependent on the ionic strength (refs). [3]One characteristic of this type of dipole is that two polyelectrolytes of the same length and shape, at the same ionic strength, should have closely similar orientation curves. HOSC 14.1-3

The 'Janus-like' RMs mentioned in section 6.2.6 above also contribute to this phenomenon.

6.5.5 Differences in RM Usage

Analyses of Relevance Markers in texts, such as those displayed in Figures 6.2 to 6.5, allow comparisons to be made within and between the research articles under discussion. This section will examine the options available with respect to Relevance Markers and unit construction, and will note the effect of various option choices on the character of the units and texts as a whole. Four such differences will be discussed: the presence or absence of RMs, the significance or organisational roles of the RM, the extent of RM coverage and the complexity of RM coverage.

Firstly, units may or may not be marked by Relevance Markers. That is, a unit may be identified by its internal organisation (to anticipate Chapter 7), rather than by a boundary demarcator. Figure 6.4, for example, shows that in HOSC, paragraph 15 contrasts with 18 in that the former has no RMs while the latter does. I would claim that the use of an RM is the norm and that its absence is always motivated. In other words, I take it to be, in this respect, similar to the third move in a Teacher-Elicit exchange (Sinclair and Coulthard, 1975, 51), whose absence carries as much meaning as its presence. What that meaning is, however, varies according to

circumstance. In the classroom, the lack of an acknowledging move may mean that the answer is wrong or that it is right (for further discussion of this point, see Hunston, 1987).

If the presence of an RM is the norm, therefore, it becomes necessary to identify the possible motivations for its absence. Figures 6.2 to 6.5 suggest that there are five main circumstances under which RMs are not present. The first, with what I would call the strongest motivation, is exemplified by Example 6.50, and it occurs when results which conflict with the current writers' are being criticised. This example has numerous cohesive ties but no Relevance Markers. (The same paragraph was discussed in Section 5.2.5 above.)

Example 6.50

[1]As can be seen from figure 1, the dichroism measured for the filment 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 attempted 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

This paragraph is notable for what it does <u>not</u> say. Firstly, the difference in dichroism results is evaluated as a *discrepancy* (S4), but only through a cohesive tie. Sentences 1-3 are not explicitly given the relevance

of being a discrepancy. Secondly, the suggestion of Tjerneld et.al. is evaluated negatively via the grounds of a quantity of contradictory evidence (S5-7) but the relevance of that evidence in disproving the suggestion is never explicitly stated. Then, the experiments which were apparently designed to mimic Tjerneld's results (S8), are clearly relevant to the non-verification of those results, but again this relevance remains implicit. Finally, the observations concerning possible aggregation (S9) and agreement with other methods of investigation (S10) are also left, as it were, in limbo, with no significance explicitly attached to them. The resulting impression is of a paragraph which is cohesive and yet curiously disjointed. This is not, of course, to fault the writers: the impression is also one of tact, of criticisms deliberately left unsaid. I would argue that at least part of the reason for the sense of disjunction is the lack of Relevance Markers in the paragraph.

The second very obvious absence of RMs is noted in the Methods section of each of the research articles. This absence suggests that either the organising principle of the units to be identified here must be totally different from that in the 'argument' sections of the paper, or that, as West points out, the Methods sections of many research articles are 'list-like' and discoursally anomalous (West, 1980).

Thirdly, units which are organised into sub-units by a prospective RM have optional retrospective RMs. This seems to be true of HOSC 27-32, which comprises two units (28-29 and 30-32) with an introductory focusing unit (27) which subordinates the other two. The first of these units is terminated by an RM (29.3), the second is not. I shall argue later that where, in such circumstances, the unit ends with evaluation of value, the

absence of an RM is less marked. (This argument applies also to Example 6.39, discussed in Section 6.3.4 above.)

The fourth circumstance is where the unit has a larger organisational role. An example is cited here as Example 6.51, which acts as the RM of the whole research article. Each sentence gives relevance to a distant part of the text (the cohesive items are underlined), but the paragraph itself has no internally organising RM.

Example 6.51

[1]Our relaxation data provide strong confirmatory evidence for the solenoidal model of the 30 nm chromatin fiber, with 6 nucleosomes for each 11 nm of solenoid length, previously deduced by other methods. [2]Most importantly, the dichroism measurements show that 30 nm chromatin fibers isolated from a variety of cell types and organisms share a major structural feature: the packing of the chromatosomes within the fiber is constrained so that in each case the chromatosome face is inclined at an angle of between 20° and 32° from the solenoid axis. [3]This constancy of packing prevails despite a variation from 10 to 80 bp in spacer DNA length among the chromatin samples studied. [4]We propose that the model shown in Figure 5 is the basic organization of the thick chromatin fiber in all higher organisms. HOSC 42.1-4

Finally, it must be said that on some occasions the significance of a unit simply remains unstated. Presumably it is expected to be 'understood' by the expert reader. It might be argued that such units are less effective as communication, or simply that they represent a less interactive style of writing.

The second main parameter of contrast is between units which have a prospective RM as an opening sentence and those which are terminated by a retrospective RM. At this point it is helpful to remember that a retrospective RM apparently has two functions: to give the significance of the information in the unit, saying what it means in terms of the overall argument; and to close the unit, that is, to act as a meta-organiser. Even in an example such as Example 6.52, where a retrospective RM (S4) appears

only to have the second of these functions, the extension of the RM (S5) actually fulfils the first function.

Example 6.52

[4]The three curves correspond to three successive sucrose gradient fractions, the DNA content of which is displayed in the agarose gel shown in Figure 3B. [5]The decay curves are acceptably first order over at least 90% of their total amplitude. HOSC 16.4-5

Some prospective RMs have the same two functions. That is they mark the beginning and the end of the unit and they give the significance of the information. Example 6.53, for example, is in function identical to the last sentence of Example 6.54, repeated here. Only the position in the unit is different.

Example 6.53

As we described previously...the supercoiled spacer model implies that the repeating unit of the solenoid helix could depend on spacer length. HOSC 37.1

Example 6.54

[7]The dashed line represents a least squares quadratic fit to a DNA sample...[9]A good fit to the data is also obtained by the "ion flow analysis" developed by Hogan...[10]The solid line in figure 2 is a simple linear extrapolation...[11]The slight differences in p_a estimated by the three different extrapolation methods translate into differences of less than 1^{o}... HOSC 14.7-11

Other prospective RMs, however, such as Example 6.55, simply organise.

Example 6.55

Figure 2 shows thin sections of mitotic HeLa cells treated in this way. OCM 9.6

The text OCM in general has a large proportion of prospective RMs. This means that the discourse is organised but that the significance of the information is not always given.

The third difference to be discussed here will be referred to as a difference between 'coverage' and 'non-coverage'. That is, is the Relevance Marker cohesive with the whole unit or only with the latter part of it? In Example 6.56, for example, there is an RM (S4-5), but this is not cohesive with the beginning of the unit. This may be contrasted with PCHT 17-20 (see Figure 6.5), where most of the text is cohesive with Relevance Markers, whether prospective, as in paragraph 17, or retrospective, as in paragraph 19, or a combination of the two, as in paragraph 18.

Example 6.56

[1]We repeated our earlier (ref) measurement of the dichroism of calf thymus chromatin, stabilized against unfolding in the low-salt dichroism measurement buffer by previous dimethylsuberimidate cross-linking in 80 mM NaCl, with nearly identical results. [2]Figure 4 shows the field dependence of the reduced dichroism *p*. [3]The signal is positive and reaches a saturating value of 0.05 by about 10 kV/cm. [4]Saturation of the signal means that orientation is essentially complete at voltages above 10 kV/cm. [5]The result is expected because of the very large ionic polarizability of a highly charged chromatin fiber roughly 1000 A in length (ref). ONC 13.1-5

The difference between the 'covered' and 'non-covered' units may be described by analogy with the 'attic' and 'doric' styles noted by Halliday (1987a, 16), where 'attic' refer to the 'crystalline' complexity typical of written language (Halliday, 1985, 331) and 'doric' to the 'choreographic' complexity typical of spoken languge (Halliday, 1985, 331) (see Chapter 2). The term 'choreographic' is further glossed as

> you cannot foresee the ending from the beginning, nor recover the beginning by looking at the end. [Choreographic clause complexes] are not constructions, as are the clause complexes of written discourse.
>
> Halliday, 1987b, 17

It must be stressed that I am not here discussing clause complexes, but am borrowing Halliday's terminology for a different type of unit: the discourse unit. The distinction between choreographic and crystalline holds,

but in a different way. In Example 6.56, where the RM is not cohesive with the whole unit, the movement is choreographic, and in fact produces a linear string: method of experimentation (S1), result (S2-3), significance of result (4-5), with increasing depth of relevance. In fact, sentence 1 is in a sense preliminary to the main business of the unit. By contrast, Example 6.57 establishes the point of the unit at the beginning as well as at the end, so that the retrospective RM is cohesive with the whole unit. In Example 6.57, the effect is of an argument being constructed, whereas in Example 6.56 a finding arises out of a methodology, and a conclusion out of a result. This distinction in turn reflects a difference between the two texts ONC (quoted in Example 6.56) and PCHT (quoted in Example 6.57) as research articles. ONC appears to allow claims to emerge naturally from method and result. No internal contradictions are allowed to remain in the finished paper. PCHT, on the other hand, is more consciously an argument, in which difficulties and indeterminacies are acknowledged.

The fourth and final difference is between texts in which Relevance Markers mark only one level or rank of unit as opposed those with a greater depth of complexity of unit marking. An example of the first type of text is ONC, whereas HOSC is an example of the second kind. We may compare specifically Example 6.56 with HOSC 7-10, which also consists of method + result + significance of result, but which has Relevance Markers at each stage of the argument (see Section 6.5.3 above). The difference here is not only one of length but of complexity. In HOSC, the constituents of the unit are themselves treated as units. This in turn reflects the nature of HOSC as the more closely argued text.

6.6 Conclusion

In this chapter I have discussed one of the functions of evaluation which accords with observations of its function in narrative: the assignment of relevance or significance. Although this function is realised throughout the text, there are certain clauses which draw particular attention to it. These clauses are designated here as Relevance Markers. These Relevance Markers may also realise other functions of evaluation, such as the assignment of value, but they do not necessarily do so. The essential meaning of the Relevance Marker may be represented as:

'x' *is/represents/means/is concluded to be* 'y'

where 'x' is the preceeding or subsequent argument and 'y' is an item at a higher level of abstraction or significance. Various types and recognition criteria for RMs have been proposed.

Relevance Markers have organisational significance and represent one of the ways in which writers interact with readers in the sense of indicating to them the patterning of the text under construction. Prospective Relevance Markers subsume and have a function similar to Focusing elements, while retrospective RMs indicate a progressive, hierarchical chunking of the text.

It is claimed in addition that RMs may act as boundaries between text units, and as such may form one of the recognitional criteria for such units. Prospective RMs act like the topic sentences of traditional rhetoric, while retrospective RMs act as concluding elements.

When texts are analysed in terms of their Relevance Markers, the differences in RM usage indicate significant differences between the texts.

Several variables in RMs usage, such as the extent and complexity of their coverage, for example, are claimed to indicate the extent to which a text is organised by RMs. This in turn may be seen as analogous to Halliday's distinction between attic and doric styles, correlating with the extent of the complexity of the argument carried by the text.

FIGURE 6.2 Relevance Markers in OCM

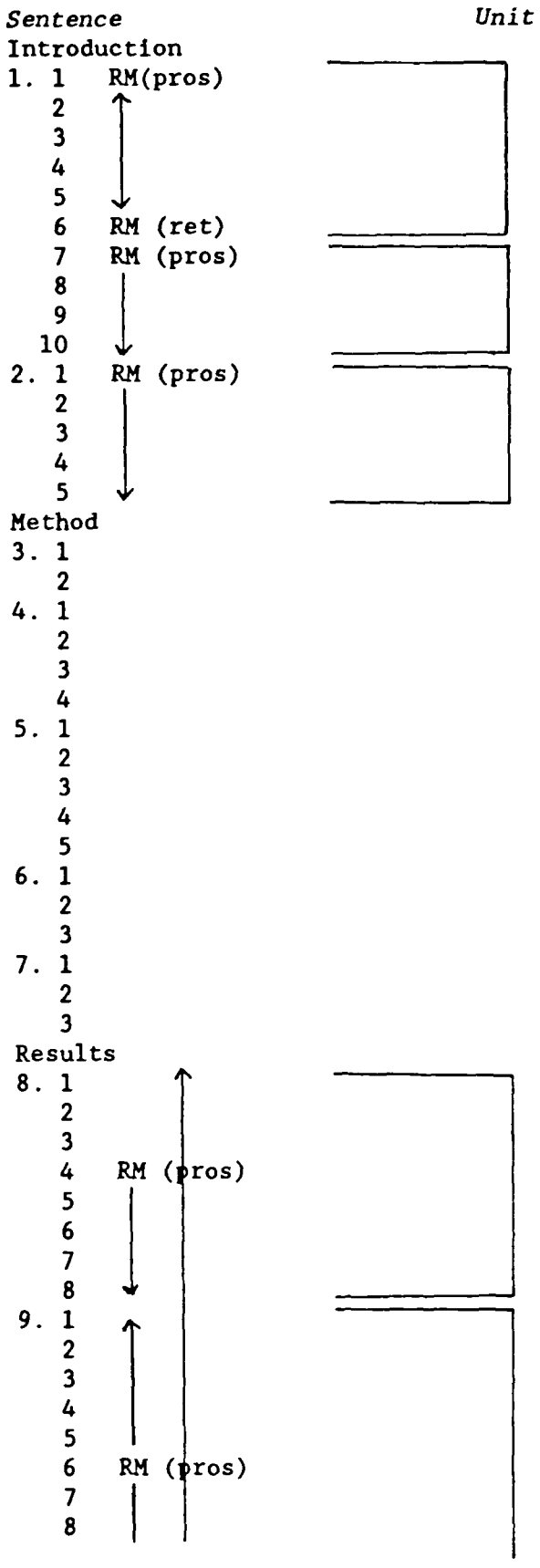


FIGURE 6.2 (continued)

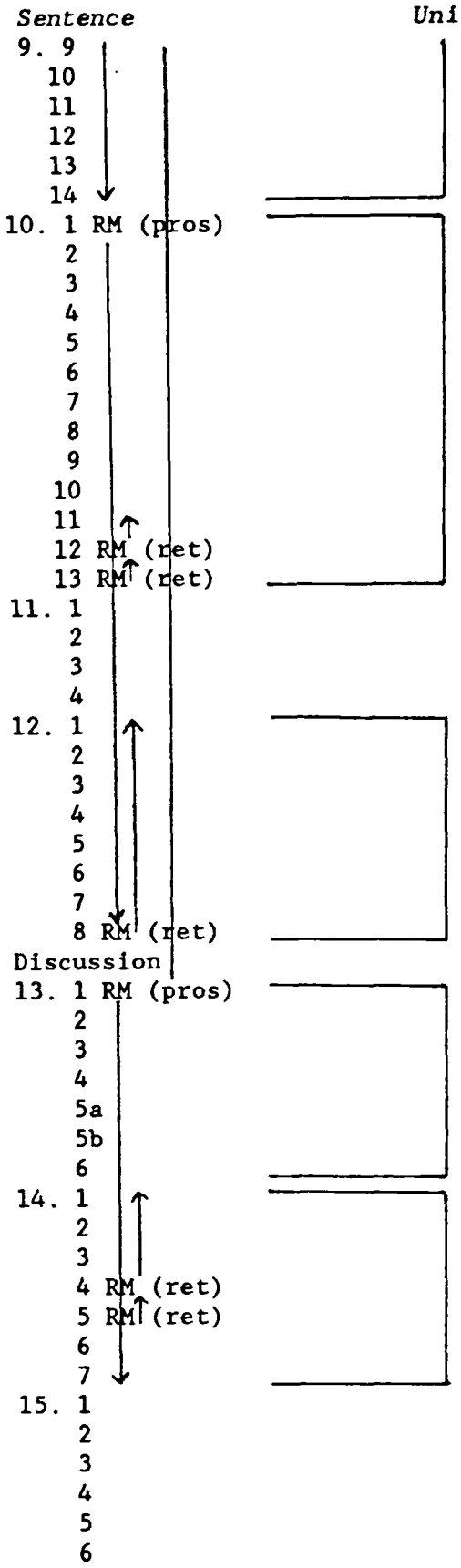


FIGURE 6.3 Relevance Markers in ONC

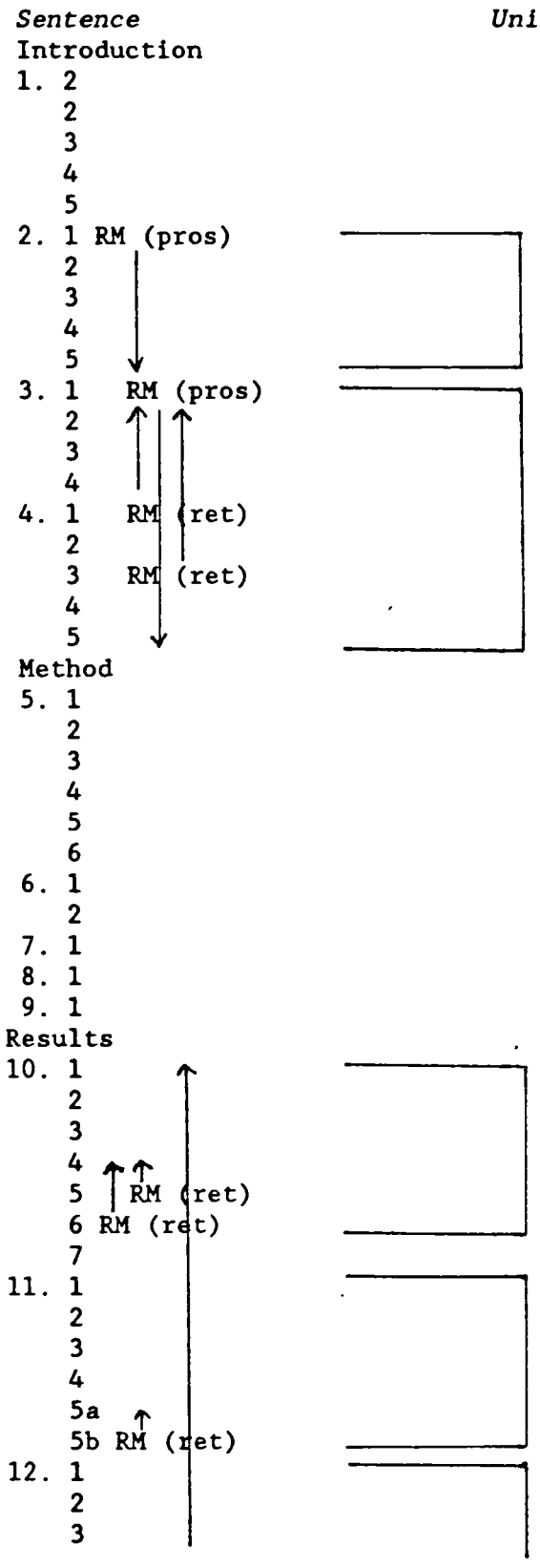


FIGURE 6.3 (continued)

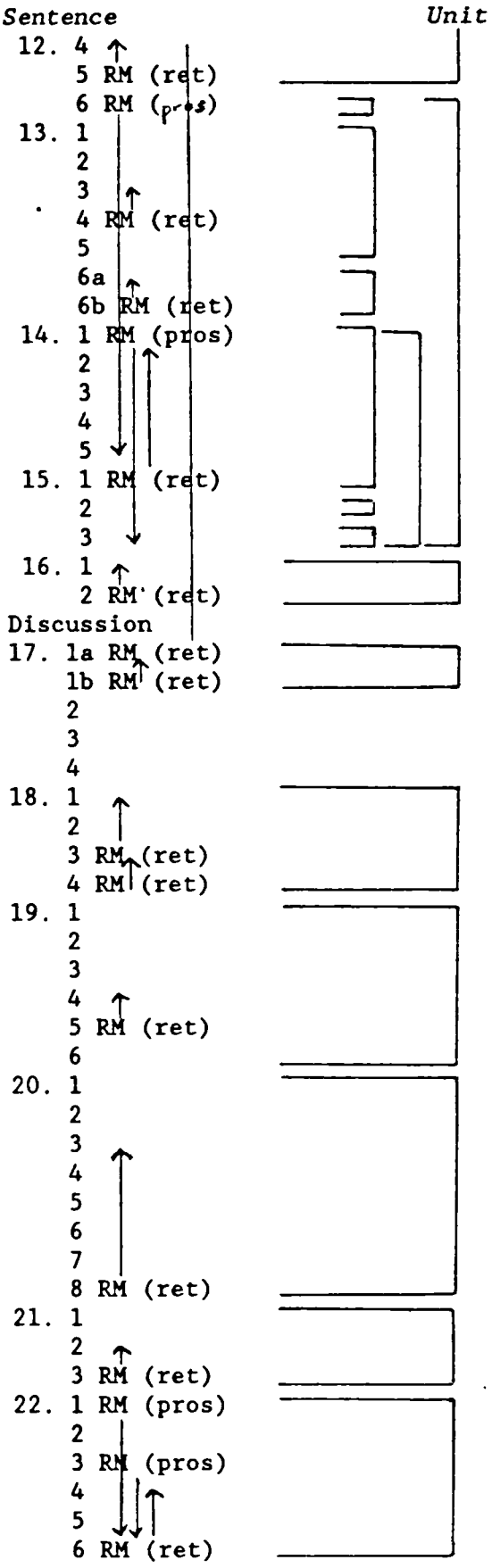


FIGURE 6.3 (continued)

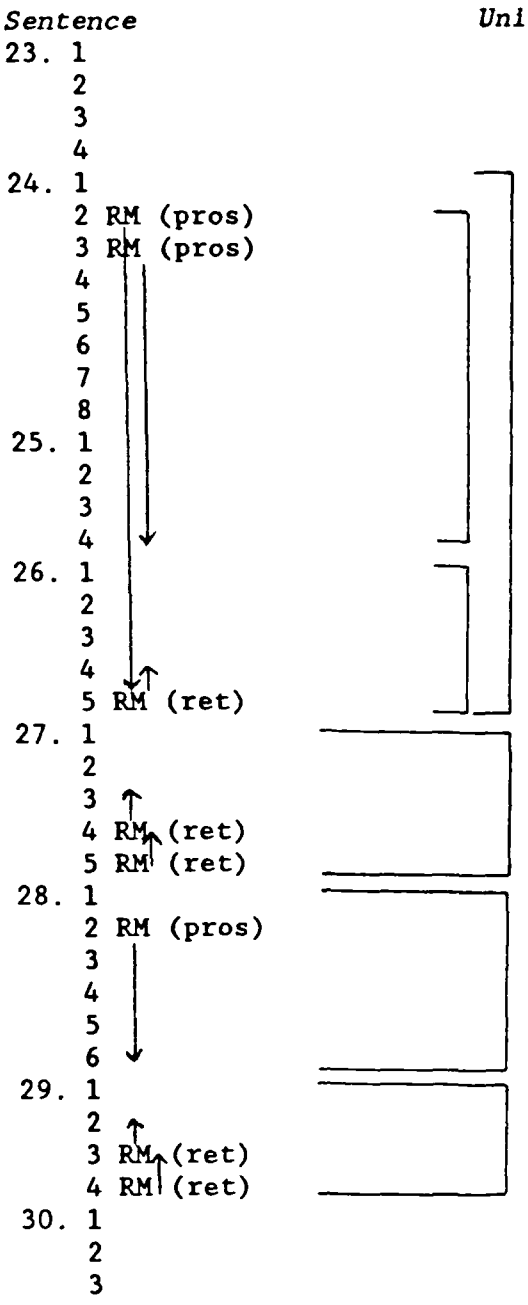


FIGURE 6.4 Relevance Markers in HOSC

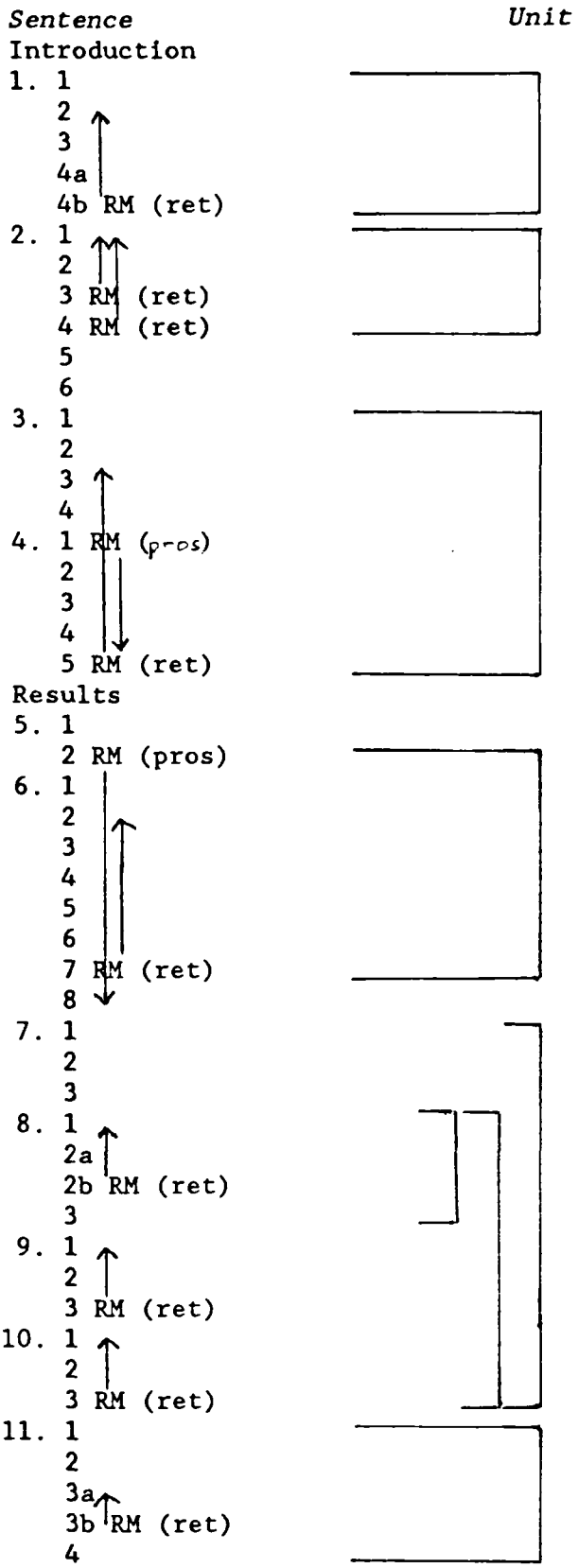


FIGURE 6.4 (continued)

