3 Signalling in discourse: a functional analysis of a common discourse pattern in written and spoken English

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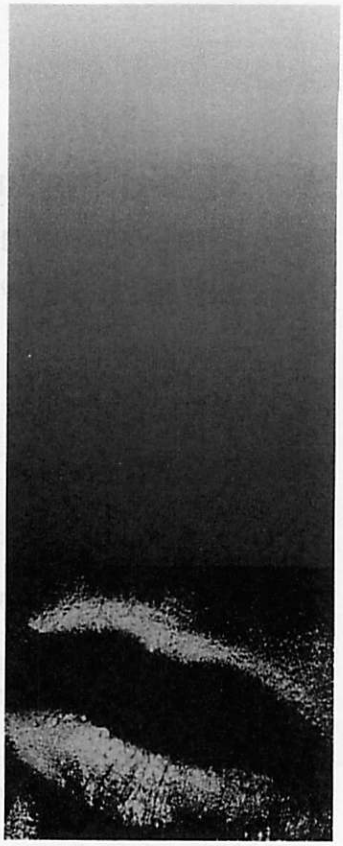
THE PURPOSE OF THE CHAPTER

This chapter is a much reduced version of a monograph first published in 1979. Although I find myself in the fortunate position of not disagreeing with what I said all those years ago, there was inevitably much in the original monograph that has little relevance to the present day. Rather than engage in substantial rewriting, I have largely confined my revising role to cutting what is no longer of interest and have altered the wording in only minor ways. With the solitary exception of an additional reference to a book by Michael Jordan, I have made no attempt to update the bibliography, though I have removed most of the referencing that the monograph contained. If a survey of the relevant literature of the period is desired, the reader is invited to consult the original monograph. I hope, though, that those readers familiar with the monograph will feel that I have retained the essence of what it had to offer and that the much larger body of readers who have never read or heard of it will feel that it was worth the archaeological effort to bring it to light again after all these years. The original monograph was dedicated to Eugene Winter. Articles are not normally dedicated to anyone but my debt to Eugene Winter will be apparent throughout.

The chapter attempts to examine the way in which monologue structures are efficiently signalled to listeners or readers. It concentrates specifically on the way in which a particular English discourse structure – the Problem–Solution structure – is signalled by the means of questions and vocabulary items of a particular type. The chapter does not, however, pretend to present a complete explanation of the complexities of monologues nor of their signalling systems; it should be taken rather as a first exploration which exposes as many questions as it answers.

PREVIOUS WORK ON THE PROBLEM–SOLUTION STRUCTURE

The structure for which I shall attempt to demonstrate the signalling mechanisms is one that has been sporadically identified as important for over forty years, and is commonly referred to as the **Problem–Solution** structure.



ADVANCES IN WRITTEN TEXT ANALYSIS

Edited by Malcolm Coulthard

ROUTLEDGE

Although Beardsley (1950) appears to have been the first to identify the structure, its recognition by linguists seems to date from the late 1960s. In Young, Becker and Pike (1970), following work by Becker (1965) and Young and Becker (1965), the structure is offered as a 'generalised plot' common in discourse and worthy of heuristic use. Labov (1972) and Longacre (1974, 1976) identify structures for narrative that may not be the same as the Problem–Solution structure but are clearly related. Van Dijk (1977) notes the existence for narrative of the structure Setting–Complication–Resolution–Evaluation–Moral, and for scientific discourse of the structure Introduction–Problem–Solution–Conclusion, noting that 'it is the task of a general theory of discourse to classify and define such categories, rules and their specific textual functions' (p.155).

Grimes (1975) also recognizes the Problem–Solution structure. He comments (p. 211) 'Both the plots of fairy tales and the writings of scientists are built on a response pattern. The first part gives a problem and the second its solution. The solution has to be a solution to the problem that was stated, not some other; and the problem is stated only to be solved.' He adds: 'How to express this interlocking seems to be beyond us . . . but that is the shape of the relation.'

Although they are aware of its existence, none of these linguists discusses the Problem–Solution structure in any detail. A more crucial role and a fuller description are, however, assigned to it in two papers by Hutchins (1977a, b) which discuss the structure as it applies to scientific texts and relate it to other posited structures. Hutchins' description is more delicate than that of Longacre, Van Dijk or Grimes, but still leaves some important questions unanswered. Perhaps the most crucial of these is the one alluded to earlier: how are the structure and its component parts identified by the reader/listener? In other words, is the Problem–Solution structure reflected in the language used, or can its existence only be intuited?

In 1969, in a mimeographed but otherwise unpublished paper, Winter attempted to provide a partial answer to the above problem by using a question technique. In 1976, in a similarly mimeographed paper, he further developed this and other techniques for revealing the Problem–Solution structure. His only published reference to the structure has been in *Instructional Science* (1977a), and that was only a passing reference. Nevertheless, all of what follows builds on his work. Both his notion of the structure and the names he gave to the elements of that structure are essentially those used here. My part has been to bring together the various threads in such a way as to systematize them and thus provide a clearer picture of how the structure is signalled to the reader/listener.