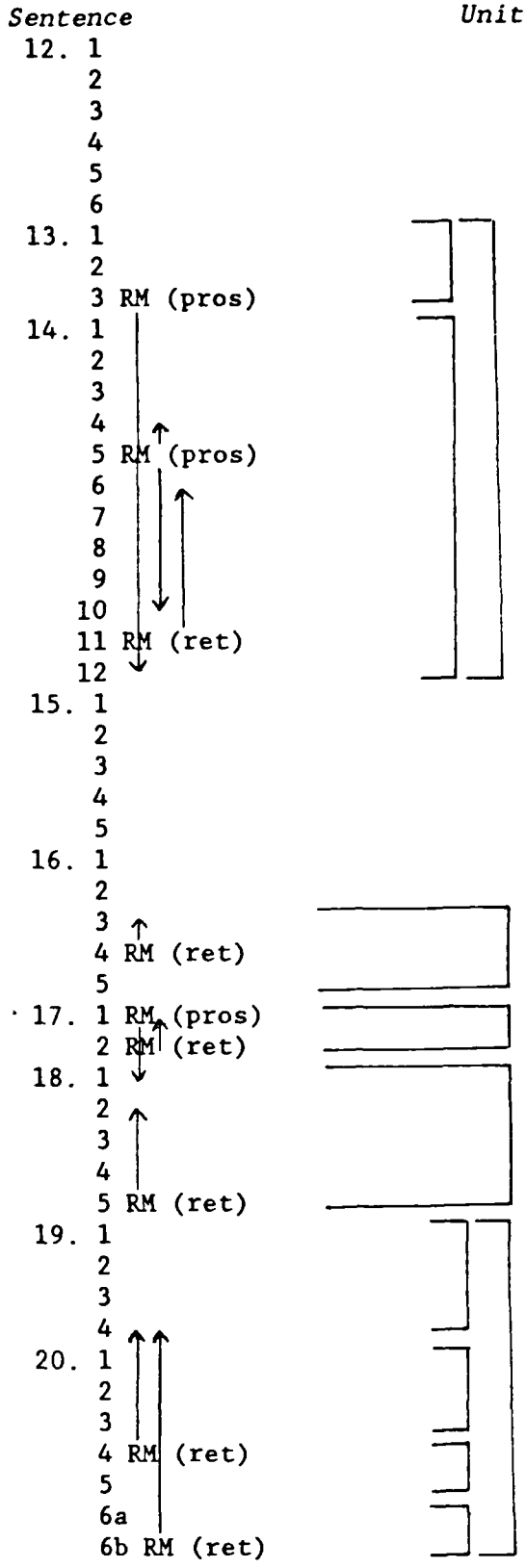


FIGURE 6.4 (continued)

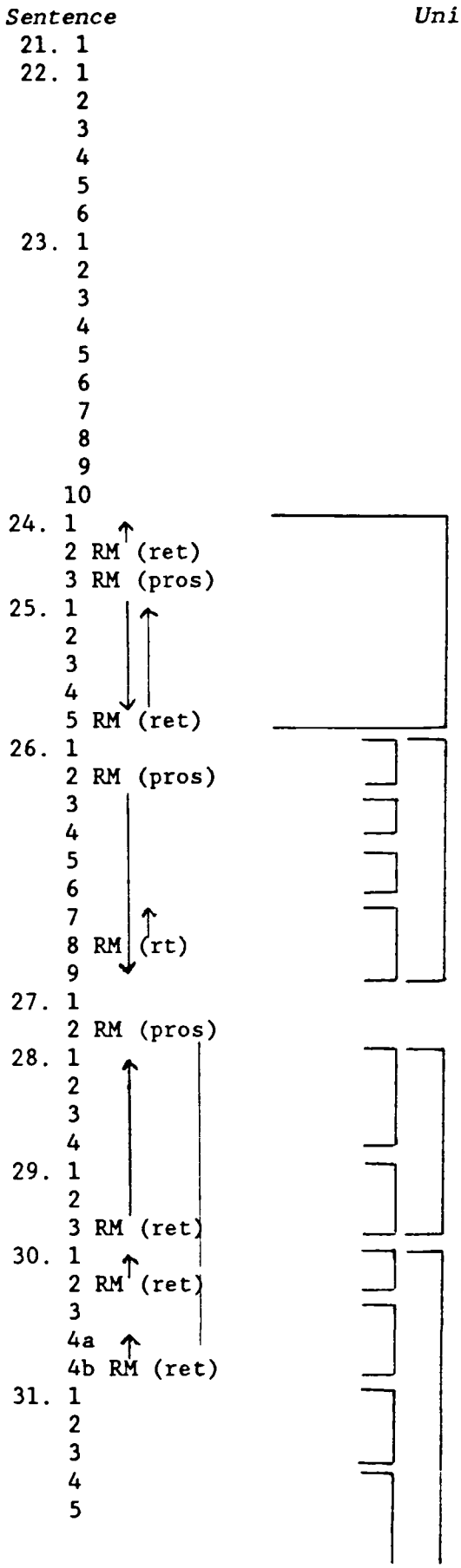


FIGURE 6.4 (continued)

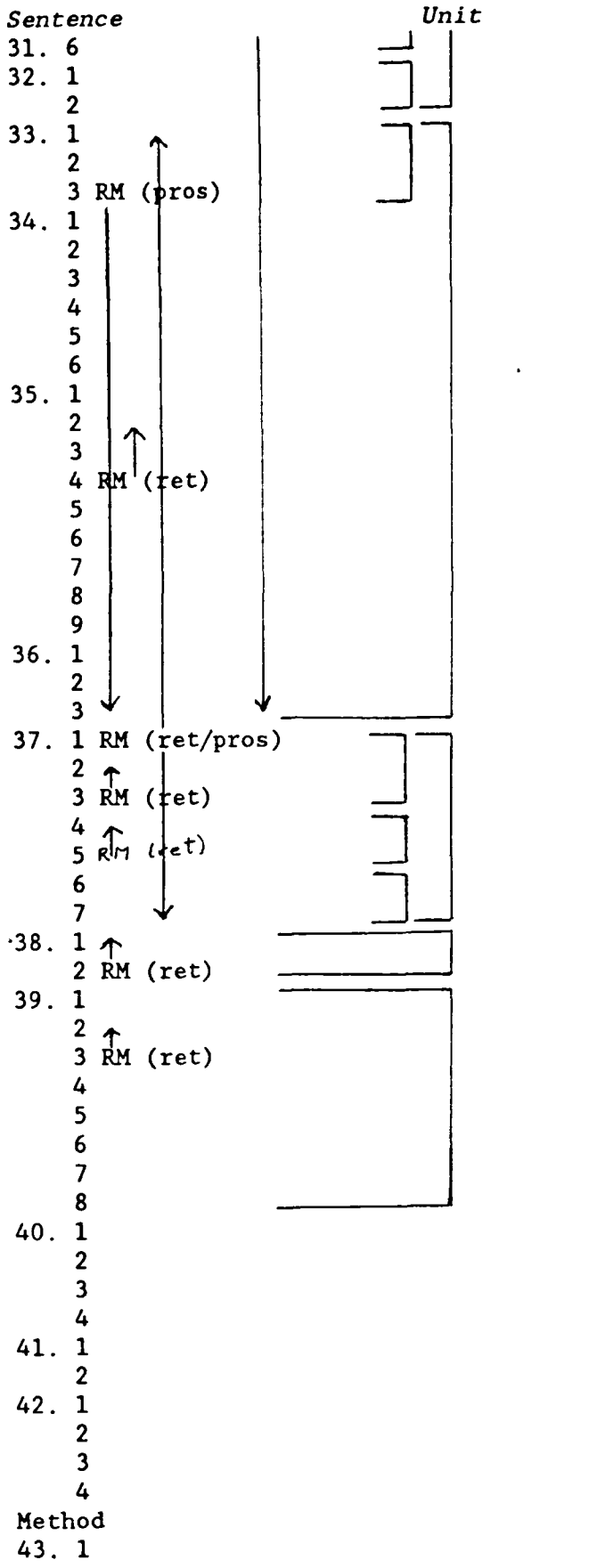


FIGURE 6.4 (continued)

Sentence	*Unit*
43.	2
	3
	4
	5
	6
	7
	8
44.	1
	2
45.	1

FIGURE 6.5 Relevance Markers in PCHT

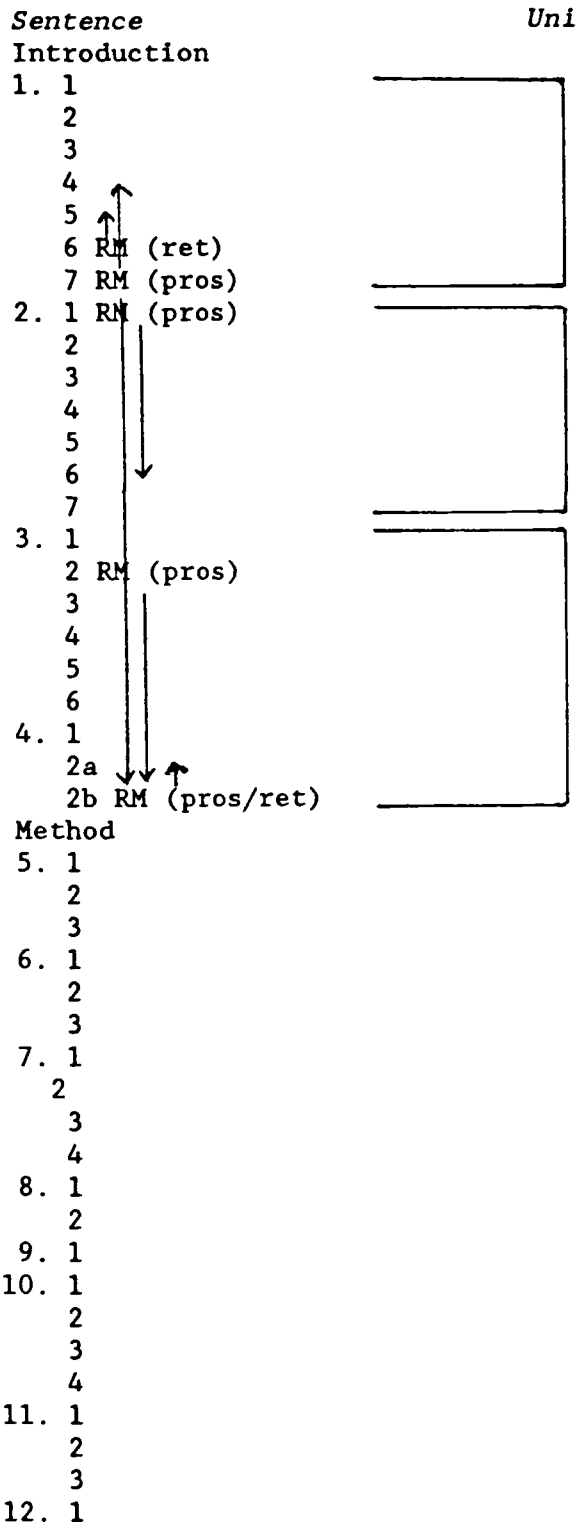


FIGURE 6.5 (continued)

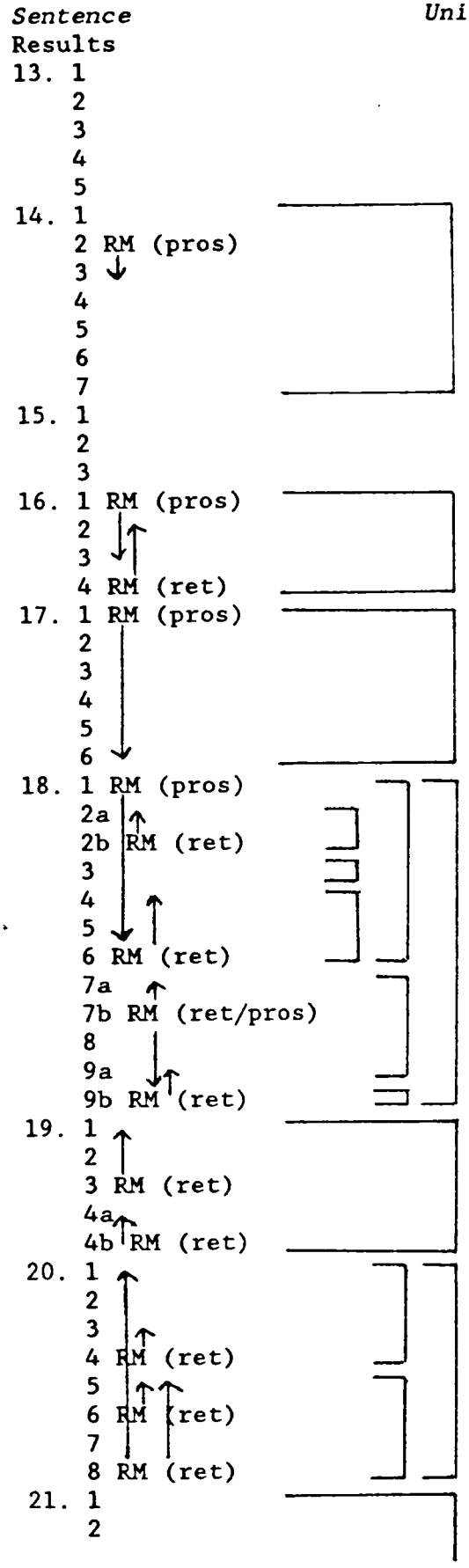


FIGURE 6.5 (continued)

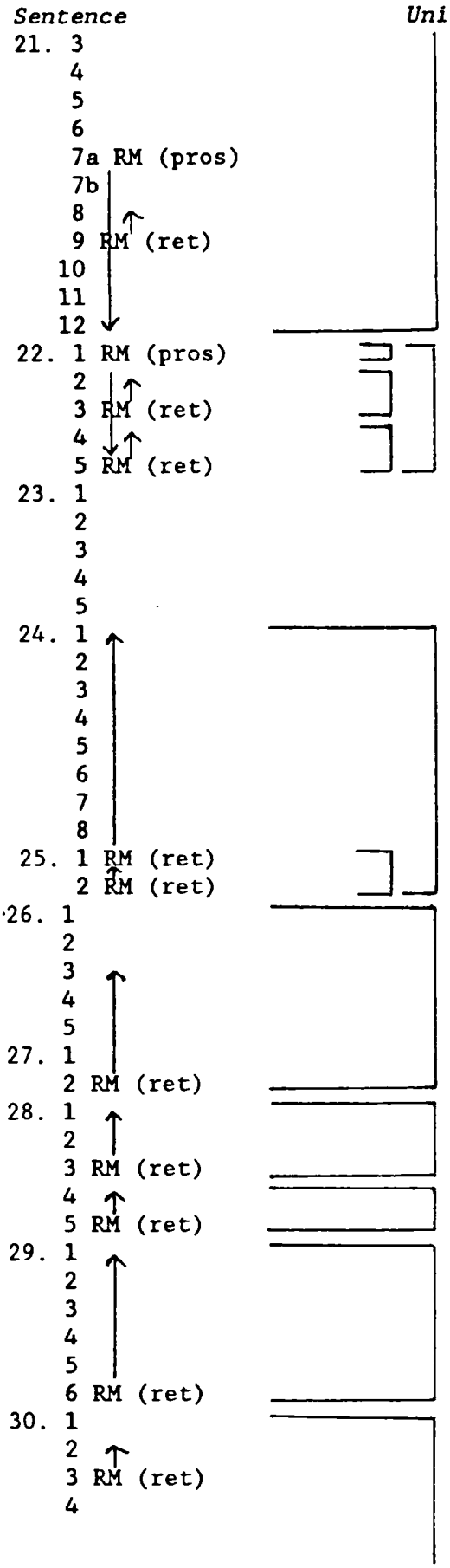


FIGURE 6.5 (continued)

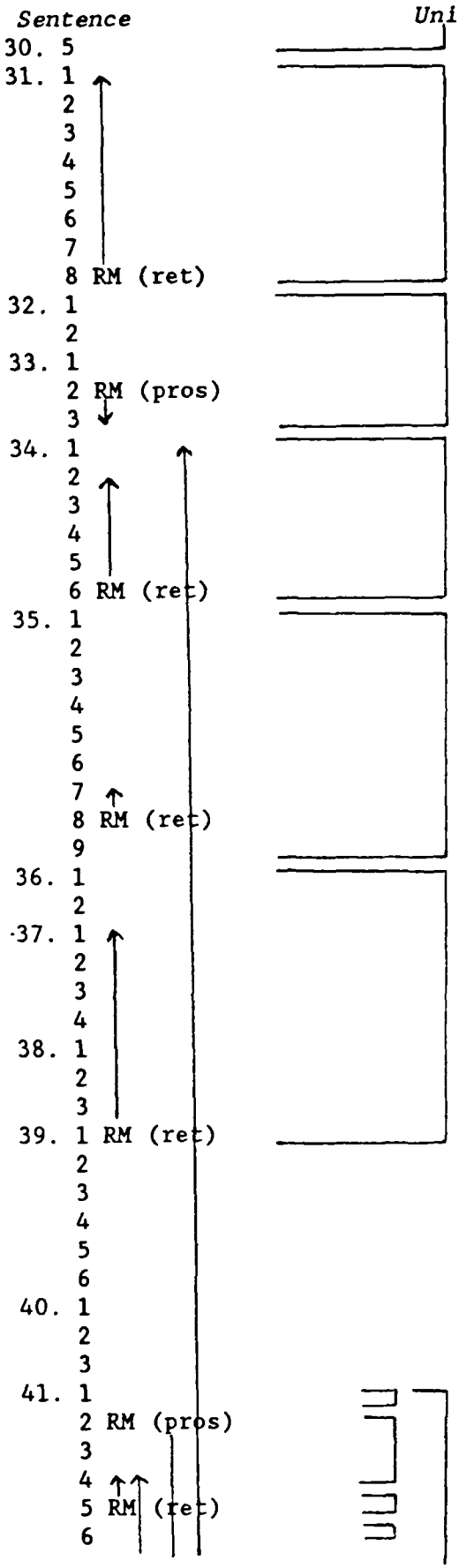
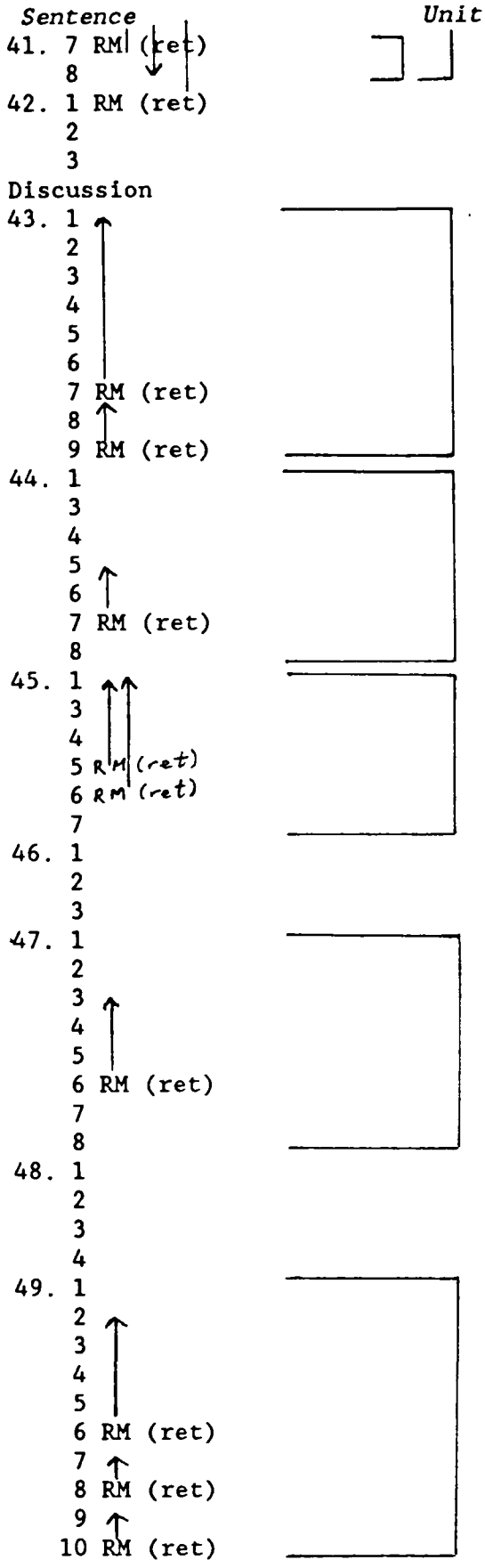


FIGURE 6.5 (continued)



CHAPTER 7

Evaluation and Structure

7.1 Introduction

I began this investigation of evaluation by criticising several existing views of the phenomenon, such as those of Sinclair, of Halliday and of Labov, as being too restrictive in their scope (see Chapter 3). In each of the above cases, however, the study of evaluation is part only of a wider concern with the structure of discourse. Having developed a less restrictive theory of evaluation, largely separate from concepts of structure, it is necessary for me now to return to the starting point of the broader issue of evaluation in discourse structure.

As discussed in Chapter 3, Halliday suggests three possible representations of structure: particulate or constituency-based, field-like and wave-like. These are associated with Field, Tenor and Mode respectively. Looking at the analyses presented in Chapters 4 and 5, it might be argued that status is best represented as a list, or string of particles, while value exerts a field-like influence, with undefined boundaries. It might also be argued, from Chapter 6, that within units there is a movement to and from relevance, that might be represented as a wave. Further consideration, however, suggests that such a neat division cannot be justified. Firstly, it has been proposed (in Chapter 6) that it is relevance which most saliently marks constitutent boundaries. Secondly, all the types of evaluation may be described in terms of wave-like movements.

I shall therefore not adopt Halliday's suggestions wholesale, but shall propose two models of discourse structure, each of which envisages a role for all types of evaluation. The models may be termed the *constituency* model and the *movement* model. I shall here look briefly at what a proposal of each of these models entails. The rest of this chapter will elaborate on the two models. It is based on analysis of ten experimental research articles, excluding the Methods section of each article.

Any theory of a constituency structure must involve the following components. First, there must be a notion of unit boundary, a demarcation between constituents. I propose that evaluation of relevance be seen as the primary definer of unit boundaries. Secondly, there must be a finite paradigm of unit types from which the text-producer may select. These types may be classified according to their internal organisation and interactive function (cf Sinclair and Coulthard), or according to their socio-semantic role within the particular discourse type (cf Hasan). I shall concentrate primarily on the former, although I shall discuss the latter in Section 7.4 below. Thirdly, for a structural statement to be complete, there is a need for a notion of constraints, that is, a set of rules for permitted combinations.

There is, unfortunately, no equivalent tradition for a description of the structure of text as a succession of movements or waves, and therefore no equivalent set of criteria or procedures. It is noteworthy that Halliday, whilst describing mood and thematicity as field and wave respectively, actually represents them graphically as if they were particles. Martin refers to 'an interpersonal attitudinal wave' (Martin, 1986, 247), and Labov presumably means something similar by his 'secondary structure' of evaluation (Labov, 1972, 369; cf Polanyi, 1979, 209). These ideas do not

really, however, give a picture of what is necessary for a wave or movement-like analysis.

The problem is that, while *constituency* is a fairly transparent notion in terms of linguistic structure, the use of the term *movement* or *wave* involves a considerable degree of metaphorical transference of meaning. A representation of a wave shows a movement from 'high' to 'low' and vice versa. Representing discourse elements in terms of waves therefore involves assigning values of relative 'high-ness' and 'low-ness'. Taking each evaluation type in turn, one may assign 'high-ness' to each of the following: status categories of the greatest certainty, maximal accretions of value, statements of the greatest explicitness of relevance (Relevance Markers). Correspondingly, 'low-ness' may be ascribed to the opposites of each of these. A wave-like representation of each of the evaluation types may therefore be proposed.

A further question which will be addressed below (Section 7.3) is that of the theoretical legitimacy of a movement statement of structure. Constituency in discourse clearly belongs to a tradition of structural linguistics. The theoretical basis for movement in discourse, and what the term *structure* means in such a usage, is not so clear.

7.2 Structure as Constituency

7.2.1 Boundaries, Relevance and Hierarchy

One of the analyst's jobs in arriving at a statement of structure is to identify units, both in terms of their internal relations and in term of the boundaries that separate them. Halliday and Sinclair agree on this. In

Sinclair's work the concern with boundaries is quite obvious and is closely connected with his interest in defining units by their constituent elements. Halliday, although questioning the importance of constituency, implies nonetheless a concern for units within a text:

> It [This pattern of development of the clause] 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.
>
> Halliday, 1982, 229 (emphasis added)

The text unit, if seen in evaluative terms, is essentially a unit of relevance. Sinclair (1986) argues that the end of a unit signifies that a certain proposition (or set of propositions) should stand temporarily as part of the shared world of the interactants. We may add that what is also shared is an understanding of the proposition's significance, its raison d'etre within the discourse as a whole. An evaluative discourse unit therefore represents not only an informational exchange, but also agreement as to the point of that information, its role in the continuing co-operative building of a discourse world. A proposition and its relevance may co-occur, as in Example 7.1. In this example, the word *verify* indicates that the absence of free DNA is a goal, and therefore that this action has a relevance in achieving the goal. In the text, this sentence stands as a unit on its own. In Example 7.2, however, the relevance of S1 is given in S2. The result cited in S1 is relevant because it forms part of a controversy (S2).

Example 7.1

The absence of free DNA and absence of histone degradation were verified as described previously (ref). HOSC 21.1

Example 7.2

[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 (ref) who correct their high-field dichroism measurements by subtracting a pulse-associated "nondichroism signal" (an actual overall absorbance decrease). HOSC 24.1-2

Because discourse units are essentially units of relevance, the evaluation which is associated with unit boundaries will be primarily that of relevance. I therefore make the assumption that Relevance Markers will play an important role as boundary markers. Prospective RMs may mark the beginning of a unit and retrospective RMs will close it. As an illustration, see Example 7.3, which may be argued to consist of two units distinguished from each other by the presence of RMs. The Relevance Markers in this example are highlighted, and the units are marked by angled brackets. (The end of the second unit is identified by means of a subsequent RM which signals the start of the next unit.)

Example 7.3

<[1]**Recent results which describe the structure of chromatin in terms of nucleosomes continue structural studies which, over a number of years, have given evidence for a variety of chromosome fibers.** [2]HeLa cell metaphase chromosomes that are spread on water show fibers of 250-300 A (ref). [3]Thin-sectioned human metaphase chromosomes and critical point dried chromosomes reveal the supercoiling of the 100 A thread into a 250 A fiber (ref). [4]Thin-section studies of interphase nuclei also reveal the chromatin to be organized into threads of around 300 A (ref). [5]Other studies with water-spread chromosomes strengthen the evidence for the existence of a fundamental chromosome fiber of around 250 A, which is formed by the coiling of a subfiber (refs). [6]**These and other investigations strongly support the concept of various levels of substructure in chromosomes (refs).**> <[7]**The manner in which these fibers are folded to produce the characteristic morphology of metaphase chromosomes has been the subject of considerable conjecture.** [8]One current model for the condensation of chromosome fibers into the metaphase morphology is the folded-fiber model (refs). [9]A model of metaphase chromosome structure has also been presented which includes the concept of 'epichromatin' loops and 'core' fibers (ref). [10]A more recent paper has taken a different approach in proposing that the morphology of human metaphase chromosomes is based on the helical coiling of a 4000 A 'supersolenoid' (ref). > OCM 1.1-10

In Example 7.3 above, the Relevance Markers draw a boundary between two discrete units. This, however, is by no means always the case. Relevance Markers may cover overlapping or embedded sections of text, as was demonstrated in Chapter 6. What must result is a hierarchy of text units. Example 7.4 below, analysed in Figure 7.1, demonstrates the hierarchical nature of unit organisation. (See also Chapter 6 for a discussion of the same extract.)

Example 7.4

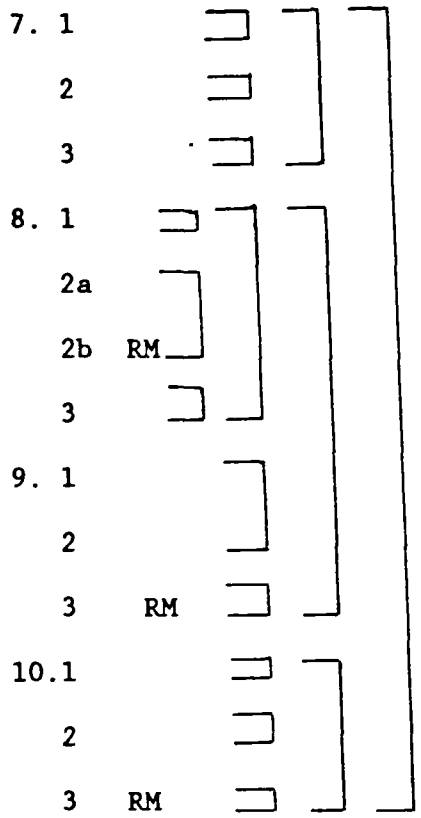
7.[1]Chromatin was prepared by mild nuclease digestion of a variety of nuclei (...), followed by dialysis against 0.25 mM EDTA and sucrose gradient centrifugation. [2]Polynucleosome size fractions, ranging in length from 20 to 100 nucleosomes,were dialyzed to low ionic strength (..) and EDTA added in the range of 10-20 $_{u}$M to chelate any remaining metal ions and hence to ensure that the chromatin was in the open 10 nm filament conformation. [3]Finally, the dichroism, p, was measured as a function of the electric field strength, E.

8.[1]Figure 1A (...) shows typical dichroism data obtained for the 10 nm filament conformation of each chromatin type. [2]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. [3]Other functional forms of the extrapolation will be considered below and will be shown to have negligible effect on our estimates of p_a.

9.[1]The dichroism associated with the filament conformation of all chromatin types studied is strongly negative (...). [2]As we reported previously for chicken erythrocyte chromatin, the dichroism extrapolates close to the value expected if the spacer DNA is completely extended and if the chromatosome faces lie parallel to the long axis of the 10 nm filament (ref). [3]For the filament conformation of all chromatin types, the chromatosome faces must lie within 20^{0} of the filament axis (or even closer if the base pairs of DNA are actually tilted somewhat from the helix axis (refs)).

10.[1]The largest difference between the extrapolated dichroism, p_a, and that predicted if the chromatosome faces and spacer DNA were parallel to the filament axis, is measured for the CHO chromatin filament. [2]This is perhaps not surprising since, in this case, the spacer DNA (...) is too short to allow neighboring chromatosomes, even if arrayed in a zig-zag fashion, to lie parallel to the filament axis. [3]Indeed this slight and easily explained discrepancy gives us confidence that p_a is a significant description of filament structure. HOSC 7.1-10.3

FIGURE 7.1



As discussed in Chapter 6, the analysis is based partly on the occurrence of Relevance Markers, and partly on a sense of the progression of the extract from Method (paragraph 7) to Result (paragraphs 8 and 9) to Conclusion (paragraph 10). Relevance Markers suggest the unity of paragraphs 8-10 (10.3) and of paragraphs 8 and 9 (9.3), and the discreteness of 8.2a and 8.2b. The sense of progression argues for the inclusion of paragraph 7 in the unit. The division within paragraph 7 is justified by the word *Finally* in 7.3, which signals the concluding item of a sequence.

These texts, then, illustrate the notion of recursive patterns in texts, which Sinclair ascribes to discourse ranks and which Halliday associates with the hierarchical recursion of pattern found in apparently

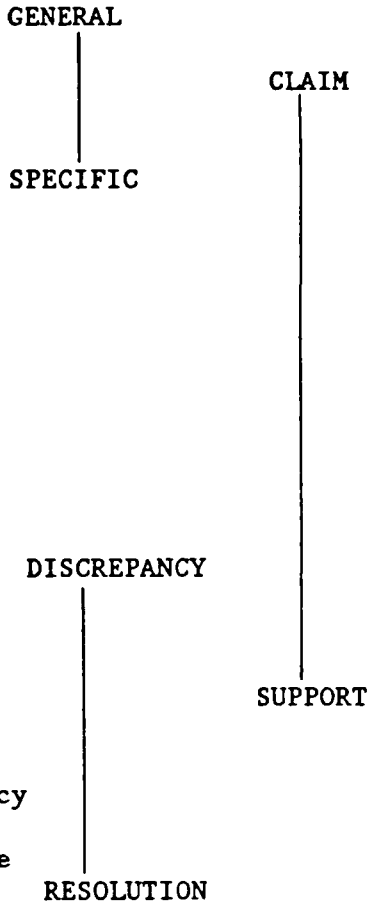
chaotic natural phenomena (Halliday, 1987). In Sinclair's approach, rank is an integral part of the statement of structure. There is a fixed number of ranks and each is described as having a structure of a different type (Sinclair and Coulthard, 1975). Any appeal to a notion of rank must, it seems to me, maintain these principles of finite number and distinct structure types. Because I do not observe these phenomena, I do not wish to describe the hierarchical pattern in experimental research articles as a rank scale. (Note that in the following discussion I shall use informal and, I hope, self-explanatory names for 'unit patterns', simply in order to illustrate the points that I am making. The actual unit types which I have identified will be discussed below, Section 7.2.2.)

There are four specific objections to the use of a rank scale in the texts under discussion. Firstly, the number of ranks is by no means consistent throughout a text. Figure 7.1 shows that not all parts of a text need to be, or can be, analysed using the same number of ranks. Rather, there is an indefinite number of recursions.

Secondly, the same patterns may be observed at each hierarchical level. The pattern of organisation at each level is not distinct, as a rank-scale theory demands. Example 7.5 below, for instance, represents a single unit with the pattern Claim-Support. Within each element, however, there are further organising patterns of General-Specific and Discrepancy-Resolution. These latter patterns frequently occur as organisers of whole units (see Example 7.3 above for two instances of General-Specific). The patterns are shown as labels alongside Example 7.5.

Example 7.5

[1]As a more general principle, it is dangerous to assume that an electric field induced optical signal corresponds to the overall orientation of a macromolecule.
[2]As we stressed in an earlier paper (ref) segmental orientation and local distortion can give rise respectively to dichroism and absorbance changes that are unrelated to the optical anistropy of the unperturbed particle.
[3]An instructive example is provided by the dichroism of chromatin in low-salt conditions, without added Mg^{2+}.
[4]McGhee et al (1980), using electric field orientation, reported a substantial negative dichroism, from which they concluded that the nucleosomal disk diameters in the 10nm fiber are roughly parallel to the fiber axis.
[5]On the other hand, Tjerneld and Norden (1982), using flow orientation, found positive dichroism for the 10nm fiber, supporting models in which the disks stack face to face with diameters perpendicular to the low-salt fiber axis.
[6]No definitive resolution of this discrepancy is yet possible, but the large dipole moment of mononucleosomes (ref) and relative flexibility of the 10 nm fiber make it plausible that electric fields cause segmental orientation of nucleosomes, yielding an incorrect picture of their disposition relative to the fiber axis in an unperturbed molecule. ONC 22.1-6



As a result of this sameness of patterning, the decision to code something as a series of elements within one unit, or as a series of discrete units must often be an arbitrary one. In Example 7.6, for instance, two paragraphs describe a method-result-conclusion pattern, but the method element in the first paragraph is expressed in terms of a Problem-Response, and the conclusion in the second paragraph is expressed in terms of a Question-Answer.

Example 7.6

32[1]A distinct problem in the determination of $\tau^{(r)}$ was the field dependence observed. [2]Because of the small signal, we could not measure $\tau^{(r)}$ below about 17% orientation and hence were forced to extrapolate $\tau^{(r)}$ to degree of orientation (equ). [3]These results are shown in Figure 9, revealing a substantial correction for the sample containing 16 kb of DNA, with smaller field dependencies for the lower molecular weight sample. [4]Within the error limits of the measurement we could not detect a concentration dependence of $\tau^{(r)}$. [5]Table II summarizes the rotational and translational relaxation times of the three main samples used in this study.

33[1]The data in Table II show that $\tau^{(r)}$ and $\tau^{(t)}$ are comparable, raising the question of the possible contribution of rotational motion to the light scattering fluctuations used to determine $\tau^{(t)}$. [2]We verified that $1/\tau^{(t)}$ was linear in q^2, where (equ) as should be the case for purely translational motion. [3]We surmise that the small optical anistropy of the particle, as reflected in its small dichroism, may cause rotational contributions to scattering fluctuations to be negligible. SSS 32.1-33.3

This extract illustrates the difficulty of defining the unit which is to be taken as 'basic', in the way that the exchange is 'basic' to the analysis of spoken interaction. The extract may be seen either as a single unit, two elements of which have complex patterning, or as a series of independent units which happen to be related in a describable pattern. Such an arbitrariness implies that an attempt to isolate defined hierarchical levels is doomed to failure and, more importantly, does not adequately reflect actual discourse structure. If the text is taken on a moment-by-moment basis, then each unit that is formed has the potential to become an element of a larger unit and so on indefinitely.

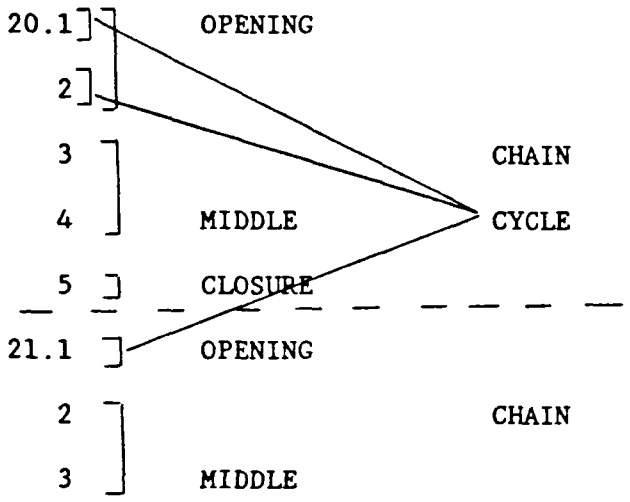
Finally, it must be noted that some examples from the texts analysed demand an analysis which is incompatible with a rank-scale. Example 7.7, for instance, shows the initial elements of two bound units.

Example 7.7

20[1]Because there is a practical limit to the amount of protein that can be loaded in the two-dimensional procedure, in other experiments the corresponding weak bands from several first-dimension gels were extracted and pooled, and the proteins analysed after reduction of the cross-links with 2-mercaptoethanol. [2]In one experiment shown (Fig.4A) the first electrophoresis of the cross-linked material was carried out in a 12% polyacrylamide gel, which partially resolved the first weak band into two halves which were eluted separately....21[1]In further experiments successive weak bands were eluted intact and analysed.... CHC 20.1-21.1

Figure 7.2 shows how the two complete units are analysed. Normally, units such as these are described as bound because they share an initial element, such as a description of method, which is followed by two sets of results. In this case, however, it is only the first sub-element of the initial element that is shared. Therefore, whilst these units are clearly bound to each other in some way, it is not a way which is describable in terms of rank.

FIGURE 7.2



Before leaving the topic of rank scale, I shall discuss one phenomenon which acts as a counter-example to the above in that it suggests the presence of a unit of structure analogous to that of the Transaction in spoken discourse. This is the presence, particularly marked in some of the texts analysed, of Focus units, whose purpose is to organise prospectively the subsequent discourse much in the same way as Boundary exchanges do in the classroom (Sinclair and Coulthard, 1975). Examples of such units are shown as Examples 7.8 and 7.9 below.

Example 7.8

In the briefest fashion, we list the definitions and equations used most throughout the present paper. HOSC 5.2

Example 7.9

[1]Our estimates of p_a for each type of chromatin solenoid are collected in Table 1. [2]We now use these measured dichroisms to estimate parameters associated with the three different solenoid models diagrammed in Figure 4A. HOSC 27.1-2

There are two reasons why I do not propose a 'Transaction'-like unit for these texts, with a Focus unit as first element. One is that, although the text cited above (HOSC) has several such units, other of the texts under discussion have none at all. Secondly, as was pointed out in Chapter 6 with respect to Relevance Markers, the Focus units do not necessarily cover discrete sections of text and may in fact demarcate a multi-layered hierarchy.

To summarise, then, I define discourse units in terms of evaluation of relevance, and use Relevance Markers as the primary (although not the only) demarcators of unit boundaries. Units are clearly arranged in a hierarchy, but this hierarchy is not describable in terms of a rank scale.

7.2.2 Patterns, Constraints and Unit Types

In attempting to identify unit types, it is possible to look at units in at least three different ways. Firstly, units may be categorised in terms of the meaning constraints within them. For example, the first element of a unit may be seen as a Method, constraining Temporal Sequence or Result or Justification. Further constraints, or at least probabilities, may well be imposed by where the unit occurs. For instance, Method in the Methods section constrains only temporal sequence, but that is insufficient in a Results section. A unit consisting of a temporally-sequenced method in a Results section must be only part of a larger unit, as in Example 7.4 above.

Secondly, a unit may be classified with respect to its role in the social activity of the text. For example, a unit such as Example 7.4 might be described as *interpreting the data* of the experiment. In this case, the Method element acts as a preliminary to the main point of the unit.

Finally, a unit may be categorised in terms of its internal organisation. In other words, the unit may be divided into its constituent elements, each of which may be coded in terms of position (1st. 2nd. 3rd. in a sequence) and structural role (Preliminary, Opening, Middle, Closure, see Section 7.2.3 below). The structural role will express the function of the element in terms of the unit boundaries. Its realisations in terms of meaning will also be defined.

In the texts analysed so far, my initial attempts to define unit types led to labels of clause relation, such as General-Specific; Hypothesis-Evaluation; Method-Result-Conclusion; Question-Answer. This attempted typology had three problems: first, even my initial analysis of a few texts threw up ten such types, and it seems unlikely that ten is the total number.

In fact, part of the creativity of the writing process lies in the production of new unit types, within certain constraints. Following Sinclair and Coulthard (1975), however, it is my aim to arrive at a finite set of categories. Second, many units seemed to consist of more than one type. Example 7.10, for instance, incorporates Method-Result-Conclusion, General-Specific, and Conflict-Resolution (the Resolution appears in the following paragraph). An appeal to a notion of hierarchy (see above) will solve the problem, but only after an initial decision has been made about the basic unit type.

Example 7.10

[1]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. [2]Recent experiments by McGhee et.al. (1980) and in our laboratory (refs) have used electric field orientation to obtain the dichroism of the fiber. [3]The results of those studies left some unresolved discrepancies, which we seek to clear up in this paper. [4]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. [5]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 2.1-5

Third, and most importantly, the labels used above essentially describe different things. For example, Method-Results-Conclusion describes what kind of information is included in the unit, whilst Question-Answer describes how that information is presented. The term Hypothesis-Evaluation could well be used to describe the function of the unit as an element in the text as a whole, whereas General-Specific does not describe function, but rather the organisation of the unit and the clause relations within it.

My decision, therefore, is to consider two pieces of information about each unit: its organising principle and its social function in the complete text. The second type of information would, if done consistently, lead to an

Actual Structure of the Hasan type. I shall, however, concentrate on the first type, and shall refer to the second again only in Section 7.4 below.

To explain the concept of 'organising principle', I shall compare four text units, shown below as Examples 7.11 to 7-14.

Example 7.11

[1]The electric dichroism of chromatin (ref) yields information relating to two structural features. [2]First, the average orientation of the DNA relative to the fiber axis can be estimated from the limiting reduced dichroism. [3]Second, the relaxation rate of the fibers after the extinction of the orientating field can be measured and this depends on the rotational diffusion coefficient and hence on the dimensions and flexibility of the particle. [4]These two parameters taken together form an exacting criterion for the structural state of chromatin (refs). PCHT 16.1-4

Example 7.12

[1]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. [2]Figure 3 shows a log-log plot of *s* value against ionic strength, with and without added Mg^{2+} (eq). [3]It is evident that Mg^{2+} causes compaction of the fiber but not to the extent caused by 100 mM NaCl, with or without Mg^{2+}. [4]From the starting point of 83 S at 0.013 mM Tris-EDTA buffer, with Eq, s increases by over 25% of its value of 103 S when 100 mM NaCl is added. [5]Hence it is clear that chromatin with only Mg^{2+} added is not as compact as it is at 100 mM salt concentration. ONC 12.1-5

Example 7.13

[1]The products of digestion of the core histones *in situ* in stripped chromatin (SPN) were analyzed by gel electrophoresis in the presence of SDS. [2]The results are shown in Fig.1. [3]In agreement with previous studies (refs), five prominent bands, designated P1-P5 (ref), were found to be present. PCHT 13.1-3

Example 7.14

[1]In addition to standard measurement of particle molecular weight and CD spectra, we have determined both the rotational and translational frictional coefficients of stabilized chromatin fibers. [2]The data are analyzed by using hydrodynamic equations for cylinders, yielding nearly constant diameter and rise per nucleosome for a set of fibers of varying length. [3]A similar analysis of cylinder length and diameter by electric birefringence and quasielastic light scattering has been reported for filamentous viruses by Newman et al. (1977) and Chen et al. (1980), who found good agreement with dimensions determined by electron microscopy. SSS 3.1-3

I would describe the organisation of these units as follows. In Example 7.11, the arrangement is *cyclical*. The last sentence in effect returns to the first sentence. The middle part of the unit, S2-3, is made necessary by the incomplete information of S1, and its relevance is determined by S1. In other words, S1 acts as a 'topic sentence' to the unit. In Example 7.12, the first sentence also organises the rest of the unit, this time because it forms the first pair part of an *adjacency pair* (following Sacks et.al., 1974). As in Example 7.11, S1 determines the relevance of the rest of the unit. Sentences 2-5 are relevant because they answer the question posed in S1. The arrangement in Example 7.13 is somewhat different, in that the end of the unit is not predictable from the beginning. In fact, this unit could continue with interpretations arising from the results almost indefinitely. Each statement within the same unit would have to arise from the one before and continue along a scale of externality (see Chapter 2). In other words, the first two sentences of the unit start a *chain*, each subsequent element of the unit adding to the chain until the unit comes to a more or less arbitrary end. Each element is relevant because it leads to the following element. Although Example 7.14 begins rather like Example 7.13, with a description of experimental method, its organisation is very different. The final sentence, instead of continuing along a chain of Method-Result-Conclusion, evaluates the method in terms of value. For this reason, the relevance of the unit as a whole is not perceivable until the end, and the value statement at the end of the unit gives relevance to the method at the beginning, rather than vice versa. The unit may be said to be organised from the *back* rather than from the front.

To summarise, then, 7.11 and 7.12 may be described as having a crystalline organisation, whilst 7.13 and 7.14 have a choreographic one (see Chapter 2 and Chapter 6 for a discussion of Halliday's use of these terms). In other words, in Examples 7.11 and 7.12 the end of the unit is prefigured in the beginning, while this is not the case for Examples 7.13 and 7.14. Example 7.12 has a clear unit closure, prefigured from the opening, whilst the beginning of 7.13 suggests the direction in which the unit will travel, so to speak, but not the place it will end. In 7.11 and 7.12, the beginning of the unit gives relevance to the end, whilst in 7.14 the opposite is true. In 7.13, relevance accumulates as the unit progresses.

Using the above observations, I propose four unit types: **Front-Organised**, **Chain**, **Back-Organised** and **List**. The categories are deliberately general, because I suggest that whatever new unit configurations are met will fall into one of these organisation types. Here I define each type and below (Section 7.2.3) I shall discuss them in terms of internal constituency. Note that the Focus units referred to in Section 7.2.1 above may be of just one element (Example 7.8), or their organisation may be of one of the following types (Example 7.9). The name Focus refers to their function rather than to their organisation.

(1) **Front Organised**. In these units, the nature of the outcome of the unit is predictable from its opening. In other words, the unit is organised by an opening 'Topic Sentence' which defines the relevance of the end of the unit. For example, if the first element of a unit poses a question, the preferred end to the unit is the answer to the question, and that information is given relevance by its role as answer. There are two sub-types: Adjacency Pairs and Cycles. The term 'Adjacency Pair' has been borrowed from ethnomethodology (Sacks et. al, 1974) and seeks to capture the matching

nature of the beginning and end of these units. The types of adjacency pair recognised so far are:

Hypothesis - evaluation

Problem - outcome

Conflict - +/-resolution

Question - answer

Goal - +/-achievement

Reported result - +/-confirmation

Projection - +/-confirmation

Gloss:

evaluation = assessment of accuracy of hypothesis

outcome = either the solution to the problem, or the reason why an apparent problem does not need resolution

confirmation = reference to data etc. which (dis)confirms results or projection

Example 7.12 is an illustration of the Question-Answer type. It might be added that in those cases where there is a possibility of negative evaluation (e.g. in Hypothesis-evaluation), such an evaluation is frequently followed by another similar unit in which the outcome is positive. See, for example, HOSC Paragraphs 27-36 which demonstrates this. This possibly represents discourse organisation at a higher level in the hierarchy.

Cycles are units in which the end in some way returns to the beginning, such as when the pattern is General-Specific-General, or Knowledge Claim-Support-Reaffirmation of Claim. Although the name 'Cycle' calls to mind those cases where the final element simply reformulates the

initial one, in many cases, such as Example 7.11 above, the final element moves the discourse on from the initial one. The term Cycle is also used where the pattern is General-Specific or Knowledge Claim-Support, in other words when the final part of the cycle is missing, even though it might be argued that such units are more like Adjacency Pairs. In either case, the units are Front Organised.

(2) **Chain**. In chain-organised units the first and second elements together determine the direction of movement in the unit, without delimiting the nature of the outcome. A commonly-met example is the Method-Result-Conclusion chain, illustrated in Example 7.13 above. Because of the nature of the chain, the terms Method etc. are not intended to label the unit elements (Example 7.13, for instance, has no conclusion, and other examples begin with a result rather than the method), but rather to indicate the direction of development of the unit. Other chains are also found, the main types being:

Known-Possible-Unknown

Unknown-Possible-Known

Logical Progression

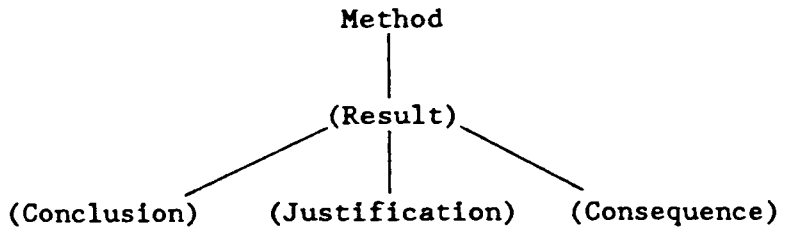
Temporal Sequence

(3) **Back Organised**. In back-organised units, the relevance, point or outcome of the unit is not predictable from the beginning, but only emerges when the unit is ended. In contrast to Front-organised units, the end gives relevance to the beginning rather than vice versa. For convenience's sake the units may be labelled, for instance, Method-Evaluation (Example 7.14 above), Question-Justification, Result-Consequence, Contrast. Many units which close with an evaluation of value are of this type.