A MINIMUM STRUCTURE

We begin by looking at a brief artificial discourse originally invented by Eugene Winter for teaching purposes.

If we take the four separate sentences listed as example 1, we find that one sequence seems more natural than any other, namely:

1 I was on sentry duty. I saw the enemy approaching. I opened fire. I beat off the enemy attack.

There are twenty-four possible sequences, but this is the only one that can be read without special intonation and make perfect sense. Others, however, need not be nonsense. If read with a parenthetical intonation on the second sentence, sequence 2 (among others) also makes good sense:

2 I saw the enemy approaching. (I was on sentry duty.) I opened fire. I beat off the enemy attack.

Other sequences seem never to be acceptable, for example:

3 I opened fire. I was on sentry duty. I beat off the enemy attack. I saw the enemy approaching.

The fact that out of twenty-four possible sequences only one is acceptable without special intonation and with equal emphasis on all sentences, very few are acceptable even *with* special intonation and most are never acceptable, leads us to suggest that we can divide sentence sequences into three categories – unmarked sequences, marked sequences and incoherent sequences, matching closely the notions of unmarked, marked and ungrammatical when applied to sentences.

The unmarked sequence is the one in normal time sequence, and this is sufficient to explain the preferability of version 1 over the others. But it is not just the sequence of the sentences that is important, it is also their presence. None of the four sentences can be omitted (unless certain information is presupposed) without threatening the text's clarity or completeness. What this suggests is that each of the four sentences is essential to the structure. Were time sequence the only factor to consider, the first three sentences of sequence 1 would form a complete text. Since they do not, we must assume that each sentence in the sequence has its place in an overall structure. That structure we can tentatively identify as the Problem–Solution structure, with the following elements

Situation	I was on sentry duty.
Problem	I saw the enemy approaching.
Response	I opened fire.
Evaluation	I beat off the enemy attack.

The question then arises: how does the reader/listener identify this structure in the discourse? We shall consider two possible answers to this question, which can be briefly indicated as (a) projection into dialogue, and (b) the identification of lexical signals.

PROJECTION INTO DIALOGUE

A monologue, written or spoken, may be regarded as a dialogue in which the reader/listener's questions or comments have not been explicitly included but which retains clear indications of the assumed replies of the reader.

Winter (1974) shows how the use of questions helps to explain the relations that hold between a sentence and its context. The same idea is pursued, though in less detail, in Winter (1977a), where he discusses questions as the most marked form of connection between sentences. It is, however, in an unpublished paper by Winter, mimeographed by the Hatfield Polytechnic in 1976, that he has most fully pursued the use of the question technique at a level greater than the immediate context of the sentence. In this paper he draws attention to the characteristic questions answered by scientific texts, basing his prescriptive advice on the detailed study of large numbers of short scientific/technical reports. These characteristic questions are discussed in modified form below.

The projection of monologue into dialogue must be done with the greatest caution. To begin with, we must introduce into the interviewer's 'speech' as little extraneous material as is compatible with explaining the sentences in the monologue. Second, for every sentence a number of questions may be provided that are capable of eliciting it. Let us look, for example, at the final sentence, in the following extract from an Eden Vale advertisement:

4 Sometimes we don't do a thing to Cottage Cheese, down at Eden Vale. We simply leave it plain. At other times, though, we do add things to it. Like pineapple, chives or onion and peppers.

But plain or fancy, the cheese itself is still stirred carefully, by hand, until it reaches exactly the right consistency.

A number of questions are capable of eliciting the last sentence in this context (ignoring the conjunction *but*). Among them are:

How are the Eden Vale Cheeses prepared?
How much care is taken in the preparation of Eden Vale Cheeses?
What feature do all Eden Vale Cheeses share?

The fact that more than one question may elicit the same answer does not reflect a weakness in the dialogue-projection technique but reflects instead the considerable complexity of monologue. We need to select the form of the question that is most revealing or manifests most clearly a common pattern. The three questions given above, for example, all recur in innumerable other contexts in the more general forms:

How is/was x done/made?
How well is/was x done/made? (= evaluation of action)
What features do/did A and B share, whatever their differences?

The tense and modality of the verb forms used in the questions vary according to the context in which the discourse is being produced and according to the type of discourse produced. So, for example, a procedural discourse (e.g. a series of instructions on how to rustproof your car) might include the answer to the question *How might x be done?* or an interview might include the question *How will x be done?*

Our four-sentence artificial text can now be projected into dialogue. As a consequence of selecting an artificial example, the last sentence involves the conflation of two questions, both of which are given below:

5 A: What was the situation?
B: I was on sentry duty.
A: What was the problem?
B: I saw the enemy approaching.
A: What was your solution?
B: I opened fire.
A: What was the result?
and
How successful was this?
B: I beat off the enemy attack.

The questions used here need some refinement. *What was the problem?* is a reasonably natural form of the more precise question *What aspect of the situation required a response?* As we shall see, there are other good reasons for defining *problem* as *an aspect of situation requiring a response*; these will become apparent below.