(4) **List**. Occasionally units are formed of lists of results, or of Relevance Markers to a series of Figures. These are termed List units.

It is important at this point to consider the compatibility or otherwise of the categories proposed above with Sinclair's notions of constraint, or prediction, and of the prospective nature of organisation on the interactive plane, to which structure of the type I am describing must belong. I would suggest that the terms 'constraint' and 'prediction' are commonly used in three different ways, and that this usage represents three related but not identical aspects of the interactive plane.

Firstly, constraint may be seen as a statement of writer options. For example, the options following a statement of experimental method occurring as the Opening of a unit (see below) may be given as follows:



A Method may of course be followed by anything else, but not within the same unit. This corresponds to Sinclair and Coulthard's usage. Within an exchange, for example, it may be said that each move constrains (or predicts) what function a subsequent move may have and still be in the same exchange. Writers such as Halliday and Butt would criticise this by arguing that such a constraint is not absolute as it is not always met (Butt, personal communication). Sinclair's counter to this would be, I assume, that if the constraint is not met then, simply, a new unit has begun. The option of beginning a new unit rather than continuing an existing one is of course always open to every speaker.

In the preceding discussion, it was noted that the constraining role of a statement of method depended partly on its position in the text, a topic that will be taken up in Section 7.2.3 below. This brings us, however, to the second usage of the term *constraint*, which relates to the possible number of elements in a unit. An initial element in a unit, then, predicts that something related to it will follow, without necessarily defining what that will be. In addition we might say that an opening element will constrain some kind of closing element, again without predicting exactly what that element will be or when it will occur. When we say that Method predicts Justification, then, what we mean is that a Method is likely to be followed by something, and that if and when a Justification is met, that is likely to be the closure of the unit.

A third meaning of the term *constraint* has to do with a notion of completeness and well-formedness. This is a notoriously difficult notion to apply to discourse, and can lead to confusion between description and prescription as a goal of analysis. I would prefer to say that in some units (the Adjacency Pairs and, to a lesser extent, the Cycles) the Closure point of the unit can be predicted, so that when it is met it is known that completeness of the unit has been achieved. Furthermore, at the heart of the notion of adjacency pairs is the understanding that the second pair part is defined by its first pair part. It would be nonsense, for example, to ask whether a Method could be followed by an Answer, because an Answer is only made such by the presence of a Question. This is in part what is meant by the first part of such pairs giving relevance to the second part in a way which is not done by, for example, Method-Justification pairs.

7.2.3 Unit Constituency

Sinclair's assertion that the pattern of organisation at each rank in discourse is three-part is well-known but frequently derided on the grounds that not all texts or parts of texts can be divided uncontroversially into three parts. Sinclair, however, makes no claim that such would be the case. His appeal for three-partedness is based on the following argument (Sinclair, 1987). Maximally three part structures are demonstrable in many parts of many texts of different types. It therefore makes sense to take three-part-ness as a hypothesis, to attempt to analyse texts taking the three element unit as an assumption and then to test the hypothesis by making judgements as to how acceptable the analyses are.

In my own case, I began analysing evaluation with as few preconceptions as possible, and certainly without an assumption of the existence of three element units. Once I turned my attention to structure, however, I found only two possible ways of describing the internal constituency of the units identified in the manner described above. The first of these is similar to that used by Wells, Montgomery and Maclure (1981) in the analysis of spoken exchanges, that is, a series of overlapping pairs. Examples 7.15 and 7.16, shown with this kind of analysis below, illustrate the concept well. Here, each element is simultaneously the opening of one unit and the closure of the preceding one, in the same way as an utterance may acknowledge or respond to a preceding utterance and simultaneously make a move that itself requires a response (Wells et.al. 1981). Such an analytical system would of course require suitable revision of the organisational types described in 7.2.2 above, and the labels used below are simply indications of how the 'pairs' are envisaged.

Example 7.15

[1]Polynucleosomes fractionated by sucrose gradient centrifugation were subjected to DMS cross-linking as described under [2]Materials and Methods.	METHOD
[2]The crucial factor in this procedure is to keep the DMS additions small enough so that the ionic strength and pH change contributed by the imidate salt and its hydrolysis do not result in histone H1 [3]dissociation.	GOAL
[3]This we accomplished by repeated small additions of DMS to the reaction mixture, which we kept in dialysis contact with [4]buffer to prevent pH drift.	ACHIEVEMENT OF GOAL/ RESULT
[4]Under these conditions, roughly seven additions of DMS were sufficient to cross-link all the histones to the extent that no protein could be observed to enter a sodium dodecyl sulfate-5% [5]acrylamide gel (Fig.).	CONSEQUENCE/RESULT
[5]In contrast, when 2.5 times larger additions of DMS were made, an octamer band persisted in the gel profile (Fig), accompanied by the presence of [6]slowly sedimenting material (ref).	CONTRAST/RESULT
[6]This failure of complete cross-linking in Figure 1b may result from the high ionic concentration or large pH drift which follow large additions of DMS. SSS 19.1-6	INTERPRETATION OF RESULT

Example 7.16

[1]Due to the typical saturation properties of polyelectrolyte dipole moments (ref), we only reach 85% of p_a at the highest [2]field strengths available to us.	RESULT
[2]In contrast, Crothers and coworkers (ref) claim actually to reach p_a at [3]field strengths similar to ours.	CONTRAST/ REPORTED RESULT
[3]Additionally, they report that solenoids orient with a clasical induced (non-saturating) dipole moment, unlike [4]polyelectrolytes of similar lengths.	SECOND REPORTED RESULT
[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 [5]to be isotropic.	THIRD REPORTED RESULT
[5]As will be discussed in detail below, we do not observe this pulse-associated absorbance change. HOSC 15.1-5	CONTRAST

These two examples, while illustrating how an analysis based on the concept of overlapping pairs might work, also illustrate the drawbacks to such an analysis. In both cases the unity of the unit, that is, the relation of the end to the beginning, is lost, and with it the possibility of unit hierarchy and of boundaries. In Example 7.15, for instance, the end is tied to the beginning in that it is the end of a Method-Result-Conclusion chain. The detail of how and why the experiment was done (S2-3) is secondary to this main progression. The parenthetical nature of these sentences can be shown by a hierarchical analysis, but not by overlapping pairs. In Example 7.16, the essential issue of the unit is the resolution of a controversy brought about by conflicting results. An overlapping pairs analysis masks this unity of purpose.

Therefore, although many units would accept either an overlapping pairs analysis or a hierarchical, possibly three-part unit analysis, the latter is preferable. In addition to the above arguments, one might add that it is the 'stronger' theory, that is, it makes more demands, its claims are more radical and it is therefore more open to falsification, which in itself may be productive of a better theory. An overlapping pairs theory, on the other hand, merely reflects the fact that in coherent discourse each sentence must presumably be related in some way to what comes before and after it. The theory adds nothing but detail to this fairly commonplace observation. Moreover, my concepts of constraints and of RMs lead me naturally to a 3-part unit hypothesis. For example, the Method-Result-Conclusion pattern has been described as the most frequently found pattern. Patterns such as Question-means to answer-Answer are also common. Relevance Markers also make three element units likely, with the pattern RM-middle-RM (such as the first unit in Example 7.3) or 1st member-2nd member-RM. What is

more remarkable is that where units of the same type have between them many more than three elements, it is disconcerting how often only three are chosen in any one example of the unit type. The unit type which I have labelled 'Hypothesis evaluation', for example, often has any three out of the following elements: Preliminary; Model or hypothesis; Test or consequence or detail; Evaluation 1; Evaluation 2. (It must of course have Model and one Evaluation to satisfy the constraint conditions.)

Whilst four element units in such cases are not unknown (see Example 7.23 below), the surprising frequency of the three element unit motivated me to continue with an assumption that the units I identify should be analysed, if possible, into three parts, or elements. To represent the sequence of elements I use the letters OMC, where O is compulsory, M and C are optional but expected.

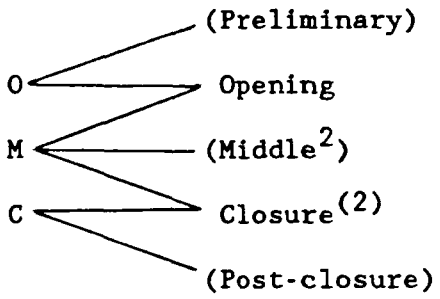
In this section, therefore, I shall describe the internal constituency of my proposed unit types based on the assumption of three-element-units. I shall then discuss how far this approach fits the data.

1. The 'Adjacency Pair' Type

In these unit types, the constraining element has a preferred second part i.e.

Hypothesis	-	evaluation
Problem	-	outcome
Conflict	-	resolution
Question	-	answer
Projection	-	+/-confirmation
Report	-	+/-confirmation
Goal	-	outcome

A third part of the unit, justifying the achievement of the second part, may occur before or after it. The structure of this unit type may be described as follows:



where Preliminary - something which does not continue the preceding unit

Opening - hypothesis, problem, conflict, question etc.

Middle - step, explanation, evidence etc.

Closure - evaluation, outcome, resolution, answer etc.

Post-closure - evidence

Example 7.17 Adjacency Pair: Hypothesis evaluation

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 (Fig). — OPENING

[2]This arrangement, in which the dichroism of the spacer DNA is at its most negative, leads to the maximum predicted tilt angle of the chromatosome away from the solenoid axis, since the chromatosome dichroism must be maximally positive to be consistent with the observed net dichroism.

[3]These maximum chromatosome tilt angles, γ_c, are easily calculated and are listed in Table 1.

[4]They range from 39^0 to 52^0 as the spacer length increases from 10 to 80 bp. — MIDDLE

29.[1]There are strong objections to such a lengthwise spacer model.

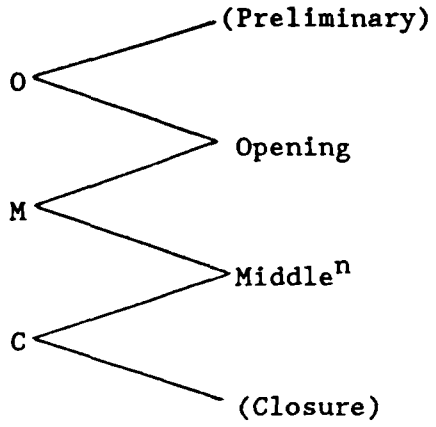
[2]With sea urchin sperm chromatin as the extreme example, an 80 bp spacer running parallel to the solenoid axis would predict a more than 10-fold greater rise per nucleosome than is expected from solenoid dimensions.

[3]Thus lengthwise spacer models require abrupt, and probably unlikely, direction changes in the spacer DNA. — CLOSURE

HOSC 28-29

2. The 'Chain' Type

In these unit types there is no preferred second part but a preferred movement of status. There can easily be a succession of RMs. The structure of this unit type may be described as follows:



where Preliminary = other result, criteria, known etc.

Opening = unknown, method or result

Middle = continuance of chain of statuses

Closure = Relevance Marker

Types: Method-Result-Conclusion

Unknown-Possible-Known

Known-Possible-Unknown

Logical Progression

Time Sequence

Example 7.18 Chain: Logical Progression

[1]The dichroism of a nucleosomal disk with an integral number of half-turns can be expressed (ref) (equ) in which $_a$ is the angle between the DNA base transition moments and the DNA helix axis, $_\beta$ is the angle between the DNA helix and the nucleosomal superhelix axis, and $_{\gamma 1}$ is the angle between the normal to the plane of the nucleosomal disk and the chromatin fiber axis.	OPENING
[2]Our earlier work on nucleosome dichroism showed that the data were consistent with $_a=90^0$, $_\beta=85^0$. [3]Using these values and p=0.063 we obtain $_{\gamma 1}=51^0$.	MIDDLE
[4]Whatever assumption is made about the path of the linker DNA, it is clear that the nucleosomal superhelix axis can be neither parallel nor perpendicular to the fiber axis, and one is forced to consider models in which the disks are angularly placed relative to the fiber axis.	MIDDLE

SSS 40.1-4

3. The 'Cycle' Type

In this type the discourse pattern is General-Particular, with an optional final element which returns to the general or assigns relevance to the unit. The structure may be described as follows:

O ———— Opening

M ———— Middle

C ———— (Closure)

where Opening = RM Prospective or Knowledge Claim

Middle = Details or support

Closure = RM Retrospective, possibly reformulating the Opening

Types: General-Specific

Claim-Support

Example 7.19 Cycle: Claim-Support

[1]Although chicken erythrocyte chromatin is exceptional in that it is the only preparation known to contain two linker histones per nucleosome (ref), it represents only one extreme of the range of linker histone to nucleosome ratios that have been found in chromatins of different origins.	OPENING
[2]Yeast chromatin contains no H1 (ref), whereas the proportion of linker histone in pea chromatin depends on the source of the tissue, increasing by as much as a factor of three during maturation (ref). [3]Finally, Pehrson and Cole (ref) have recently demonstrated that, when the growth of HeLa cells is arrested in culture, histone $H1^0$ accumulates in the chromatin with no diminution in the amount of the normal H1.	MIDDLE
[4]It would appear, therefore, that a wide variation in linker histone to nucleosome ratio between the limiting values of zero and two is an intrinsic feature of chromatin, and that increases in this ratio are invariably associated with decrease in the template activity of the chromatin, both in replication and in transcription. RHS 39.1-4	CLOSURE

4. The 'Back-organised'('Choreographic') Type

In these types the first part of the constraint pair does not definitely predict the second part, and the second part is only a potential or temporary closure. The end of the unit may be confirmed by a Relevance Marker. The structure of this unit type may be described as follows:

O ———— Opening

M ———— (Middle)

C ———— (Closure^2)

where Opening - RM (pros), or anything which does not continue preceding unit

Middle - details, next item in sequence, consequence, evidence, example

Closure - evaluation of value or Relevance Marker

Types: - item + evaluation as significant, good/bad, +/-support

- two items related in some way e.g. consequence, contrast, temporal sequence.

Example 7.20 Back-organised:Item + evaluation

[1]In view of the involvement of H1 in higher-order structures, the dependence of folding on ionic strength, and the apparent existence of arrays of H1 molecules in close proximity, we have investigated the arrangement of H1 molecules in chromatin by mild cross-linking and as a function of ionic strength and chromatin fragment length. — OPENING

[2]We have been able to analyse the cross-linked H1 polymers without interference from cross-linke core histones by making use of the solubility of H1-rich products in 5% perchloric acid. — CLOSURE

[3]The pattern of cross-linking, reported here, could provide an assay for the correct binding of H1 molecules in partially or wholly reconstituted chromatin. — CLOSURE

CHC 3.1-3

4. List Units

These units (small in number) have been described above (Section 7.2.2). They are included here for the sake of completeness and exemplification, but their internal structure cannot be described. Insofar as meaning in these units is not derived from sequence and that it is at least arguable that the adjacent components (sentences in this case) do not

form continuous prose (or a single paragraph), they are reminiscent of Hoey's 'discourse colonies' (Hoey, 1986, 20).

Example 7.21 List

[1]The observed saturation of the dichroism at about 13 kV/cm greatly increases confidence in assigning the signal to overall orientation of the particle.
[2]The slightly higher field required for saturation of orientation of the sample in Figure 5 compared to that in Figure 4 probably results from the higher ionic strength, which reduces the polarizability (ref).
[3]The nondichroism signal is an absorbance decrease of the sample, which we have earlier tentatively ascribed to a field-induced local distortion of DNA structure (ref).
ONC 15.1-3

Does analysis of the texts, then, bear out Sinclair's assertions re three-element-units? My answer would be yes, but as a tendency or a norm rather than as an absolute. Many potential departures from the 'norm' are catered for by an appeal to hierarchy (with varying degrees of comfort). Not all 'additional parts' may be dealt with in this way, and some units, such as Example 7.23 below, end up with four parts instead of the theoretical maximum of three.

Example 7.22

[1]Cross-linking with DMS does not introduce new chiral centers in chromatin, nor does it affect the UV spectrum. [2]Hence it is reasonable to examine the CD spectrum of the cross-linked fiber.	OPENING
[3]Figure 6 shows the results obtained for chromatin cross-linked at 100 mM salt concentration. [4]An ellipticity maximum occurs at 283 mm, of amplitude (equ), with a shoulder at (equ). [5]Crossover to negative values occurs at 265 cm.	MIDDLE
[6]These values are in good agreement with the results obtained by de Murcia et al (ref) (equ) who confirmed the compact state of their chromatin by electron microscopy. [7]Higher ellipticities in lower ionic strength media (equ) have been measured by Fulmer & Fasman (ref) and others. [8]We believe that the higher ellipticity values result from unfolding of chromatin superstructure, consistent with the observations by Cowman & Fasman (ref) of (equ) for 200 bp mononucleosomes.	MIDDLE
[9]Hence it appears that the higher order folding of chromatin contributes to the CD spectrum in a significant way. SSS 24.1-9	CLOSURE

More important than the actual number of constituent elements seems to be the notions of opening and of closure. Such a view maintains the essential of Sinclair's theory, that the first part of a unit, by its initial position, predicts the presence of other parts of the same unit, and the eventual evaluative culmination of the unit indicating a (temporary) completion and mutual acceptance by writer and reader.

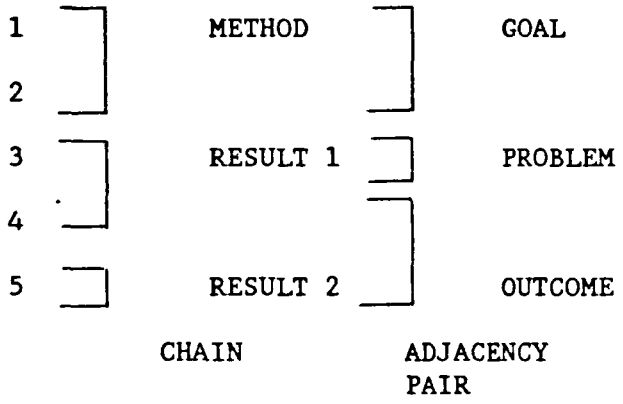
A more interesting departure is where two different principles of organisation may contribute simultaneously to a single unit. Examples 7.23 and 7.24 illustrate this. In Example 7.23 there are not one but two organising principles: Method-Result (Chain type) and Problem-Outcome (Adjacency Pair type). The first may be described as status driven, the second as value driven. For analyses, see Figure 7.3. Any choice between the

two structure-types must be arbitrary. I would suggest that the text in fact does not choose between them, but maintains both as co-existing alternatives.

Example 7.23

[1]This paper is an electron microscopy study of thin sections of chromosomes in mitotic HeLa cells. [2]Mitotic cells were studied, rather than isolated chromosomes, to minimize any distortions or disruptions of the native organization of the metaphase chromosome fibers. [3]It was found that when mitotic cells were fixed in growth medium with glutaraldehyde before preparing the cells for electron microscopy, it was difficult to define the arrangement of the chromosome fibers. [4]But when the cells were hypotonically swollen while maintaining the chromosomes in a condensed state, the organization of the chromosomes became easier to describe. [5]The fundamental organization of the nucleosome-containing DNA fibers was seen to be a radial distribution of fibers (probably loops) which extend from the centers of the chromatid arms. OCM 2.1-5

FIGURE 7.3

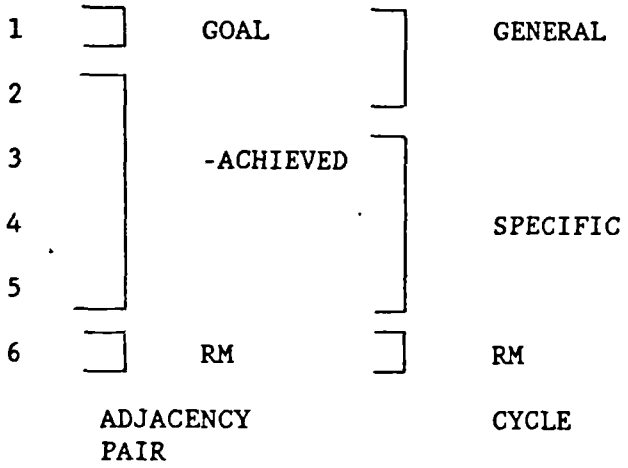


Where such dual organisational principles are operating, the internal division into elements will depend entirely on which unit type is held to be dominant. In Example 7.24, for instance, the analysis depends on whether the unit is coded as an Adjacency Pair type (Goal-achievement) or a Cycle type. Either way, of course, the unit is Front-organised. The two possible analyses are given in Figure 7.4.

Example 7.24

[1]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. [2]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. [3]Figure 1 shows comparative gel electrophoresis results for protein samples from the two cross-linked chromatin preparations. [4]Cross-linking conditions that prevent thymus histone proteins from even entering the gel leave large amounts of smaller aggregates in erythrocyte chromatin. [5]Presumably this contrast reflects the replacement of histone H1 in thymus chromatin by H5 in erythrocytes. [6]Given the similar dichroism properties of the two un-cross-linked chromatin samples that our subsequent measurements revealed, we believe that the cross-linking difference originates simply in the relative availability of suitably placed imidate-reactive sites in the two materials and does not reflect a substantial structural difference between them.
ONC 10.1-6

FIGURE 7.4



In conclusion, I would suggest that experimental research articles of the type analysed here support the notion of a three-element unit, although some aspects of that theory are more clearly supported than others.

7.2.4 Boundaries Revisited

From this discussion of unit types and unit structures, it must rapidly become apparent that Relevance Markers alone are not sufficient to identify unit boundaries. Obviously units have been demarcated as such which do not have Relevance Markers either at the beginning or at the end. Whilst it was useful, therefore, to use Relevance Markers as a heuristic tool in order to investigate possible unit types, it is now necessary to revise the concept of unit opening and closing. As with the Transaction in spoken discourse (Sinclair and Coulthard, 1975), a unit may be bounded either by its own closure or by the opening of the subsequent unit. I shall examine each of these phenomena in turn.

If a unit has an element defined as a Closure, then what follows must be the Opening of a new unit. What counts as a Closure depends on the unit type (see Section 7.2.3 above). In general, it is an item which has been constrained by the Opening (as in Front-organised units), or it is an evaluation of value or of relevance. It must be noted, however, that in the case of Adjacency Pairs, there may be a Post-Closure, which will occur after the constrained Closure item. There is therefore some potential confusion between a Post-Closure and a new Opening. The criterion then must be whether the doubtful element contributes towards the preceding unit or not. In the only example of this phenomenon found in my data, however, (Example 7.12 above), the Post-Closure (S4-5) is itself closed by a Relevance Marker (S5) which reaffirms the answer to the question. There is therefore no doubt as to where S4-5 belongs in terms of the structure of the unit.

If a unit does not have a Closure, which may happen particularly in the case of a Cycle or a Chain, the crucial identifying feature is the

Opening or Preliminary (in either case, the element will realise the O of the unit) element of the subsequent unit. An Opening may be defined as that which no longer contributes to the movement of the preceding unit but which represents some kind of change (cf Sinclair's 'change of posture'). Changes noted are: tense; researcher cited; figure described; topic. In addition or alternatively, an Opening may be of a kind which clearly begins a new unit, such as the first part of an Adjacency Pair. (Considerations of hierarchy may be a confusing factor here, however. Consider, for instance, Example 7.6 above, in which the Closure of a unit is in itself a Question-Answer Adjacency Pair. It would be a mistake in this example to consider the unit closed just because a new Question is apparently raised.)

A problem at the beginning of units analogous to that of Post-Closure above may arise with the notion of Preliminary in Adjacency Pair and Chain unit types. In PCHT 21.1-12 (shown below as Example 7.30), for example, a Method-Results-Conclusion chain begins in S4. On the other hand, S1-3 are not unrelated to what follows, as the clear definition of spacer regions (S3) is a prerequisite to the procedure that follows. S1-3 are therefore coded as Preliminary to the unit, although the distinction between this and a separate unit remains not entirely clear.

Although the units are in part prospective in their organisation, for the analyst, decisions on coding may need to be made retrospectively. In OCM 10.9-13, for example, a decision has been taken to make a unit division, at one level of the hierarchy, between S10 and S11. This decision is based entirely on the reference for *This* in S12, which is S11 only and not S9-11. In a more significant example, it is found that the units in HOSC 1.1-2.6 are 'drawn together' retrospectively. This may be demonstrated by quoting

the relevant sentences below, as Example 7.25, with the key terms highlighted.

Example 7.25

1.[1]The lowest level of DNA coiling in eucaryotic chromatin is the 10 nm filament or beaded string....
2.[1]The next higher level of chromatin coiling appears to be best described by a winding of the 10 nm filament into a shallow supercoiled "solenoid" (ref) with pitch of 11 nm, diameter of 30 nm, and with 6 nucleosomes per solenoid turn....
2.[6]A number of groups have demonstrated that there is a reversible and cation-controlled interconversion between the 10 nm filament and the 30 nm solenoid (refs). HOSC 1.1-2.6

In this way the Example cited above follows a pattern similar to that in Example 7.26 where, however, there is also a status movement from Unknown to Possible to Known, which makes it a single unit of the Chain type. There is no such Chain in Example 7.25. Examples 7.25 and 7.26 are therefore both similar and different.

Example 7.26

[1]The detailed structure of the 30-nm chromatin fiber, which is readily visualized in the electron microscope (ref), remains unknown. [2]The organization of nucleosomal disks in chromatin fibers has been studied by electron microscopy (refs), neutron scattering (refs), X-ray diffraction (ref), light scattering (ref), electric dichroism (refs) and flow dichroism (ref). [3]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. [4]However, this conclusion is not supported by the flow dichroism studies of Tjerneld & Norden (ref). [5]The 30-nm fiber results from further coiling or folding of the 10-nm fiber, which is induced by higher salt concentration or addition of multivalent cations, and occurs over a range of salt concentrations (refs). ONC 1.1-5

Finally, a comment needs to be made about the relation between unit and paragraph. Although the paragraph has not been taken as a discourse unit, it is not surprising that unit and paragraph frequently coincide. In these cases, writers and analyst agree on the divisions within the text. One notable counter-example occurs in PCHT 36.1-39.6. Paragraphs 36 to 38 consists of three elements in a Chain which has no Closure. As S39.1 is a

Relevance Marker, therefore, it is coded as the Closure of the preceding unit. The remainder of Paragraph 39, however, whilst continuing to interpret the results cited in Paragraphs 37-38, does so in terms of a Problem-Outcome Adjacency Pair, which cannot be an extension of the RM in S1 but which forms a new unit. In other words, the analysis is based primarily upon the notion of unit type and closure. The writers, in placing their paragraph division before 39.1, reflect a different notion of text structure, in which all the discussion and interpretation of results belongs together, no matter how the information given is organised. This paragraph division is not arbitrary but simply reflects another and equally valid concept of the organisation of the text.

In the long run it must be admitted that some boundaries between units remain indeterminate, either because of poor writing or because the writer deliberately obscures boundaries in order to make the prose more 'flowing'.

7.3 Towards a Movement Model for Analysis

7.3.1 Identifying and Representing Movement

Although evaluation can be used to identify units and their consituents, the same evaluation phenomena can also be described in terms of movement (cf Martin, 1986). For example, a sequence of result-conclusions can be described as a movement towards the external. Problem-Outcome can be seen as a movement towards positive value. There are several arguments for describing evaluation in this way. Firstly, most evaluative phenomena can best be described in terms of 'less' and 'more' rather than 'yes' and 'no', and this makes them candidates for representation as waves rather than as

series of discrete particles. Therefore, the contribution of *degree of certainty* to status may be represented as a wave, whereas the contribution of the *source of the information* is particulate. It has already been pointed out (see Chapter 5) that the labelling of parts of a text as 'evaluative' or 'non-evaluative' may not always, or even usually, be valid, and that some other form of representation, such as movement, may be preferable. Furthermore, even constituency occasionally needs to make reference to movement. It was argued in Section 7.2.3, for example, that a Chain unit ends when the movement of status is reversed. Finally, a constituency analysis, with its single-term labelling, must always omit some evaluation. Indeed, this was the source of my initial dissatisfaction with such an analysis. In Example 7.13 repeated here, for instance, the highlighted evaluation of value in S3 is not captured by a constituency analysis, which merely labels the Method-Result-Conclusion chain.

Example 7.13

[1]The products of digestion of the core histones *in situ* in stripped chromatin (SPN) were analyzed by gel electrophoresis in the presence of SDS. [2]The results are shown in Fig.1. [3]**In agreement with previous studies (refs),** five prominent bands, designated P1-P5 (ref), were found to be present.
PCHT 13.1-3

Given, then, that the metaphor of a wave or movement is a useful one for the analysis of evaluation, how may such a wave or movement be identified? As noted in Section 7.1 above, there is a need to identify aspects of each evaluative type with the metaphors of 'more' and 'less', bearing in mind that any such metaphorical association must be partial and, to a certain extent, arbitrary. Within evaluation of value, then, the accumulation of value discussed in Chapter 5 may be represented as an upwards movement. Alternatively, the movement from low to high may indicate a change from negative to positive evaluation. Within evaluation of status,

a greater certainty may be shown by upward movement, as may greater externality. This illustrates, however, the arbitrariness of what is being done, as a movement towards greater externality is in itself a movement towards uncertainty, not certainty. In an unmarked case, such as HOSC 4.1-5, the greatest externality coincides with the least certainty or greatest uncertainty. In an example such as ONC 12.1-5, however, the most external statement is also marked as the most certain or least uncertain. Within evaluation of relevance, the high point of a wave would occur in a Relevance Marker, in the closure of a constraint and in any other evaluation of relevance. A high point could therefore be at the beginning, at the end, or at the beginning and end of a unit, or indeed at some mid-point, as in Example 7.24 above, where S2 represents one high point of relevance and S6 another.

An attempt is made in this chapter (see Figures 7.5 to 7.8 at the end of the chapter) to represent information regarding evaluation in the form of graphs. In each case, the horizontal axis shows the sentence number, while the vertical axis marks stages in the progressions mentioned above. Where the graph represents status, the points on the vertical axis show stages in externality, labelled for convenience: *method*; *result*; *deduction* (from result); *further deduction*; (application to) *model*. On the value graphs, the points are positive evaluation, neutral and negative evaluation. Where a co-ordinate is placed between positive and neutral, as in Figure 7.7, this shows evaluation that is positive, but not the most positive reached in that unit. The vertical axes of the relevance graphs have two basic points: + and - RM, but distinctions are also made between intertextual and intratextual RMs (Figure 7.7) and between RMs marking greater or lesser segments of text

(RM1 and RM2 respectively in Figure 7.8). Intratextual RMs and RM1s represent a 'higher' level of relevance marking than the others.

A fairly typical set of evaluative movements or waves within a single unit is illustrated in Example 7.27 below, which is analysed in Figure 7.5. Note that there is a co-incidence of increase in externality, value and relevance, which is to be expected.

Example 7.27

[1]Corresponding to the $_y$ angles of 60^0 and 52^0, the nucleosomal disk diameters form angles of 30^0 and 38^0, respectively, to the chromatin fiber axis. [2]It should be noted that it is because the disks are at an angle to the fiber axis that the dichroism is very sensitive to small angular changes. [3]If the disk diameters were parallel to the fiber axis in the Mg^{2+}-containing un-cross-linked fiber at low salt, $_y$ would have to change by 20^0, from 90^0 to 70^0, to explain the dichroism increase of 0.14. [4]Hence, not only is the dichroism itself not consistent with disk diameters arranged parallel to the helix axis but it is also more difficult with this model to explain the significant dichroism changes that accompany modest compaction under the cross-linking condition. [5]Hence, the results, taken together, support general models in which the nucleosomal disks lie at an angle relative to the chromatin fiber axis. ONC 27.1-5

7.3.2 Movement, Periodicity and Constituency

By no means all units follow the pattern of Example 7.27 above. If we take Example 7.27 to be a kind of norm, and describe the movement patterns shown in Figure 7.5 as coinciding, then we can look for comparison at examples where the waves interact in different ways. I believe that this wave interaction is what Halliday means by 'periodicity' (Halliday, 1982, 226). The examples below (Examples 7.28 to 7.30) show, respectively, interactions of status and value, of value and relevance and of status and relevance. The wave patterns which show this interaction are illustrated in Figures 7.6-8.

Example 7.28 Status and Value

[1]It is difficult to trace complete loops of the nucleosome-containing fibers which extend from near the center of a chromatid to the periphery and which then fold back again. [2]This is primarily because the fibers twist out of the plane of the sections and because of the density of the fibers. [3]But a number of the fibers are seen to loop back at the outer boundaries of chromosomes. [4]And since it is generally believed that each chromatid contains essentially one long DNA molecule, the results of this paper imply that the predominant organization of the fibers in mitotic cells is a radial arrangement of loops. [5]These thin sectioning results do not give any information, however, about how the loops are connected. [6]The nucleosome-containing loops could, in fact, progress along the chromatid arms in a helical manner. [7]More detailed electron microscope studies will be required to understand this fine structure of chromosome organization. OCM 14.1-7

Example 7.29 Value and Relevance

[1]Our comparison of the dichroism properties of low-salt plus Mg^{2+} and high-salt-treated chromatin fibers is complicated by inclusion of a cross-linking step in the latter case. [2]The recent results of Fulmer & Bloomfield (1982) on the dimensions of un-cross-linked chromatin fibers in high salt allow further evaluation of the influence of cross-linking itself on compaction. [3]The sample sets of both Lee et.al. (1981) and Fulmer and Bloomfield include material estimated by sedimentation-diffusion to be 45-46 nucleosomes in average length. [4]Lee et.al. (1981) found a sedimentation coefficient of 125 S for their samples in 85 mM salt concentrations. [5]The near agreement of these values is consistent with our earlier observations indicating little change in the *s* value upon cross-linking (ref). [6]However, since the cross-linked material sediments slightly faster, it is possible that cross-linking produces a 10-15% compaction. ONC 19.1-6

Example 7.30 Status and Relevance

[1]In the electron microscope, SPN presents its characteristic appearance, consistent with partial condensation into irregular structures (ref), whereas tryp.SPN appears more extended. [2]In the latter it is often possible to distinguish indivdual polynucleosome chains and to trace the path of the DNA along the entire length. [3]Almost all the spacer regions in the chain are clearly defined. [4]We have measured the lengths of more than 500 spacer segments (defined as the center-to-center spacing of adjacent nucleosomes) in randomly selected electron microscopic images of tryp.SPN. [5]The results of this analysis are shown in Fig.8, in which spacer lengths are represented in terms of base pair of DNA (equ). [6]The number average spacer length was found to be 95 base pairs. [7]Two features of the data require comment: first, the distribution of spacer lengths is skewed towards higher values and has a relatively sharp cut-off at about 125 base pairs. [8]For chicken erythrocyte chromatin, with a repeat length of 212 base pairs, a spacer of 125 base pairs would leave only 87 base pairs of DNA associated with the core histone fragments. [9]This, according to current estimates (refs), is the length of DNA required for just one full turn around the core particle. [10]Secondly, the data suggest that the spacer lengths in tryp.SPN vary discretely in units of 20 base pairs. [11]Well-defined peaks in the distribution were found at 125, 105, 85 and 65 base pairs. [12]A 65 base-pair spacer would leave 147 base pairs of DNA in each trypsinized core particle. PCHT 21.1-12

In the above examples, movement and constituency are shown as coinciding. In other words, a movement wave, or set of waves, ends at the same point as the unit ends. In some cases, as discussed above, the change in movement helps to signal the unit boundary. Frequently, however, movement occurs across units, binding them together into larger units. A research article as a whole, for example, will show a general movement towards the external and the relevant, probably also with a movement towards positive value. The whole of the results section of the article OCM, for example, shows a movement from less successful to more successful methods of investigation. In the subsequent Discussion section of the same article, the evaluation of value again moves toward the negative, as restrictions on the usefulness of the research are discussed. Movements may also, of course, occur within only a part of a unit, without covering the whole unit, as in Example 7.23 above, where there is a negative-positive value movement in S3-

4 only. In these cases there may be said to be an interaction between movement and constituency structures.

7.3.3 Is Movement Structure?

Evaluation may therefore be seen as participating in two types of organisation: movement and constituency. It is important to realise that it is the same evaluation that is participating in both, and that one is simply an alternative view of the other. The view of evaluation as movement is clearly compatible with Halliday's variate view of discourse structure. Can it, however, be reconciled with Sinclair's view of structure as an interaction between paradigm and syntagm? This question remains to be answered fully, but there are clearly two possibilities. Firstly, movement may be a way of describing evaluation on the autonomous plane (which has organisation but no structure), whilst constituency describes its contribution to the interactive (structural) plane. This would confirm Bolivar's view that evaluation in language and evaluation in discourse should be viewed differently. For example, in Example 7.13 the evaluation of S3 would be autonomous, not interactive. The second alternative is that all evaluation contributes to the interactive plane, but that it can be modelled in two different ways. If this alternative is to be accepted, it must be shown that waves are themselves products of paradigm and syntagm.

To recapitulate what has been said above, choices of evaluation are paradigmatic, but they represent a choice between more and less rather than between two discrete options. It is for this reason that a wave is a more suitable method of representation than a set of categories would be. Turning to syntagm, the waves that have been illustrated in the Figures in this

section are clearly not rule-governed in the way that the constituency types are. On the other hand, it can be demonstrated that changes in movement indicate or coincide with unit boundaries. Tracking the movement of evaluation is therefore analogous to tracking 'posture'. At any point in the discourse, the writer has the single choice that is basic to writing within any constituent structure: to continue the same direction of movement (or the same unit) or to effect a change to a new direction (unit).

For these reasons, it seems to me that the movement of evaluation is as interactive as constituency is, although possibly in a different way. It should be remembered, also, that the wave is a less explored metaphor to represent structure than the particle is. It may be that further investigation would reveal ways of expressing waves in terms of rules, thereby satisfying Sinclair and Coulthard's 'impossible combinations' criterion.

7.4 Implications

7.4.1 Constituent Structure and Generic Structure Potential

In this chapter, constituent structure units have been identified using the internal criteria of boundary identification and constraint. For a Generic Structure Potential, on the other hand, each unit (or 'element', in Hasan's terms) is identified by its function, its role as a single stage in the achievement of a goal. A definitive GSP can be identified only by a member of the community which has produced the text (in this case, a biochemist), but one alternative is to take the units that I have identified as described in Section 7.2 above, and assume that each one corresponds

roughly to a GSP element. It is then possible to propose the function of each unit/element and to define each unit type in terms of its semantic features.

Before this is done, however, it is important to note that the assumption that each constituent unit corresponds to a GSP element has some interesting consequences. In particular, it involves the amalgamation of some sequences of semantic features into a single element, with a consequent down-grading of some of those features. For example, a unit of the Method-Result-Conclusion chain type, such as Example 7.4 above, contains a sequence of semantic features that might be labelled respectively 'reference to experimental method', 'description of inscription' and 'deduction from inscription'. One option, then, is to describe Example 7.4 as a sequence of three separate GSP elements. I would propose, however, that the notion of constituent units, as described in this chapter, be used instead. In this case, Example 7.4 is a single stage, or element, with a single function towards the goal of the text as a whole. It may be given a name such as 'Interpretation of Results' and may be defined in terms of the semantic features given above, with the proviso that only the third feature is obligatory or central. The other features are therefore down-graded in importance.

In other words, using constituent units as a basis for deriving a GSP represents a two-part process. Firstly, it is assumed that writers will mark linguistically and evaluatively what is for them a unit, or stage in the progression of their argument. Constituent units are identified on this basis. Secondly, the units so identified are labelled according to the role in the discourse genre under discussion, and the text to be examined in particular. Although this in some ways represents a departure from the usual

method of deriving a GSP (e.g. Hasan, 1984), it seems to me to be based on a surer foundation than the alternative of giving a single label to, for example, each instance of Description of Experimental Method. Similar conclusions with respect to very different discourse types have been reached by Harris (1988), Kwa (1988) and Samraj (1989).

A tentative list of the elements or stages to be found in the Introduction, Result and Discussion sections of the analysed texts is given below. Each element is given a name, a definition in terms of semantic features, and an example. A more delicate analysis for texts sharing this Field of discourse would no doubt be possible.

ELEMENTS IN INTRODUCTION

Element	*Semantic Features*	*Example*
Background information (BI)	What is known, hypothesised and unknown about research topic from previous sources	SSS 1.1-6
Current research (CR)	Reference to *this paper* or *research* Reference to method, aim or result	RHS 4.1-4
Question (Q)	Reference to *we* plus previous hypothesis etc. Or reference to controversy	OCM 1.7-10

(Note: BI may include motivation for research, including controversy. CR may include a question or aim.)

ELEMENTS IN RESULTS

Element	*Semantic Features*	*Example*
Present method (PM)	Description of experimental procedure	ONC 10.7
Justify method (JM)	Reference to method or inscription Interpretation of inscription, where this is reference to positive value of method	OCM 12.1-8
Present results (PR)	Description of inscription	ONC 14.1-5
Interpret results (IR)	(Description of method) (Description of inscription) Deduction from inscription	ONC 13.1-6
Evaluation of results (ER)	Reference to inscription or deduction where this is reference to positive value of results	PCHT 19.1-4
Comparison of results (CoR)	Reference to current results and other results for purpose of comparison	HOSC 15.1-5

ELEMENTS IN DISCUSSION

Element	*Semantic Features*	*Example*
Background information (BI)	See above	RHS 39.1-4
Justify method (JM)	See above	CHC 36.1-4
Present calculation (PC)	Description of calculation	SSS 34.1-5
Interpret (IR)	See above	CHC 32.1-5 results
Evaluation of results (ER)	See above	SSS 38.1-6
Comparison of findings (CF)	Reference to current interpretation of results and others for purpose of comparison	RHS 41.5-7
Evaluation of model (EM)	Description of hypothesis, model etc. Evaluation of hypothesis, model etc.	HOSC 28.1- 32.2
Summary (S)	Summarised reformulation of findings	HOSC 42.1-4
Relation to theory (RT)	Proposal for use of results in theory	HOSC 41.1-2
Recommendation (R)	Reference to extant problem or research to be done	OCM 14.5-7

The definitions above are incomplete in that in each case there is an assumption that the semantic feature used to define the element is the 'main point' of the constituent unit. Whether or not a feature constitutes the main point depends largely on its position in the unit. For example, a reference to other researchers' results will not define the unit as a Comparative one unless that reference appears as the Opening or Closing to the unit.

It is possible to propose a GSP for the Introduction sections:

BI ^ (Q) ^ CR

but in the other sections, the ordering seems to be less predictable (although Summary, of course, is always at the end of the article). If, however, we consider genre to be, not a determinable sequence of stages, but the consequence of similar reactions by different writers to similar situations (Miller, 1984, 152, quoting Bitzer, 1968, 13), then variations in

sequencing may be explained in terms of slightly different situations producing slightly different responses.

It must be stressed that, contrary to what might be expected, there is no one-to-one correspondance between the GSP element types and constituent unit types. I shall take two examples to illustrate this point. First, consider the element type Current Research (CR), which is found in all Introductions. Its most frequent realisations are as a Back-organised unit (e.g. CHC 3) or as a Chain (e.g. HOSC 4), but a Front-organised Cycle is also possible (e.g. RHS 4). An additional complication is that in two texts, SSS and ONC, the Current Research element occurs as the second part of an Adjacency Pair unit: Problem-Outcome and Controversy-Resolution respectively. There are therefore at least four different ways in which this information may be presented. Each, of course, represents a different strategy on the part of the writers, a different way in which writers and readers are interacting.

My second example involves paragraphs 15 to 19 of the text ONC, each paragraph of which is one unit realising the element Interpret Results (IR). Yet the unit types are by no means uniform, but are: List, Chain, Cycle, Chain and Adjacency Pair. Once again, although the type of information being presented in each case is the same (the interpretation of experimental data), the organisation of that information is in each unit different. This is not a trivial matter. As Halliday has shown within the lexico-grammar, the order in which the parts of the clause are presented alters the meaning of the clause and changes the relation between the writer and reader of the clause. The same is true of discourse.

I would suggest, therefore, that a GSP analysis of the structure of a text needs the additional input of a constituent unit analysis in two ways.

First, a division into units can aid in the identification of GSP elements. Second, the organisational information to be gained from a constituent analysis of the kind developed in this chapter is an essential complement to a GSP analysis.

7.4.2 Using the System of Analysis to Characterise Texts

A good analytical system will provide a meta-language for characterising texts. In other words, the set of choices made by the writer within a given structural system will produce a text of a particular type or character. Ideally, this may be proven by using the meta-language to compare texts of different types or characters. As the texts discussed in this thesis are all of similar types, however, the opportunity to do this is fairly limited.

It is possible, however, to suggest a character for each of the unit types discussed in Section 7.2 above. This is an attempt to correlate the linguistic categories proposed with intuitive reactions to the different texts.

Front-organised and Focus units are very interactive in character. The reader is told explicitly what the subsequent discourse is to do. Units which are not front-organised, or organised by Focus units, are less interactive: the reader has to do more work to grasp their structure and has to wait until the end of the unit to discover the point or significance of the unit. The text HOSC has the largest number of Focus units: five out of a total of thirty-eight units. It is interesting that the Focus units are used at major points of divergence between the writers of HOSC and other writers: the method of extrapolation to infinite field (HOSC 13.1-3), the correction

of high-field measurements (HOSC 24.1-3), the use of different theoretical models (HOSC 27.1-2 and 33.1-3). HOSC is a very argumentative text, in the sense that it explicitly uses the results obtained to criticise other researchers. Clearly, Focus units are being used to emphasise important points in this argument. Turning to Front-organised units, an example of a text using a large number of these is ONC. All the units between ONC 19.1 and 28.6, that is, most of the Discussion section of this text, are Front-organised. As each unit occupies one paragraph, this means that it is possible to summarise the argument of the Discussion section by reading the first and the last sentence of each paragraph. This makes the organisation very clear to the reader. The section may be 'scanned' in a way that is not possible with other similar sections.

Chain units, which are not quite so helpful to the reader in giving the organisation of the unit in advance, are the most suggestive of a scientific impartiality. They represent an apparently incontrovertible line of reasoning, or of presentation of the data. In some ways, then, they represent a 'base form' of Results sections. In the text OCM, for example, the whole of the Results section (OCM 8.1 to 12.8) is organised in Chain units. Furthermore, the Closure elements of the units are either not present or evaluate the efficacy of the method used, rather than relating the data to theory. This contributes to the objective-sounding, fact-presenting character of this early text. This text, OCM, may be compared with part of another Results section, PCHT 30.1 to 39.6, which also consists of Chain units, but where each unit is closed with a statement of the data's theoretical significance.

Back-organised units are numerically the most rare, and are the most difficult for the reader to process, because their movement is choreographic

so that reading them is a process of discovery, with the point of the unit not being revealed until the end. Examples of Back-organised units occur in ONC 29.1-30.3, where they form a sharp contrast to the rest of the Discussion section of this text, discussed above. Indeed, this ending to the text ONC appears curiously weak and inconclusive, a consequence of the unit type used. Another example of Back-organisation is HOSC 1-2, parts of which are cited as Example 7.25 above. Here again, the direction of the writers' argument is not clear until the unit is retrospectively put together in HOSC 2.6.

A constituent analysis of texts, such as the one presented here, represents primarily the interaction between writers and reader. As pointed out in Section 7.4.1 above, such interactive units do not have a one-to-one relationship with the units of Field-specific argument such as might be proposed for a GSP analysis. It is relevant to ask, however, how the interactive units are put together to make up the argument of the text. Four different alternatives may be identified.

The first alternative is for the argument to be presented as a succession of discrete items. This is exemplified by the Results and Discussion section of the text ONC, where most of the units occupy a single section of text, marked off by a sub-heading. The relation of each of these sections to the others is not given explicitly in the text.

This may be contrasted with, for example, XDS 9-15, where a string of Chain units is united by an initial (XDS 9) and a final (XDS 15) Focus unit. The Focus units make the whole section into a Cycle unit, so that the relation between the succession of Chain units is made clear.

A further option is a complex and gradual embedding of units, such as may be found in CCF 49-55. Here Cyclical and Back-organised units (CCF 49

and 50) become the Preliminary elements in a long Adjacency-Pair unit (Hypothesis-Evaluation), which continues until CCF 55 and each part of which comprises another unit type (see Figure 7.9 at the end of the chapter).

Finally, movement may be used to unite units and to build up an argument between them. In the OCM Results section mentioned above, for example, each Chain unit participates in a movement towards positive evaluation of the experimental procedure. A similar movement may be observed in the HOSC discussion section.

In each of these texts, therefore, the writers employ different strategies in informing and persuading the reader. These strategies may be described in terms of the unit categories proposed in this chapter. The constituent and movement structures proposed may therefore be used to characterise and differentiate between texts.

7.5 Conclusion

In this chapter, an attempt has been made to use the concepts of evaluation presented in Chapters 4, 5 and 6 to suggest possible structural units for the analysis of experimental research articles. The units are distinguished primarily in terms of the type of organising principle that seems to inform them. The types proposed are: Front-Organised; Chain; Back Organised; List. There is some evidence that three-element units, similar to Sinclair's proposed PRD structures (Sinclair, 1987), may represent some kind of norm. The units are hierarchically organised, but no rank scale has been identified.

Taking the same units as a basis, an attempt has been made to described structure as movement. Realisations of evaluation have been

correlated with 'high' and 'low', giving rise to a series of waves which represent the evaluative structure of a unit. These waves may coincide or they may interact, giving rise to some of the sense of complexity to be found in the texts.

This chapter has also proposed a method for identifying elements in texts in order to arrive at a statement of GSP, and has used the unit types proposed to compare texts using different types of argumentation.

FIGURE 7.5

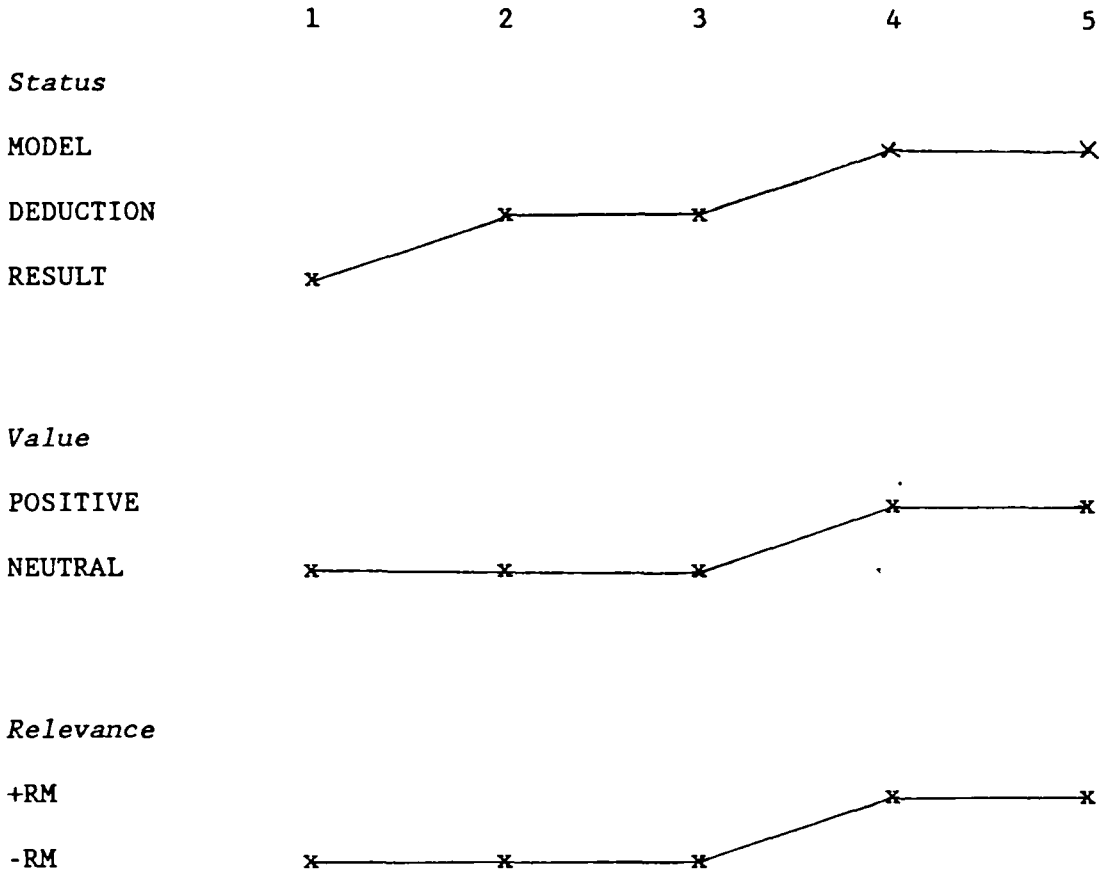

1
2
3
4
5
Status
MODEL
DEDUCTION
RESULT
Value
POSITIVE
NEUTRAL
Relevance
+RM
-RM

FIGURE 7.6

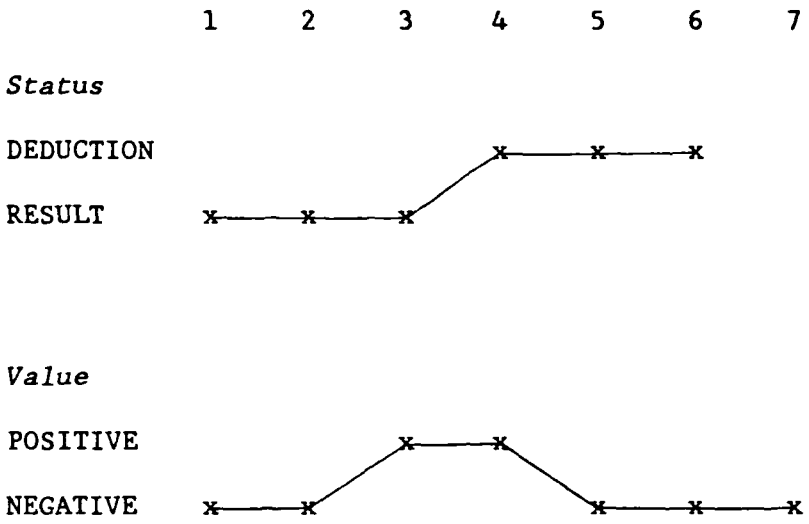


FIGURE 7.7

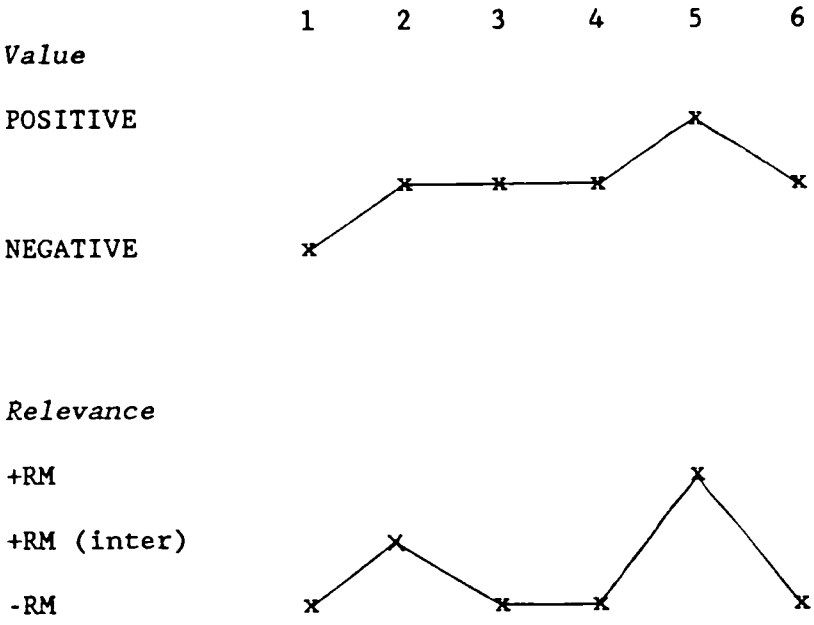


FIGURE 7.8

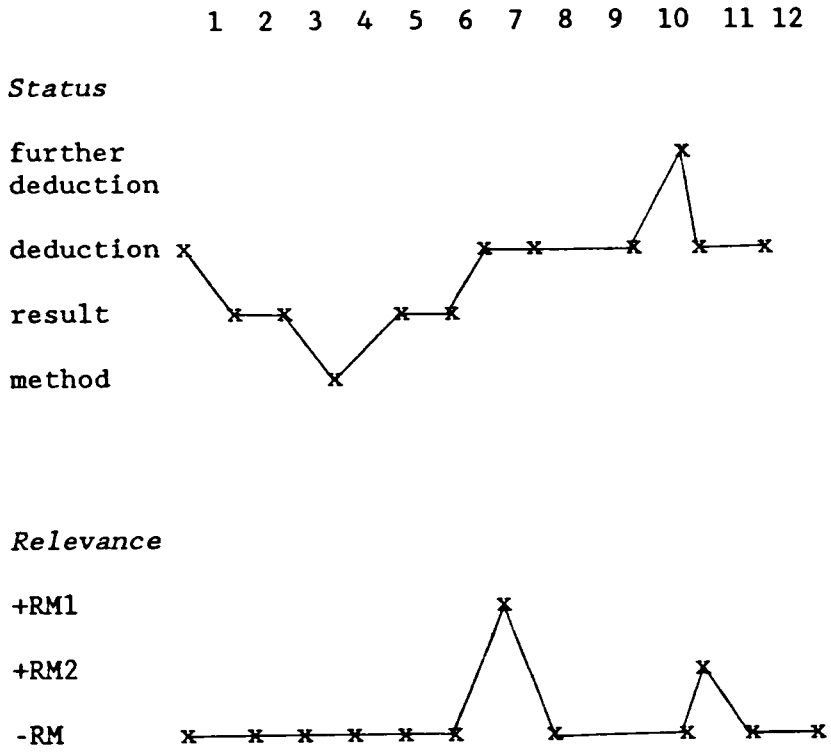
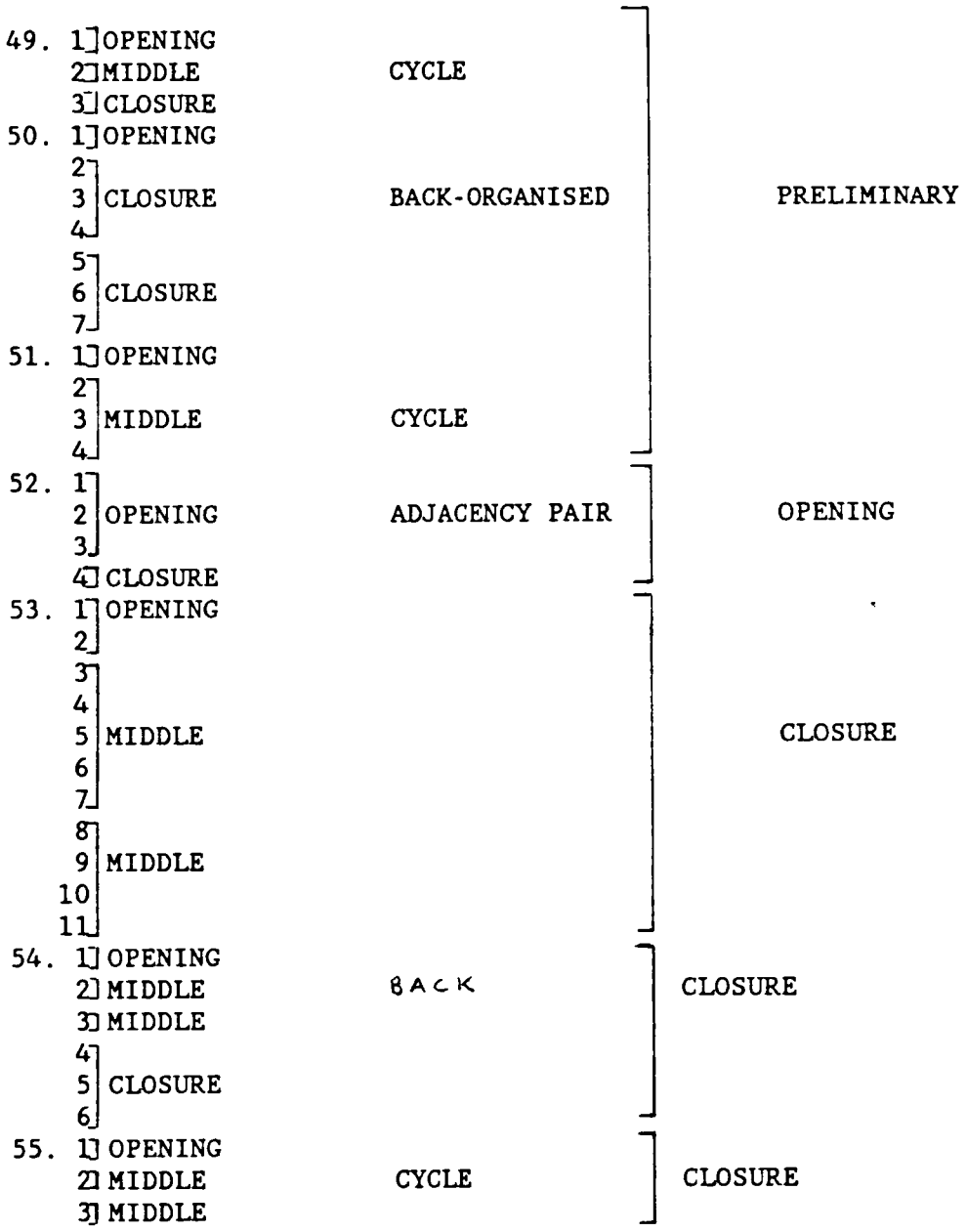

1 2 3 4 5 6 7 8 9 10 11 12
Status
further deduction
deduction
result
method
Relevance
+RM1
+RM2
-RM

FIGURE 7.9


49. 1 OPENING
2 MIDDLE
3 CLOSURE
CYCLE
50. 1 OPENING
2
3 CLOSURE
4
BACK-ORGANISED
5
6 CLOSURE
7
PRELIMINARY
51. 1 OPENING
2
3 MIDDLE
4
CYCLE
52. 1
2 OPENING
3
ADJACENCY PAIR
OPENING
4 CLOSURE
53. 1 OPENING
2
3
4
5 MIDDLE
6
7
8
9 MIDDLE
10
11
CLOSURE
54. 1 OPENING
2 MIDDLE
3 MIDDLE
BACK
4
5 CLOSURE
6
CLOSURE
55. 1 OPENING
2 MIDDLE
3 MIDDLE
CYCLE
CLOSURE

CHAPTER 8

Conclusion

8.1 Introduction

In this chapter I wish to summarise and extend the theoretical and practical implications of the work that has been described in this thesis. I shall begin by summarising the approach to evaluation which was expounded in Chapters 4, 5, 6 and 7 (Section 8.2) and shall go on to disuss the implications of this approach for the work of Halliday (Section 8.3) and that of Sinclair (Section 8.4). I shall then take a more practical approach, and shall suggest some ways in which my view of evaluation might be applied to the development of writing skills (Section 8.5). Finally, I shall address the question of evaluation and text type (Section 8.6), discussing both what the work in this thesis suggests about science and experimental research articles and what the implications are for the study of other genres and for the notion of genre itself. The chapter ends with a brief conclusion (Section 8.7).

8.2 The Study of Evaluation

Perhaps the main conclusion from this study is that bringing any one aspect of discourse meaning to the foreground will inevitably blur the boundaries between any other set of linguistic or discourse categories. Certainly a foregrounding of evaluation, such as has been done in this thesis, suggests that it is not easily relegated to one branch of a

classificatory system, if only because a serious examination of the phenomenon of evaluation makes non-evaluation extremely difficult to identify. This is in fact a logical deduction from the definitions of evaluation given in Chapter 1. If evaluation is essentially about a personal meaning, and tells the reader 'what the writer thinks' (Winter, 1982, 9), then every choice of lexical or grammatical item is evaluative because it reflects what the writer thinks. If evaluation is assignment to a value-system, then again no choice made by the writer is neutral with regard to an ideological mind-set. There is no non-evaluative text.

Rather than distinguish evaluation as a category, then, I have proposed looking at a whole text as a single realisation of evaluation. I have proposed three parameters and three functions of evaluation, and also three types of analysis. In the experimental research articles under discussion, the sets of three are associated as follows. The status function of evaluation bestows thingness (creates entities), and evaluates along the certain-uncertain parameter: This evaluation is clause based and is capable of constant nominalisation. It may be analysed as a string of discrete particles. The value function bestows quality and evaluates along the good-bad parameter. It is highly implicative, depending for its interpretation on shared knowledge and values or goals. Its effects are cumulative and its analysis is vague as to boundary. The relevance function bestows relevance (significance) and evaluates along the important-unimportant parameter. This function of evaluation is organisational and is responsible for prospective and retrospective chunking and pattern-making.

My contention is that evaluation is essential for the coherence of a text, and that it is (as Sinclair says), a necessary product of the interaction between writer and reader.

8.3 The Relation of Evaluation to Systemic Theory

8.3.1 Evaluation and the Lexico-grammar

In this section I shall discuss the relationship between evaluation of status, value and relevance, and the three systems of the lexico-grammar: transitivity, mood and theme. A possible hypothesis here is that the three functions of evaluation may each be associated with one aspect of grammar and consequently with the metafunction that most closely determines it. However, as discussed below, this is not born out by the evidence.

To recapitulate the account presented in Chapter 3: metafunctions mediate between context and the lexico-grammar and are not observable except by looking at one of those two. The ideational metafunction may be observed by investigating the transitivity system, the interpersonal metafunction is shown in the mood system and attitudinal language and the textual metafunction may be observed via Theme and Rheme.

It is of course commonly stated in Hallidayan linguistics that the three aspects of the clause are not independent (see Chapter 3). As an illustration, in the clause *This possibility has not been fully taken into account*, the nominal *This possibility* encodes a semantic role (the ideational metafunction), represents a choice in the modality system (the interpersonal metafunction) and is used as the Theme element in the clause (the textual metafunction). One possible account for the production of this clause is that the choice to encode a particular modality (*possibility*) as a nominal, rather than as a modal verb, influences the roles in the clause and also the order of its elements. Alternatively, however, it may be said that the decision to make the modality of the preceding clauses the Theme of this one leads to nominalisation. It is, in fact, not possible to say which

choice has motivated the others, or whether all have been made simultaneously.

Given this amount of indeterminacy, it is not surprising that there is no one-to-one relation between the three functions of evaluation and the three main systems of the lexico-grammar. Taking each of the evaluation functions in turn, one may describe their realisation in the lexico-grammar as follows.

Evaluation of status expresses a process acting upon one or more clause participants, or indeed upon a whole clause. That process may be relational (*represents*, *models*) or mental (*is hypothesised/claimed/concluded to be*). Material processes (*separate*, *measure*) carry their own status. Also, the status of one clause can be a participant in another clause. Evaluation of status therefore appears to influence choices in transitivity. However, these processes essentially moderate the certainty of the clause and, as has been discussed in Chapter 4, the various status types can be ranged along a certain-uncertain scale. The various mental processes and so on can be seen as metaphorical equivalents of modal verbs. In this way, then, evaluation of status appears to influence choices in the modality system.

Evaluation of value expresses the attitude of the writers in terms of the value of the statements they make to the society or cultural environment in which the text is produced. As with status, its realisation is not restricted to any one aspect of the grammar. In fact, value is realised more through lexical choice and through lexical connections in the discourse than through the grammatical system. As discussed in Chapter 5, value is realised mainly through comparators (*only*, *not*, *at least*) and through socially-valued lexis (*problem*, *discrepancy*). Another key way of expressing value is through

lexical relations of repetition, synonymy and antonymy, where an item is given value within the text itself through the establishment of a goal. Because writer attitude is interpersonal, evaluation of value appears to belong to this metafunction, which is normally considered to influence attitudinal language and modality. Much of the realisation of value does not relate to attitudinal language as it is normally conceived, however, and it is only concerned with the mood system insofar as value overlaps with status (see Chapter 5).

Evaluation of relevance is recognised in part by the order of elements within the clause, in the sense that most Relevance Markers take the preceding text as Theme. (Exceptions are the 'Thus' type and the 'Conclude' type, where the preceding text may be only implicit in the RM itself.) This suggests that relevance influences choices in the Theme system. It is also, however, recognised by particular types of processes and semantic relations, which suggests it may also influence transitivity.

The conclusion that must be drawn from the above is that there is no one-to-one correspondance between the functions of evaluation and the metafunctions of lexico-grammar. Choices in status influence choices in transitivity and modality; choices in value influence choices in lexis and in transitivity; evaluation of relevance influences choices in the theme and transitivity systems. It must be recognised also that choices in value and relevance also influence choices outside the clause. Lexical cohesion, which is a feature of discourse rather than of the clause, is important to both, as are clause relations, an area of discourse organisation which sits unhappily within clause grammar. (For a further discussion of clause relations see Section 8.3.5 below.) Because of this lack of one-to-one correspondance between evaluative functions and the lexico-grammatical

systems, it is equally impossible to associate those functions uncontroversially with the metafunctions which determine the system choices.

8.3.2 Evaluation and Context

As the attempt to associate the functions of evaluation with the primary divisions made by Hallidayan linguistics in the area of grammar has not been successful, the same problem may now be tackled from the other end, that is, from the perspective of the variables of context: Field, Tenor and Mode.

There is a tendency among Halliday's followers to associate all evaluation automatically with Tenor. Evaluation after all expresses a personal meaning, and can be interpreted only by reference to the beliefs and assumptions of the evaluator. Whilst this is true, in many cases to associate evaluation exclusively with Tenor would leave a very 'thin' Field. In describing a discussion of a toy train between a father and son, for example, Halliday includes the son's evaluations of the train (as *good*, *efficient* etc.) in the Field of discourse, presumably because the text is partly 'about' such evaluations (Halliday and Hasan, 1985, 36). In doing so, Halliday privileges the participation of the evaluative items in the transitivity system (as attributes) above their attitudinal, and Tenor-like, nature. He in fact assumes a separation of evaluation and the interpersonal, which implied separation the work described here has made explicit. In experimental research articles, evaluation of procedures and theories is part of the topic of the text. Much of the discussion in Chapters 4, 5 and 6 has had little to do with the obviously interpersonal. It is therefore not

unreasonable to propose that evaluation be considered in relation to each of the variables of context, rather than to Tenor exclusively.

Two further complications, however, need to be taken into account at this stage, relating to the interdependence between the context variables themselves. Firstly, the overall goal of the experimental research articles under discussion is that of persuasion, which is in itself interpersonal, in that it seeks to influence the reader in some way, i.e. to accept a particular point of view. The goal of the discourse, that is, what activity the discourse is part of, is described by Halliday as constituting the Field of discourse. If the goal is to persuade and the activity of which the language is a part is persuasion, then the Field must be acknowledged to have an interpersonal or Tenor-like component. Secondly, the Tenor of the discourse, the interpersonal component, is heavily influenced by the Mode, the role of the language in the activity. The language role in experimental research articles is a conventional one - a scientific fact or theory is being brought into existence by language used in an almost ritualistic format. This performative use of language in turn influences the nature of the interactants, as they are not interacting with the text as individuals but as a community. On the other hand, of course, the communal nature of the interactants, and their ability to collectively 'make' a fact (Latour, 1987) influences the conventional Mode of the discourse. To summarise, my work on evaluation challenges the notion of Field, Tenor and Mode as separate categories.

Bearing these caveats in mind, we can look at the Field, Tenor and Mode which constitute the context of the texts under discussion. They may be described as follows:

Field - formation of theory concerning the structure of chromosomes, and persuasion of the reader of its accuracy. (In the lexico-grammar, relational processes predominate; the participants are concepts and nominalised activities, including mental activities.)
Tenor - interactants are members of a scientific discipline; non-hierarchic; maximum social distance. (In the lexico-grammar, the mood is uniformally declarative. There is heavy use of modality.)
Mode - constitutive; performative; reflective; written. (In the lexico-grammar, there is heavy use of summative anaphoric nouns.)

Not surprisingly, given the above, there is no one-to-one correspondance between evaluative functions and the variables of context. The best that can be done, within a Hallidayan framework, is to argue that each of the evaluative functions represents one of the variables as influenced by the others, as follows.

Status may most nearly be associated with Field. The goal of the text is to bring into being a hypothesis, or to change a doubtful hypothesis into a more certain one. In other words, the goal is to produce statements of a certain status. To do this, facts, experimental procedures, results, conclusions and so on are talked of. The items of content of the texts are therefore evaluated in terms of their status. As discussed above, however, the Field is itself influenced by Tenor, and so too is the status. Evaluations of status orientate themselves around the professional values of the interactants. The status of an item is decided by its use in the scientific community. In addition, evaluations of status are concerned with the role of the language (the Mode) in formulating concepts and facts, as reflected in the important role of projecting verbs in indicating status.

Value may be associated with the Tenor of the discourse. The writer relates the content of the text to the socially-created value-system of the readers. On the other hand, of course, the items of content have value because of what they are (scientific concepts and activities). That is, the Field influences the evaluation of value. In addition, the social goals in measurement against which the items are given value depend on the conventional type of argument being developed (the Mode).

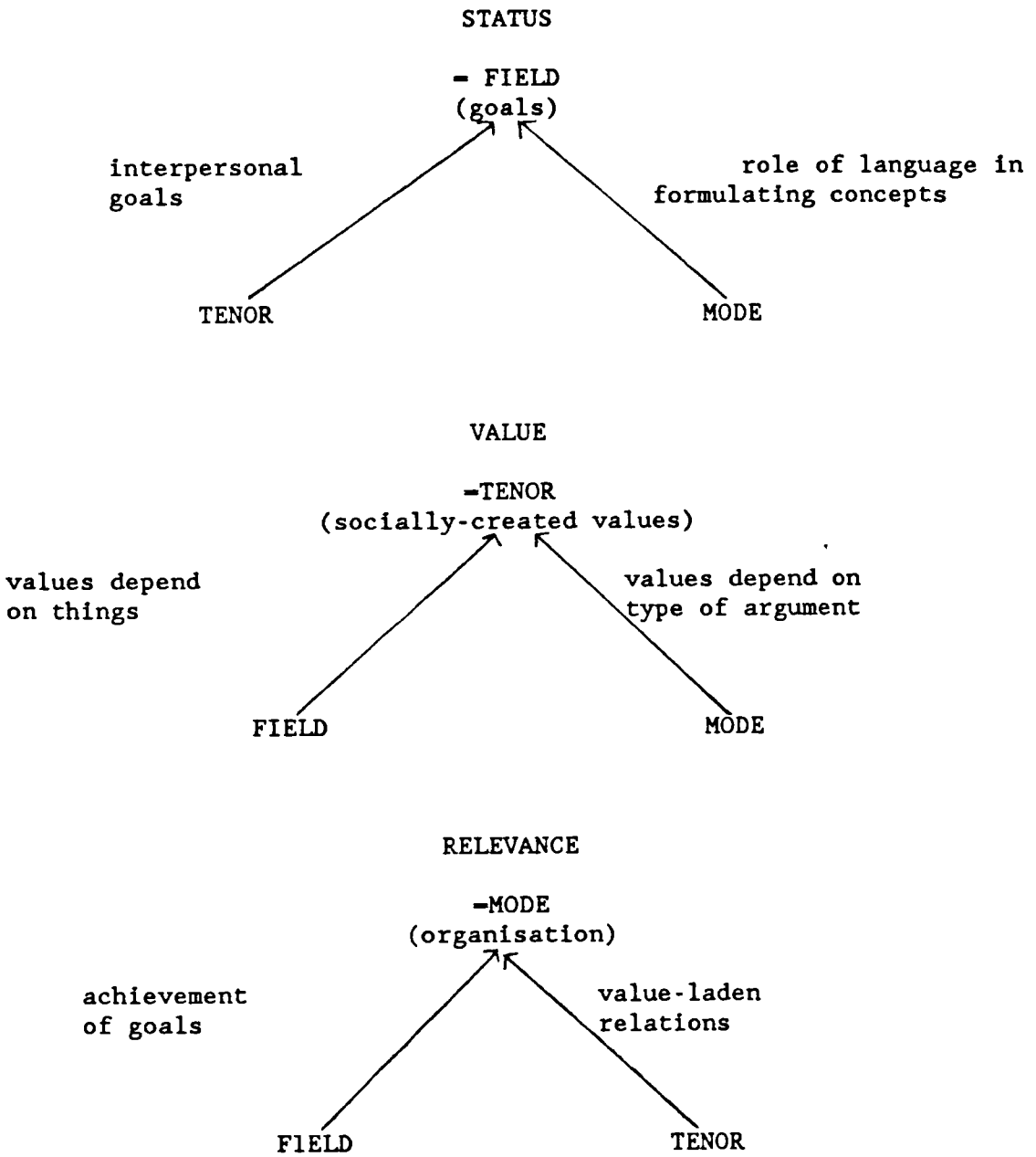
Finally, relevance may be associated with Mode because of its meta-discoursal and organising function. Insofar as the organisation is related to the overall goals of the discourse, however, relevance is influenced by the Field, and because relevance aligns the text content to a value-system of importance possessed by the interactants, it is influenced by Tenor.

In short, the nearest association that can be proposed between Field, Tenor and Mode and the evaluative functions is a set of triangular relations to explicate the association of evaluation with contextual variables. These relations are stated diagrammatically in Figure 8.1.

8.3.3 Particle, Field and Wave

A final attempt to calibrate the functions of evaluation with the metafunctions may be made using Halliday's suggestion that texts may have structures analogous to those in the clause (Halliday, 1982). In arguing that the metafunction primarily associated with status is the ideational metafunction, for example, one can look, not at the ideational meaning of the clause (realised through the transitivity system) but at the ideational structure of the text, which would be recognised by its particulate nature.

FIGURE 8.1



Key

------> = *influences*

Similarly, it can be argued that an analysis of evaluation of value reveals a field-like structure and that an analysis of relevance leads to a wave-like pattern analogous to, but not necessarily dependent on, the movement from Theme to Rheme in a clause.

As seen in Chapter 4, analysis of evaluation of status is indeed particulate in the sense that the segments of text given a status label (the clause) are separate from each other, and the status of one clause does not influence or 'run into' the status of any other. In this way, a list of status labels is similar to a list of roles and processes in an ideational analysis of a clause.

Evaluation of value, on the other hand, does not lead to a string of isolated segments, and it is often not possible to isolate a single sentence to be labelled 'evaluation of value', in contrast to other non-evaluative ones. Rather, as was discussed in detail in Chapter 5, a single evaluative item may affect the reading of several clauses, and a whole paragraph may indicate a particular evaluative stance through the accumulative effect of several widely-scattered value items, including those which also signal status. In this way, then, an item which evaluates for value is analogous to a modal verb, which does not simply modify the head verb of the phrase but indicates the writer's attitude towards the clause as a whole. When one considers the role of attitudinal language, such as attitudinal epithets, in the clause, the similarity to, and indeed the dependence on, text structure becomes even more marked. The word *excellent* in *She is an excellent student*, for example, is likely to affect not only the whole of that clause but subsequent clauses too. In this case the attitudinal nature of the epithet in question seems to belong to the interpersonal structure of the text

rather than of the clause. It is a feature explicable through concepts of discourse rather than of lexico-grammar.

As in Chapter 6, it may be argued that evaluation of relevance very clearly evinces the wave-like structure proposed by Halliday as indicative of the textual metafunction. Halliday instances the topic sentence followed by idea-development sentences as a type of wave from Topic to Comment, analogous to the textual movement in a clause. In the light of the discussion of relevance in Chapter 6, I think this suggestion needs revision. Relevance Markers can, as discussed in Chapter 6, occur at the beginning of a unit, but they may also occur, indeed they more typically occur, at the end. There may therefore be a movement away from or towards significance. In the clause, the movement from Theme to Rheme interacts with another movement from Given to New (or vice versa). In the text, the wave of relevance may be seen to interact with a movement of status, say, from greater to lesser certainty, and with a movement of value, say, from weaker to stronger indications of value. Just as in the clause the 'normal' order is Theme-Rheme and Given-New, so in the text unit the 'normal' order would be less to greater significance, greater to less certainty, weaker to stronger value. It will be noted, however, that there is far greater flexibility in the text unit than in the clause. In the clause, the order of Theme and Rheme is fixed and the order of Given and New varies. In the text, none of the orders is fixed. In addition, the wave-like pattern affects not only the relevance function of evaluation but the other functions too.

8.3.4 The Implications for Halliday's Model

From the above discussion, several implications may be drawn relating to the model of discourse developed by Halliday and others. Firstly, it has, I think, been demonstrated that evaluation belongs not just to Tenor but to Field and Mode as well. This overlap illustrates the interaction between Field, Tenor and Mode and the variability of their influence. Similarly, it has proved impossible to uphold the viability of the ideational, interpersonal and textual metafunctions as discrete motivators for choices in the various systems of the lexico-grammar. For example, it has been shown that the interpersonal has a significant role in determining choices normally ascribed to the ideational. One way in which these blurred distinctions may be interpreted is as a useful reminder that dividing context or metafunctions into three does not mean an examination of three different things, or three different parts of the same thing, but it implies looking at the same phenomenon in three different ways. Alternatively, one may simply see it as direct counter-evidence to Halliday's model.

One aspect of Halliday's work which has proved to be of major importance to the study of evaluation is the notion of grammatical metaphor. In Chapter 4 the idea of interpersonal metaphor was used and extended beyond Halliday's examples. It appears that the discourse of experimental research articles relies heavily upon such metaphor in order to couch personal judgements in the language of objective observation. It might even be reasonable to suggest that there may be a phenomenon of evaluation metaphor, in which information which is essentially evaluative, in the sense of indicating social value, is expressed in non-evaluative, in the sense of non-personal, terms.

Finally, the discussion in the previous sections raises the question of whether the patterns of evaluation discussed in Chapters 4, 5 and 6 constitute systems and structures in the Hallidayan sense. The sense in which they contribute to structures has been discussed in Section 8.3.3 above, and their relation to the other half of Halliday's system-structure model, the system, will be taken up here.

The status function of evaluation is clearly well within the Hallidayan tradition. A network of choices may be established, as has been done in Chapter 4, and choices from that network lend a text character and particulate structure. For example, each of the major text divisions found in experimental research articles consists of clauses of predominantly one or more status types.

With relevance too there is a system in that each clause makes a choice between RM and non-RM. If RM is chosen, there are then simultaneous choices between prospective and retrospective RMs and between the various realisation types. As discussed above, the structure that arises from this system may be variously described in terms of particles or of waves.

As regards evaluation of value, there is a system of choices with respect to the parameter along which the evaluation is being made. The predominance of any one parameter, along with the status of the item being evaluated, may delimit sections within the text. There is, however, another set of choices which are not systemic in the Hallidayan sense: that is, the strength of the evaluation or, as it was expressed in Chapter 5, the height of the evaluation up the Value-Grounds ladder. It is not possible to represent this 'ladder' by a set of system networks.

It appears, therefore, that some of the functions of evaluation can be represented in terms of system networks. Such networks cannot represent all aspects of evaluation, however, neither can they capture the important interaction between the functions. This suggests that, whereas the description of evaluation does not necessarily contradict the tenets of systemic linguistics, evaluation is a semantic entity which cannot entirely be explained in terms of Halliday's metafunctional categories. This uneasy fit may be explored further by investigating a parallel case: the discourse feature of clause relations. As shall be discussed in the section below (8.3.5), approaching texts from the point of view of clause relations leads to a similar mixture of fit and lack of fit with respect to systemic language description as the approach of evaluation does.

8.3.5 A Note on Clause Relations in Halliday's Model

The place of clause relations within Halliday's model is somewhat uncertain. Within the clause, 'conjunctions' are placed in the textual metafunction, that is, influenced by the Mode (Halliday and Hasan, 1985, 36). Within discourse, however, 'logical relations' are described as part of the ideational meaning, that is, influenced by the Field (Halliday, 1982, 224). This uncertainty is a result, I feel, of Halliday's placement of clause grammar at the heart of the discourse theory. As clause relations do not really belong within the clause, this centrality of the clause makes them appear a peripheral aspect of discourse. In fact, as Winter (1982), Hoey (1983) and indeed Mann (1987) have shown, they are a central feature of discourse organisation.

Work on evaluation and on clause relations confirms suspicions that if any aspect of discourse not presupposed by the Field-Tenor-Mode distinction is studied, it will be found to be influenced by each of the variables rather than just one. In other words, if Field, Tenor and Mode are horizontal layers of the cake, taking a slice of that cake at any other angle will show part of all the horizontal layers. Clause relations are ideational in that they add to the content of the discourse, interpersonal in that they describe the writers' attitude and textual in that they assert relevance and the line of development of the argument. All signals of clause relations participate in all the metafunctions, but in many cases one or two of the metafunctions may be more clearly operating than the others. In Example 8.1, for instance, the relation between the clauses is Field-like in that it adds to the facts. That something is a *reason* is a type of fact.

Example 8.1

[a]Since the overall nucleosome repeat length varies from 160 to 250 bp, depending on the chromatin source (ref), [b]the spacer DNA...therefore must vary between 0 and 80 bp. HOSC 1.4

With respect to the first clause, the relation is also Mode-like. It reduces 'informational prominence' (Halliday, 1982, 224) by asserting that the only relevance of this clause is to support the second clause.

In Example 8.2, however, the function of the relation signal *Furthermore* is primarily interpersonal in that it indicates the writer's attitude: what follows is more 'good news' supporting the writer's theory.

Example 8.2

Chromatin denuded of H1 exists only in the extended state (refs)...Furthermore, one can recognize separate roles for the three structural domains of H1..... PCHT 2.2-4

Like evaluation, then, clause relations illustrate a lack of comprehensiveness in the ability of systemic linguistics to account for the phenomena of discourse. This lack is due mainly to the tendency, when divisions are made, as into Field, Tenor and Mode, to treat each division as a separate entity which will uniquely account for a more or less tidy 'bundle' of discourse features. The concentration on any such discourse feature, such as evaluation or clause relations, and the placing of it as central to a description, will illustrate the shortcomings of such an approach.

8.4 Evaluation and Planes of Discourse

8.4.1 Planes Revisited

Before discussing the relationship between evaluation as described in this thesis and the planes of discourse, it is necessary to recapitulate Sinclair's theory, which was described more fully in Chapter 3. The planes of discourse are to be thought of primarily as planes of organisation. The autonomous plane organises the discourse retrospectively, through the accumulation of meanings. It is content-oriented, non-metadiscoursal and non-structural. The interactive plane organises the discourse prospectively because it is structure-oriented. It is meta-discoursal and existential, creating a discourse in real time. It is possible on the interactive plane to propose 'rules' for a well-formed discourse, but on the autonomous plane it is possible only to note likely patterns. When the discourse-as-interaction itself becomes an object of content on the autonomous plane, plane-change may be said to have occurred.

Whereas all sentences in a discourse participate in both autonomous and interactive planes of organisation, certain discourse items orientate more clearly towards one or other of the planes. Anaphoric cohesion, for example, helps to organise the autonomous plane, whereas discourse focusing helps to organise on the interactive plane. It is normally noted that evaluation may be oriented to either plane, depending largely on where in the syntagm it occurs, and to a lesser extent, on what is evaluated. For example, evaluation of the discourse itself is interactive, whereas evaluation of 'outside world' items is autonomous. Evaluation which closes a unit is said to be interactively or discoursally more significant than that which occurs at the beginning of in the middle of a unit. (For further discussion, see Chapter 3.)

It is now possible to consider how the functions of evaluation proposed in this thesis orientate towards the planes of discourse. My comments will be based on the essential differences between the planes noted by Cooper (1981): the difference between interaction and interpretation, between prospection and retrospection, and between structure and pattern. I argue that evaluation is primarily interactive, but that certain of its features suggest Cooper's dichotomies cannot reliably be maintained.

8.4.2 Interaction and Interpretation

All types of evaluation operate interactively. Value and, to a lesser extent, status depend on a sharing of goals and ideologies between writer and reader, a creation of a mutually-agreed world and a mutually-agreed text. Value can be stated obliquely or implicatively because of this sharing. Many status labels, such as <u>question</u>, are meta-discoursal, and

therefore interactive, in the sense that they define the discourse as a real-time process.

Relevance also acts interactively in the sense that Relevance Markers inform the reader explicitly of the significance of what he or she is reading, that is, its relevance to the reader's world and to the ongoing discourse. There is a cumulative chunking of the text by RMs which interacts with the reader's processing of information.

Evaluation is also, however, interpretative in the sense that it labels items in the world of the discourse. Because assessments of certainty, goodness and importance can be nominalised, they attach interpretative names to items which can then be reworked as the discourse proceeds.

8.4.3 Prospective Structure and Retrospective Pattern

Although Cooper (1981) suggests prospection and retrospection as diagnostic of planes, when we look at evaluation, such a distinction does not hold good. Evaluation, as argued above, is primarily interactive, yet it operates both prospectively and retrospectively.

As far as status is concerned, anaphoric status nouns, such as *result*, *conclusion*, are retrospective. The relation between status and value, however, is prospective, in the sense that the status of an item constrains the basis upon which it may be given value (see Chapter 5).

Evaluations of value and of relevance are in general retrospective and cumulative. That is, they add meaning to what has gone before, giving it a

value, in terms of good and bad, or a significance. Both are cumulative in the sense that the item evaluated, as noted in Chapters 5 and 6, may be an increasingly large segment of the text, with no upper limit to the amount of text that may be 'chunked' in this way. Markers of relevance may also be prospective, however, partly in the sense that there are prospective Relevance Markers as well as retrospective ones, but also in the sense that even retrospective RMs mark boundaries and therefore signal that 'something new is to follow'.

Patterns of text are formed by the chunking effect of anaphoric status nominals, by evaluations of value and by Relevance Markers. In other words, evaluation organises the text retrospectively. In addition, however, it contributes to internally-structured units (as argued in Chapter 7), and so participates in prospective structuring. The two types of organisation, retrospective patterning and prospective structure, cannot be separated by looking at the role of evaluation in each. Therefore, although the basic idea of planes remains unchallenged, the absolute dichotomy between retrospective and prospective, between structure and pattern, cannot be upheld as a diagnostic. This is turn raises doubts about an absolute distinction between structure and pattern.

8.5. Implications for teaching writing

If evaluation is such an important phenomenon in the production of texts, it follows that an awareness of it is crucial to the successful teaching of text-production. As a starting-point to this discussion, I shall take a paper by Bartholomae on the teaching of Basic Composition in American universities (Bartholomae, 1985).

Bartholomae argues that students learning to write within a particular discipline are not simply learning a set of conventions or arbitrary stylistic rules, but neither are they, in Flower and Hayes' (1981) terms, attempting to achieve goals that are entirely of their own making. The texts that students produce are, or should be, 'made possible by prior texts' (Bartholomae, 1985, 141). That is, they should locate themselves within an academic tradition and both use and argue against what Bartholomae calls its 'commonplaces'. Commenting on a set of successful student essays, Bartholomae notes:

> By trading in one set of commonplaces at the expense of another, they could win themselves status as members of what is taken to be some more privileged group.
>
> Bartholomae, 1985, 153

In other words, students have to learn to pretend to be part of an academic community (the 'privileged group' in question) and to produce texts that could legitimately be part of that community's discourse, in order eventually to become part of that community. As Bartholomae says,

> The student has to appropriate (or be appropriated by) a specialized discourse, and he has to do this as though he were easily and comfortably one with his audience, as though he were a member of the academy or an historian or an anthropologist or an economist; he has to invent the university by assembling and mimicking its language while finding some compromise between idiosyncracy, a personal history, on the one hand, and the requirements of convention, the history of a discipline, on the other.
>
> Bartholomae, 1985, 135

Bartholomae describes the defining features of the academic discourse as a set of 'peculiar ways of knowing, selecting, evaluating, reporting, concluding and arguing ' (Bartholomae, 1985, 134). I would argue, firstly, that the topics discussed in this thesis are an integral part of these 'peculiar ways' and, secondly, that many of the infelicities and

inappropriacies produced by learner writers can be explained in terms of the expectations of the academic community as regards what I have called evaluation.

More detailed observations concerning this issue may be made under the headings used in this thesis: Relevance, Value and Status. To a certain extent, these observations simply restate in evaluative terms features of lexico-grammatical choice and paragraph organisation already well-known to teachers of writing. Particularly in the area of status, however, I feel that this restatement can lead to new and valuable insights.

Turning first to relevance, we might note that one of the commonest infelicities in learners' writing is a failure to indicate at intervals the significance of the arguments that have been given, that is, their relevance to the ongoing dialogue with the (possibly specialist) reader. Textbooks of writing tend to emphasise the importance of the Topic Sentence in this regard, but it may be equally effective and, indeed, necessary to teach the notion of the Ending Sentence or Relevance Marker.

Secondly, in terms of value, teachers are aware that lexical choice has to be consistent with the value-system infusing the argument of the text. Evaluation of value is highly implicative, so that inappropriate lexical choice can lead to inconsistency in argument. For example, in an essay arguing that working women should have greater economic and social equality with men, a student writes as follows (Examples 8.3 and 8.4).

Example 8.3

It was not until the late twentieth century that certain factors threatened to change the traditional roles of women. (Yong Shyun Wen)

Example 8.4

With this breakdown in the old values, it became more acceptable for women to go out and work. (Yong Shyun Wen)

Underlying the student's argument about male and female equality, however, is an assumption that it is right, or at least acceptable, for traditional practices regarding the role of women to change. The negatively evaluative words *threaten* and *breakdown* militate against this and so spoil the coherence of the argument.

The third area of concern is status, and two factors here deserve mention. Firstly, writers need to be aware of how a particular choice of status constrains subsequent evaluation. Equally importantly, however, learners need to know the status of particular knowledge claims within the discipline and how to reformulate the knowledge claims of others with a status that is appropriate to themselves as junior members of the discipline. Example 8.5 is an extended example of a student who has failed to integrate herself with the demands of academic writing. The three paragraphs come from an essay section entitled *The Future Prospects of the Soviet System of Social Organisation*.

Example 8.5

1.[1]One of these prospective changes is that the Communist Party will increasingly face the necessity of compromises. [2]For example, the desire for professional and creative freedom of expression will contribute to the general atmosphere of moderation (ref). [3]Even now, the relaxation of censorship is an indication of this atmosphere which the Communist Party would not have condoned twenty years ago.

2.[1]Moreover, assuming that material and social life will be more satisfactory as a result of the reforms and compromises, the Party will be more motivated and receptive to changes. [2]At the same time, the Soviet people will be more willing to cooperate in any of the Party's reforms.

3.[1]Besides this, private pursuits as a result of the rising standard of living will probably increase in the future and this will erode the traditional high level of public commitment and self-sacrific in the Soviet society to some extent (ref). (Samantha Wong Mei Pheng)

My discomfort with this passage, as a teacher, concerns two related points, both explicable in terms of status. Firstly, the writer is according too high a status to claims about events in the future about which it is impossible that she should be so certain. Secondly, and more importantly, there is what seems to me to be an inappropriate relation between this writer, as a member of an (my) academic community, and her source writers referred to in Example 8.5. Possibly the source writers are themselves not writing within a tradition of academic discourse, in which case the student writer is at fault for taking over the status of their claims without sufficient critical interpretation. (The student's Bibliography, which shows that most of the sources are published by a small and apparently politically-motivated publishing company, seems to support this interpretation.) Alternatively, the student may have misinterpreted the status of the original knowledge claims and thus is at fault in her reporting. Either way, the student has failed to create an academically appropriate distance between herself and her sources. As an illustration of how such 'distance' may be achieved, consider the third paragraph of Example 8.5, where the certainty categories selected are PROBABLE and CERTAIN. Re-writing the paragraph as in Example 8.5a would yield certainty categories of POSSIBLE, which would be much more appropriate to the context.

Example 8.5a

Black (ref) predicts that private pursuits as a result of the rising standard of living will probably increase in the future, and he suggests that this may erode the traditional high level of public commitment and self-sacrifice in the Soviet society to some extent (ref).

I believe that this example shows how evaluation as discussed in this thesis has relevance to a wide range of issues in the teaching of writing, including questions of intertextuality and of the social contexts of students' writing practices.

8.6 Evaluation and Text Type

8.6.1 The Experimental Research Article

It is now possible to return to the research described in Chapter 2 and to consider what contribution the work in this thesis can make to the study of the sociology of science and of scientific writing. In one sense, I have simply reinforced the sociologists' existing claim that the objectivity of scientific facts is a myth. In addition, however, my work on evaluation does provide a link between the observations made by sociologists of science on the way that science works and the linguistic analysis of scientific writing. In the notion of status, for example, I have attempted to make more linguistically explicit the notions of externality (Pinch, 1985) and of statement types (Latour and Woolgar, 1979) explained in Chapter 2. In my discussions of status and of value, the description of the implicitness and metaphorisation of personal assessment in research articles helps to account for the 'inversion' (Latour and Woolgar, 1979, 240) by which scientists, when writing experimental research articles, attempt to persuade by appearing not to persuade at all.

An important contribution to an understanding of how the ideology of objective science is maintained is made by the essential unity of status and value as sub-categories of evaluation. In order to discuss certainty and value-judgements together, there must be a sense in which they belong to the same order of phenomena. In the experimental research article, certainty is 'good', while uncertainty is 'bad'. It is for this reason that a <u>hypothesis</u> can be given positive value by being pushed up the certainty scale, while something that carries the status UNKNOWN always represents a problem, that is, something of negative value. Such a unity between judgements of status

and judgements of value presupposes a model of the world in which natural phenomena are external to the text and separate from the text-producer, yet knowable and describable by that producer, as opposed to a world accounted for by traditional rationality (Goulet, 1981, 9), a world which is non-dual, in which there is a forgetting for every learning and which is ultimately not describable.

The work described in this thesis also contributes to a debate concerning the nature of scientific writing as constituting monologic or dialogic discourse. Bazerman (1984, 163-4) rightly criticises, albeit implicitly, the notion that in scientific writing the relationship between word and object is 'univocal'. Comprone (1989), on the other hand, using Bakhtin's (1981) terminology, describes the traditional research article as monologic, as opposed to the dialogic nature of hybrid genres such as the literary-scientific work of Sachs and Gould. Whether or not these views are contradictory depends on what Comprone means when he claims that the experimental research article is monologic. If he means that the voice of the research article represents a single authority, that it does not explicitly take account of the discourse of those with other relationships to science, those upon whom science acts rather than those who act upon science, then he is clearly right. In that sense, the experimental research article speaks as Bakhtin's peasant, who 'was not yet able to regard one language (and the verbal world corresponding to it) through the eyes of another language..' (Bakhtin, 1981, 296). On the other hand, each research article is part of a dialogue, both in the sense that it refers explicitly to other (previous) research articles, and in the sense that arguments are presented in such a way that they take account of, and forestall, potential

criticism. Lodge (1987) makes the same point with respect to literary criticism:

> ...scholarly discourse is saturated in the kind of dialogic rhetoric that Bakhtin named 'hidden polemic', when an utterance not only refers to a given topic, but engages with, or anticipates or seeks to discredit another actual or hypothetical speech act about the same topic.
>
> Lodge, 1987, 95

Furthermore, there is in the research article a demonstration of what Bakhtin calls 'the internal dialogism of the word' (Bakhtin, 1981, 279), specifically, a tension between the ideology and the practice of science, or between two ideologies: the objective and the subjective. The pressure that has consistently been noted in this thesis towards making the personal and the evaluative implicit and metaphorical confirms this duality of voice.

8.6.2 The Notion of Genre

Having considered what a study of evaluation may show about the register or genre of experimental research articles, it is now appropriate to ask what the same study may contribute to the very notion of genre itself.

In Chapter 2 it was stated that, whereas research articles could not be seen as hybrids of other registers, there was a sense in which they were the products of competing ideologies. It could be said that each of those ideologies is represented more clearly in, respectively, popular scientific articles (the narrative of natural phenomena) and scientists' contingent discourse (the narrative of scientific discovery). In turn, however, it might be argued that popular articles are themselves in tension between the

straight narrative of the mystery story and scientific exposition, whilst the scientists' informal talk lies between scientific exposition and gossip. In short, it appears that any genre, once examined, is an outcome of conflicting, or interacting, ideologies.

Turning to Generic Structure Potential as an account of genre, it appears that using interactively-demarcated units might be a way of identifying GSP elements. Such a method of analysis would represent a synthesis of Hasan's and Sinclair's analytical approaches. The unit types that I have proposed in Chapter 7, however, also throw doubt on one of the features of a statement of GSP: the primacy of meaning-type over organisation. If existing investigations in the area, such as Swales' (1981; 1984) attempts to describe Introductions, are considered, for example, we find that, whereas it seems undeniable that certain types of information will be found in certain parts of the experimental research article, there cannot be said to be a consistent mapping of semantic function on to the unit types that I have proposed. For example, whereas every Introduction appears to raise some kind of question, this may appear in many guises. Similarly, a research finding may be presented using Method-Result-Conclusion, Question-Answer, Problem-Outcome or even Controversy-Resolution. At its worst, a GSP of the Swales type simply states the obvious: that a research article contains certain types of information in certain preferred orders. Such a model ignores the organisation of each meaning unit.

How, then, could differences between text types be described in terms of evaluation? Clearly, an attempted distinction between evaluative and non-evaluative types is not useful. The register of discourse studied here is one that is often held to be 'objective' or 'unevaluative', and yet I have argued for its being explicable only in terms of evaluation. My contention

is that evaluation is essential for the coherence of a text, and that it is (as Sinclair says) a necessary product of the interaction between writer and reader. It follows that there can be no unevaluative text or register.

Rather than ask whether a text or register is evaluative or not, then, the discourse analyst needs to ask of a text or register the following questions:

What **Status** categories are made salient by this text or register? That is, what items in the text are responded to by evaluations of value? In other words, how do the writers and readers of this register divide up their world?

To what do the writers, and therefore the ideologies within which the writers are writing, give **Value**? Upon what bases are the items in the text or register given value, and how explicitly is that value expressed?

How is **Relevance** assigned in this text or register? What unit types are demarcated by markers of relevance?

The answers will not be the same for every text or register. In particular, the association of certainty with status and good-badness with value that was found to hold for experimental research articles may not be true for other registers. It may well be in many registers, for example, that status categories are distinguished by the positive or negative value attached to them. What would be carried over from this study to studies of other genres would be the method of investigation rather than the specific categories used. While this calls into doubt the finiteness of the categories proposed here, the consequent idea of a register as comprising

those texts which divide the world, and their own discourse, in a comparable way, seems to be reasonable.

To return, briefly, to the notion of a register as the product of a particular configuration of ideologies (see Chapter 2), we might note that evaluation is closely linked to the way that ideology becomes expressed in language. In fact, I would say that the clearest influence of the writer's ideology (or ideologies) upon the finished text is to be seen through an investigation of evaluation.

8.7 Conclusion

Evaluation may be regarded as making contributions of two kinds to the text in which it is found: a contribution of meaning and a contribution of organisation. The evaluative meanings which this thesis has described are closely linked to the ideology of the community within which the text is written. Because of this, the study of such meanings is important to the study of writing and of genre. An attempt has been made to account for the meanings in terms of Halliday's distinction between Field, Tenor and Mode, but this attempt has not been successful.

Evaluation is important also as a principle of organisation within a text. This organisation has both prospective and retrospective aspects. Because of this, it might be described as contributing to both structure and pattern, in Sinclair's terms, although it also challenges the distinction between them.

Appendix

This appendix contains the research articles referred to in the main text, full details of which are given in Chapter 1. Some figures have been omitted for reasons of length. The articles may be found on the following pages:

Note that most detailed references in the main text are to the articles OCM, ONC, HOSC and PCHT.

The articles in the appendix cannot be reproduced in the digital version of this thesis because they are in copyright.

Links to known online versions are provided here for convenience, though some are only available to institutions or individuals who subscribe to the source journals.

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
http://dx.doi.org/10.1083/jcb.90.2.279

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
http://dx.doi.org/10.1083/jcb.93.2.285

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*, Biopo1ymers 21 (1982) 101-116 IIS
http://dx.doi.org/10.1002/bip.360210109

Lee. K.S., Mande1kern, M. and Crothers, D., *Solution Structural Studies of Chromatin Fibers*, Biochemistry 20 (1981) 1438-1445 SSS

McGhee, J.D. et.a1., *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
http://dx.doi.org/10.1016/0092-8674(83)90025-9

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

BIBLIOGRAPHY

Bakhtin, M.M. (1981), *The Dialogic Imagination* , translated by C. Emerson and M. Holquist (Austin, University of Texas Press). Originally published as *Voprosy Literatury i Estetiki* (1975)

Barber, C.L. (1962), 'Some Measureable Characteristics of Modern Scientific Prose' in F. Behre (ed); *Contributions to English Syntax and Philology*, Gothenburg Studies in English, 14 (Stockholm, Almquist & Wiksell) pp 21-43, reprinted in J. Swales (1985), *Episodes in ESP: A source and reference book on the development of English for Science and Technology* (Oxford, Pergamon Press) pp 3-14

Barnes, S.B. (1983), 'On the Conventional Character of Knowledge and Cognition', in K.D. Knorr-Cetina and M. Mulkay (eds), *Science Observed: Perspectives on the Social Study of Science* (London, Sage)

Bartholomae, D. (1985), 'Inventing the University', in M. Rose (ed), *When a Writer Can't Write* (New York, Guilford Press) pp 134-165

Bazerman, C. (1981), 'What Written Knowledge Does: Three examples of academic discourse', *Philosophy of the Social Sciences* 11, 361-387

Bazerman, C. (1984), 'Modern Evolution of the Experimental Report in Physics: Spectroscopic articles in Physical Review, 1893-1980', *Social Studies of Science*, 14, 163-196

de Beaugrande, R.A. and W.U. Dressler (1981), *Introduction to Text Linguistics* (London, Longman)

Benson, J. and W. Greaves (eds) (1985a), *Systemic Perspectives on Discourse Vol 1: Selected theoretical papers from the 9th International Systemic Workshop (1982)* (New Jersey, Ablex)

Benson, J. and W. Greaves (eds) (1985b), *Systemic Perspectives on Discourse Vol 2: Selected applied papers from the 9th International Systemic Workshop (1982)* (New Jersey, Ablex)

Berry, M. (1981), 'Systemic Linguistics and Discourse Analysis: A multi-layered approach to exchange structure', in M. Coulthard and M. Montgomery (eds), *Studies in Discourse Analysis* (London, Routledge & Kegan Paul) pp 120-145

Birch, D. and M. O'Toole (eds) (1988) *Functions of Style* (London, Pinter)

Bitzer, L.R. (1968), 'The Rhetorical Situation', *Philosophy and Rhetoric* 1, 1-14

Bolivar, A. (1985), *Interaction through Written Text: A discourse analysis of newspaper editorials* (PhD.thesis, University of Birmingham)

Bremond, C. (1970), 'Morphology of the French Folktale' *Semiotica* 2, 247-276

Brown, P. and S. Levinson (1978), Universals in Language Usage: Politeness phenomena' in E.N. Goody (ed), *Questions and Politeness: Strategies in social interaction* (Cambridge, Cambridge University Press) pp 56-310

Burton, D. (1980) *Dialogue and Discourse: A sociolinguistic approach to modern drama dialogue and naturally occurring conversation* (London, Routledge & Kegan Paul)

Butt, D. (1988a), 'Randomness, Order and the Latent Patterning of Text', in D. Birch and M. O'Toole (eds) *Functions of Style* (London, Pinter) pp 74-97

Butt, D. (1988b), 'Ideational Meaning and the "Existential Fabric" of a Poem', in R.P. Fawcett and D. Young (eds), *New Developments in Systemic Linguistics Vol 2: Theory and Application* (London, Pinter) pp 174-218

Candlin, C. and J. Lucas (1986), 'Interpretations and Explanations in Discourse: Modes of advising in family planning', in P. Meara (ed), *Spoken Language*, Papers from the Annual Meeting of the British Association for Applied Linguistics, September 1985, pp 49-62

Charlesworth, M. (1982), *Science, Non-Science and Pseudo-Science* (Victoria, Deakin University Press)

Christie, F. (1984), 'Young Chidren's Writing Development: The relationship of written genres to curriculum genres', in B. Bartlett and J. Carr (eds), *Language in Education Conference: A report of proceedings* (Brisbane College of Advanced Education) pp 41-69

Christie, F. (1985), 'Curriculum Genres: Towards a description of the construction of knowledge in schools', paper given at the Working Conference on Interaction of Spoken and Written Language in Educational Settings, University of New England, 11-15 November 1985

Christie, F. (1987), 'The Morning News Genre: Using a Functional Grammar to illuminate educational issues', *Australian Review of Applied Linguistics* 10, 182-198

Collins, H.M. (1985), *Changing Order: Replication and Induction in Scientific Practice* (London, Sage)

Comprone, J. (1989), 'The Phenomenon of the Scientist Doing Literary Text: The work of Stephen Jay Gould and Oliver Sachs' Faculty Lecture, National University of Singapore, 5th. January, 1989

Cooper, M. (1981), 'Aspects of the Structure of Written Academic Discourse and Implications for the Design of Reading Programmes', in Hoedt et. al. (eds), *Pragmatics and LSP: Proceedings of the 3rd. European Symposium on LSP, Copenhagen, August 1981* (Copenhagen School of Economics) pp 403-433

Cooper, M. (1983), *Textbook Discourse Structure: An investigation into the notion of predictable structuring in the discourse of scientific textbooks* (PhD.thesis, University of Birmingham)

Coulthard, M. and D. Brazil (1981), 'Exchange Structure', in M. Coulthard and M. Montgomery (eds), *Studies in Discourse Analysis* (London, Routledge & Kegan Paul) pp 82-106

Danes, F. (1974), 'Functional Sentence Perspective and the Organisation of Text' in F. Danes (ed) *Papers in Functional Sentence Perspective* (The Hague, Mouton) pp 106-128

van Dijk, T.A. (1977), *Text and Context: Explorations in the semantics and pragmatics of discourse* (London, Longman)

Dubois, B.L. (1981), 'The Construction of Noun Phrases in Biomedical Journal Articles' in Hoedt et.al. (eds), *Pragmatics and LSP* (Copenhagen, Copenhagen School of Economics) pp 49-67

Dudley-Evans, T. (1986), 'Genre Analysis: An investigation of the Introduction and Discussion sections of MSc dissertations', in M. Coulthard (ed), *Talking about Text: Studies presented to David Brazil on his retirement*, Discourse Analysis Monograph 13 (University of Birmingham) pp 128-145

Eggins, S. (1987), 'Keeping the Conversation Going: The dynamics of sustained casual talk', paper given at the 14th. International Systemic Workshop, Sydney, Australia, August 24-28 1987

Fahnestock, J. (1986), 'Accommodating Science', *Written Communication* 3, 275-296

Fahnestock, J. and M. Secor (1988), 'The Stases in Scientific and Literary Argument', *Written Communication*, 5, 427-44

Fairclough, N. (1988), 'Register, Power and Socio-semantic Change' in D. Birch and M. O'Toole (eds), *Functions of Style* (London, Pinter) pp 111-125

Fillmore, C.J. (1982), 'Discussion of Michael A.K. Halliday's Paper "How is a Text Like Clause?"', in S. Allen (ed.), *Text Processing: Proceedings of Nobel Symposium 51* (Stockholm, Almquist and Wiksell International) pp 249-258

Flower, L. and J. Hayes (1981), 'A Cognitive Process Theory of Writing', *College Composition and Communication* 32, 365-387

Francis, G. (1986), *Anaphoric Nouns*, Discourse Analysis Monograph 11 (University of Birmingham)

Francis, G. and S. Hunston (1987), 'Analysing Everyday Conversation', in M. Coulthard (ed), *Discussing Discourse*, Discourse Analysis Monograph 14 (University of Birmingham) pp 107-148

Garfinkel, H., M. Lynch and E. Livingstone (1981), 'The Work of a Discovering Science Construed with Materials from the Optically Discovered Pulsar', *Philosophy of the Social Sciences* 11, 131-158

Gilbert, G.N. (1976), 'The Transformation of Research Findings into Scientific Knowledge', *Social Studies of Science* 6, 281-306

Gilbert, G. N. and M. Mulkay (1984), *Opening Pandora's Box* (Cambridge, Cambridge University Press)

Goulet, D. (1981), 'In Defense of Cultural Rights: Technology, Tradition and Conflicting Models of Rationality', *Human Rights Quarterly* 3, 5-11

Graustein, G. and W. Thiele (1987), *Properties of English Texts* (Leipzig, VEB Verlag Enzyklopadie)

Gregory, M. (1967), 'Aspects of Varieties Differentiation', *Journal of Linguistics* 3, 177-198

Gregory, M. (1985), 'Towards "Communication" Linguistics: A framework', in J. Benson and W. Greaves (eds), *Systemic Perspectives on Discourse Vol 1: Selected theoretical papers from the 9th International Systemic Workshop (1982)* pp 119-134

Gribbon J. (1985), *In Search of the Double Helix: Darwin, DNA and Beyond* (London, Corgi)

Halliday, M.A.K. (1963), 'Class in Relation to the Axes of Chain and Choice in Language', *Linguistics* 2, 5-15

Halliday, M.A.K. (1967 and 1968), 'Notes on Transitivity and Theme in English', *Journal of Linguistics* 3, 37-81; 199-274 and *Journal of Linguistics* 4, 153-308

Halliday, M.A.K. (1973), *Explorations in the Functions of Language* (London, Arnold)

Halliday, M.A.K. (1978), *Language as Social Semiotic* (London, Arnold)

Halliday, M.A.K. (1982), 'How is a Text Like a Clause?', in S. Allen (ed.), *Text Processing: Proceedings of Nobel Symposium 51* (Stockholm, Almquist and Wiksell International) pp 209-239

Halliday, M.A.K. (1985a), *An Introduction to Functional Grammar* (London, Arnold)

Halliday, M.A.K. (1985b), *Spoken and Written Language* (Victoria, Deakin University Press)

Halliday, M.A.K. (1985c), 'Systemic Background', in J. Benson and W. Greaves (eds), *Systemic Perspectives on Discourse Vol 1: Selected theoretical papers from the 9th International Systemic Workshop (1982)* pp 1-15

Halliday, M.A.K. (1987), 'Language and the Order of Nature', in N. Fabb, D. Attridge, A. Durant and C. MacCabe (eds), *The Linguistics of Writing* (Manchester, Manchester University Press) pp 135-154

Halliday, M.A.K. (1988a), Foreword to D. Birch and M. O'Toole (eds) *Functions of Style* (London, Pinter) pp vii-ix

Halliday, M.A.K. (1988b), 'Poetry as Scientific discourse: The nuclear sections of Tennyson's "In Memoriam"', in D. Birch and M. O'Toole (eds) *Functions of Style* (London, Pinter) pp 31-44

Halliday, M.A.K. and R. Hasan (1985), *Language, Context and Text: Aspects of language in a social-semiotic perspective* (Victoria, Deakin University Press)

Halliday, M.A.K., A McIntosh and P. Strevens (1964), *The Linguistic Sciences and Language Teaching* (London, Longman)

Harris, S. (1988), 'Court Discourse as Genre: Some problems and issues' in R.P. Fawcett and D. Young (eds), *New Developments in Systemic Linguistics Vol 2: Theory and Application* (London, Pinter) pp 94-115

Hasan, R. (1984) 'The Nursery Tale as a Genre', *Nottingham Linguistic Circular*, 13, 71-102

Hasan, R. (1985), 'Offers in the Making: A systemic-functional approach', paper given at the 12th International Systemic Workshop, Ann Arbor, USA, August 1985

Hasan, R. (forthcoming) 'Situation and the Definition of Genres', in A. D. Grimshaw (ed.), *Perspectives on Discourse: Multi-disciplinary study of a naturally occurring conversation* (New Jersey, Ablex)

Heslot, J. (1981), 'Tense and Other Indexical Markers in the Typology of Scientific Texts in English' in Hoedt et.al. (eds), *Pragmatics and LSP* (Copenhagen, Copenhagen School of Economics) pp 83-104

Hesse, M. (1974), *The Structure of Scientific Inference* (London, Macmillan)

Hill, S.S., B.F. Soppelsa and G.K. West (1982), 'Teaching ESL Students to Read and Write Experimental-Research Papers', *TESOL Quarterly* 16, 333-347

Hoey, M. (1979), *Signalling in Discourse*, Discourse Analysis Mongraph 6 (University of Birmingham)

Hoey, M. (1983), *On the Surface of Discourse* (London, Allen & Unwin)

Hoey, M. (1986), 'The Discourse Colony: A preliminary study of a neglected discourse type', in M. Coulthard (ed), *Talking about Text: Studies presented to David Brazil on his retirement*, Discourse Analysis Monograph 13 (University of Birmingham) pp 1-26

Hoey, M. (1988), 'The Discourse Properties of the Criminal Statute', in C. Walter (ed), *Computer Power and Legal Language: the use of computational linguistics, artificial intelligence, and expert systems in the law* (Westport Connecticut, Quorum) pp 69-88

Hoey, M. (forthcoming), *Patterns of Lexis in Text* (Oxford, Oxford University Press)

Huddleston, R.D., R.A. Hudson, E.O. Winter and A. Henrici (1968), *Sentence and Clause in Scientific English*, Report for the Office of Scientific and Technical Information (mimeo, University of London)

Hunston, S. (1982), *Text and Sub-Text: An investigation into viability of sub-text creation as a means of revealing the complexity of written texts* (M.A. Thesis, University of Birmingham)

Hunston, S. (1985), 'Text in World and World in Text: Goals and models of scientific writing', *Nottingham Linguistic Circular*, 14, 25-40

Hunston, S. (1987), 'The Negotiation of Meaning in the Science Classroom', in B.K. Das (ed), *Communication and Learning in the Classroom Community* (Singapore, SEAMEO Regional Language Centre), pp 64-89

Hunt, R.A. and D. Vipond (1986), 'Evaluations in Literary Reading' *Text* 6, 53-71

Hutchins, J. (1977), 'On the Structure of Scientific Texts', *University of East Anglia Papers*, 5, 18-39

Kinneavy, J.L. (1971), *A Theory of Discourse: The aims of discourse* (Englewood Cliffs, Prentice-Hall)

Knorr-Cetina, K.D. (1981), *The Manufacture of Knowledge: An essay on the constructivist and contextual nature of science* (Oxford, Pergamon Press)

Kress, G. and R. Hodge (1979), *Language as Ideology* (London, Routledge & Kegan Paul)

Kwa, N. (1988), *Oral Presentation of Manufacturing Design Projects: A discourse analysis with pedagogical objectives* (M.A. Thesis, National University of Singapore)

Labov, W. (1972), *Language in the Inner City* (Philadelphia, University of Pennsylvania Press)

Labov, W. and D. Fanshel (1977), *Therapeutic Discourse: Psychotherapy as conversation* (New York, Academic Press)

Lackstrom, J., L. Selinker and L. Trimble (1973), 'Technical Rhetorical Principles and Grammatical Choice', *TESOL Quarterly* 7, 127-136

Latour, B. (1987), *Science in Action: How to follow scientists and engineers through society* (Milton Keynes, Open University Press)

Latour, B. and S. Woolgar (1979), *Laboratory Life: The social construction of scientific facts* (Beverley Hills, Sage)

Lee K.C. (1978), *Syntax of Scientific English* (Singapore, Singapore University Press)

Lodge, D. (1987), 'After Bakhtin' in N. Fabb, D. Attridge, A. Durant and C. MacCabe (eds), *The Linguistics of Writing* (Manchester, Manchester University Press) pp 89-102

Lynch, M. (1985), 'Discipline and the Material Form of Images: An analysis of scientific visibility', *Social Studies of Science* 15, 37-66

Malcolm, K. (1985), 'Communication Linguistics: A sample analysis' in J. Benson and W. Greaves (eds), *Systemic Perspectives on Discourse Vol 2: Selected applied papers from the 9th International Systemic Workshop (1982)* pp 136-151

Mann, W.C. (1987), *Text Generation: The problem of text structure ISI Reprint Series*, reprinted from Natural Language Generation Systems, 1987 (University of Southern California, Information Sciences Institute)

Martin, J.R. (1985), *'Process and Text: Two aspects of semiosis'* in J. Benson and W. Greaves (eds), *Systemic Perspectives on Discourse Vol 1: Selected theoretical papers from the 9th International Systemic Workshop (1982)* pp 248-274

Martin, J.R. (1986), 'Politicalising Ecology: The politics of baby seals and kangaroos', in T. Threadgold et.al. (eds), *Semiotics Ideology Language* (Sydney, Sydney Association for Studies in Society and Culture) pp 225-267

Martin, J.R. and J. Rothery (1980), *Writing Project Report 1*, Working Papers in Linguistics (University of Sydney)

Martin, J.R. and J. Rothery (1981), 'The Ontogenesis of Written Genres', Working Papers in Linguistics No. 2 (University of Sydney)

Miller, C.R. (1984), 'Genre as Social Action', *Quarterly Journal of Speech* 70, 151-167

Morgan, P.E. (1987), 'Written Discourse in the Early Years of Secondary School' (M.Litt thesis, University of Birmingham)

Myers, G. (1985a), 'The Social Construction of Two Biologists' Proposals', *Written Communication* 2, 219-245

Myers, G. (1985b), 'Text as Knowledge Claims: The social construction of two biology articles', *Social Studies of Science* 15, 593-630

Myers, G. (1989), 'The Pragmatic of Politeness in Scientific Articles', *Applied Linguistics* 10, 1-35

Myers, G. (nd), 'The Social Construction of Popular Science: The narrative of science and the narrative of nature' (ms)

Myers, G. (nd), 'Transcribing, Splicing and Translating: The form and function of review articles' (ms)

Oster, S. (1981), 'The Use of Tenses in "Reporting Past Literature" in EST', in L. Selinker, E. Tarone and V. Hanzeli (eds), *English for Academic and Technical Purposes: Studies in Honor of Louis Trimble* (Massachusetts, Newbury House) pp 76-90

Pearce, R.D. (1977), *Chain's Choice: The linguistic analysis of novels, and "A Portrait of the Artist as a Young Man"* (PhD thesis, University of Birmingham)

Pike, K.L. (1959), 'Language as Particle, Wave and Field', *The Texas Quarterly* 2, 37-54

Pinch, T. (1985), 'Towards an Analysis of Scientific Observation: The externality and evidential significance of observational reports in physics', *Social Studies of Science* 15, 3-36

Plum, G. and J. Rothery (1987), 'The Role of Interpersonal Meanings in Narrative Genres', paper given at the 14th International Systemic Workshop, Sydney, August 1987

Polanyi, L. (1978), *The American Story: cultural constraints on the meaning and structure of stories in conversation* (PhD thesis, University of Michigan)

Polanyi, L. (1979), 'So What's the Point?' *Semiotica* 25, 207-241

Poynton, C. (1985), *Language and Gender: Making the difference* (Victoria, Deakin University Press)

Reid, I. (nd) (ed.) , *The Place of Genre in Learning: Current debates* (Deakin University, Centre for Studies in Literary Education)

Rothery, J. (1984), 'The Development of Genres - Primary to Junior Secondary School', in *Language Studies: Children Writing: Study Guide* (Victoria, Deakin University Press)

Sacks, H., E.A. Schegloff and G. Jefferson (1974), 'A Simplest Systematics for the Organization of Turn-Taking for Conversation', *Language* 50, 696-735

Salager, F. (1984), 'Compound Nominal Phrases in Scientific-Technical Literature: Proportion and rationale', in A.K. Pugh and J.M. Ulijn (eds), *Reading for Professional Purposes: Studies and practices in native and foreign languages* (London, Heinemann) pp 136-145

Samraj, B. (1989), *Picture Talk as a Curriculum Genre* (M.A. Thesis, National University of Singapore)

Schiffrin, D. (1984), 'How a Story Says What it Means and Does', *Text* 4, 313-346

Sinclair, J.McH. (1972), *A Course in Spoken English: Grammar* (London, Oxford University Press)

Sinclair, J.McH. (1981), 'Planes of Discourse', in S.N.A. Rizvi (ed), *The Two-Fold Voice: Essays in Honour of Ramesh Mohan* (Saltzburg, Universitat Saltzburg) pp 70-89

Sinclair, J.McH. (1986), 'Fictional Worlds', in M. Coulthard (ed.), *Talking about Text*, Discourse Analysis Monograph 13 (University of Birmingham)

Sinclair, J.McH. (1987), 'Mirror for a Text' (Ms, University of Birmingham)

Sinclair, J.McH. and D. Brazil (1982), *Teacher Talk* (London, Oxford University Press)

Sinclair, J.McH. and M. Coulthard (1975), *Towards an Analysis of Discourse: The English used by teachers and pupils* (London, Oxford University Press)

Smith, F. (1971), *Understanding Reading* (New York, Holt Rinehart and Winston)

Strevens, P. (1972), 'Technical, Technological and Scientific English', paper given at the IATEFL Conference, London, January 1972

Swales, J. (1981), *Aspects of Article Introductions*, Aston ESP Research Reports, 1 (University of Aston)

Swales, J. (1984), 'Research into the structure of introductions to journal articles and its application to the teaching of academic writing' in R. Williams et.al. (eds) *Common Ground: Shared interests in ESP and Communication Studies* pp 77-86

Swales, J. (forthcoming), *Genre Analysis and its Application to Research English* (Cambridge, Cambridge University Press)

Tadros, A. (1985), *Prediction in Text*, Discourse Analysis Monograph 10 (University of Birmingham)

Tannen, D. (1984), *Conversational Style: Analyzing talk among friends* (New Jersey, Ablex)

Tarone, E., S. Dwyer, S. Gillette and V. Icke (1981), 'On the Use of the Passive in Two Astrophysics Journal Papers', *ESP Journal*, 1, 123-140

Tsui, A (1988), 'Beyond the Adjacency Pair', paper given at the First Hong Kong Conference on Language and Society, April, 1988

Ure, J.N. and J. Ellis (1979), 'Register in Descriptive Linguistics and Linguistic Sociology', in O.U. Villegas (ed.), *Issues in Sociolinguistics* (The Hague, Mouton)

Ventola, E. (1979), 'The Structure of Casual Conversation in English', *Journal of Pragmatics*, 3, 267-298

Ventola, E. (1984), 'Orientation to Social Semiotics in Foreign Language Teaching', *Applied Linguistics* 5, 275-286

Ventola, E. (1987), 'Linguistic Difficulties in Institutional Discourse', paper given at the 8th World Congress of Applied Linguistics, Sydney, August 1987

Weissberg, R.C. (1984), 'Given and New: Paragraph development models from scientific English', *TESOL Quarterly* 18, 485-500

Wells, G., M. Montgomery and M. MacLure (1979), 'Adult-child Discourse: Outline of a model of analysis', *Journal of Pragmatics* 3, 337-380

Wells, G., M. MacLure and M. Montgomery (1981), 'Some Strategies for Sustaining Conversation' in P. Werth (ed), *Conversation and Discourse: Structure and interpretation* (London, Croom Helm)

West, G.K. (1982), 'That-Nominal Constructions in Traditional Rhetorical Divisions of Scientific Research Papers', *TESOL Quarterly* 14, 483-488

Williams, R., J. Swales and J. Kirkman (eds) (1984), *Common Ground: Shared interests in ESP and Communication Studies* ELT Documents 117 (Oxford, Pergamon/British Council)

Winter, E.O. (1982), *Towards a Contextual Grammar of English: The clause and its place in the definition of sentence* (London, Allen and Unwin)

Yearley, S. (1981), 'Textual Persuasion: The role of social accounting in the construction of scientific arguments', *Philosophy of the Social Sciences* 11, 409-435