The question *What was the solution?* also requires qualification. As it stands, it is the natural form of the much less likely question *What was your response* (to the aspect of the situation requiring a response)? Although it is convenient most of the time to talk about Problem–Solution structures, it is important to notice that the word *solution* contains within it an evaluation of a particular response as successful. Since we shall want to be able to account for texts which describe unsuccessful responses, it is worth keeping the more artificial question as our more precise test of the existence of that part of the 'Problem–Solution' structure.

The final pair of questions in our dialogue version of the 'sentry' text also require discussion. We have seen, of course, that one sentence may answer more than one question. What we must now note is that these questions need not suggest exactly the same communicative function for the sentence that answers them. For example, in our artificial text, the first question, *What was the result?*, can be answered by a statement of non-evaluated detail, for example:

6 A: What was the result?
B: The result was that two hundred men died;

which is relatively neutral as to the speaker's attitude. The second question can be answered by a statement of evaluation, for example:

7 A: How successful was this?
B: This proved a successful move;

which is relatively unspecific and evaluative.

It is doubtful, moreover, whether the questions and answers can be satisfactorily exchanged. Even allowing for the fact that we are playing with artificial examples, 8 and 9 seem highly contrived.

8 A: What was the result?
B: It proved a successful move.

9 A: How successful was this?
B: The result was that 200 men died.

It is reasonable therefore to assume that the fourth sentence of our artificial text serves two functions, one, that of *result*, the other, that of *evaluation*, which can be fused but need not be. More strictly, we might argue that the fourth sentence has *result* as a primary function and *evaluation* only as a secondary function. The reason for this analysis is that it answers the question *What is the result?* directly:

10 A: What was the result?
B: (The result was that) I beat off the enemy attack.

It does not, however, answer the question *How successful was this?* quite so directly:

11 A: How successful was this?
B: It was very successful.
A: What is your basis for saying so?
B: I beat off the enemy attack.

Our final structure for our minimum text is then as follows:

Situation[1] . . . Problem . . . Response . . . (Result/Evaluation).[2]

The coherence of this structure is better shown if the fuller labels are used:

Situation
Aspect of Situation requiring a Response
Response to Aspect of Situation requiring a Response
Result of Response to Aspect of Situation requiring a Response
Evaluation of Result of Response to Aspect of Situation requiring a Response

This looks neat; the truth is slightly less so. To begin with, *Evaluation* may and often does precede *Result*. So we might have had:

12 I was on sentry duty. I saw the enemy approaching. I opened fire. This did the trick. I beat off the enemy attack.

In this order, the last sentence serves as the *basis* for the *evaluation* at the clause relational level. The structure would then be *Situation–Problem–Response–Evaluation* with the last two sentences supplying the *Evaluation*.

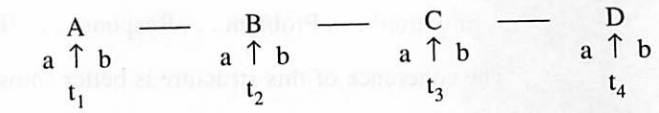
LEVELS OF DETAIL

This leads us to an important modification to our case as stated so far. For the sake of simplicity of presentation, an artificial text has been used with a one-to-one correspondence between sentence and structural element. No such correspondence exists in real texts; if it did, no text would be longer than a handful of sentences. So we could have, for example,

13 A: What was the situation?
B: It was six o'clock in the evening. I was on sentry duty.
A: What was the aspect of the situation that required a response?
B: I saw the enemy approaching. There were five hundred of them in all.
A: What was your response?
B: I sent a message for reinforcements. At the same time I opened fire with a machine-gun.
A: How successful was this? *and*
What was the result?
B: At first they kept on coming. In the end, however, I beat off the enemy attack.

where each of the structural elements is taken up by two sentences. It should be noticed that in this expanded version of the artificial text, the new sentences answer typical questions such as *What else did you do?* and *How many?*; these do not alter the structure of the text but ask that additional detail be supplied.

A diagrammatic representation of the structure of our text now looks like this:



where the upper-case letters ABCD represent the sentences' functions in the overall structure, the lower-case letters a and b represent the sentences' relations with their neighbours and the lower-case letters t_1, t_2, t_3, t_4, represent chronological sequence.[3] It should be noted that this diagram merely represents levels of detail of analysis; it does not carry the implication that each level is a different 'rank' from the one above and below it in Halliday's sense (1961), though it does carry the implication that structural links only occur at one level at a time. It should also be noted that the diagram carries with it the

possibility of recursiveness, so it is possible to have one complete structure inside an element of another complete structure.

PROBLEM–SOLUTION: LANGUAGE OR LIFE

The projection of monologue into question-and-answer dialogue form is an important test of the structure of a discourse. Examples of its operation on real discourses will be given shortly. But it might be argued that the possibility of such projection is the consequence of describing not the language but the reality which the language encodes.

Consider the following extract from an advertisement for cold wax strips:

14 The other day my teenage daughter asked me about hair removal for the first time. Apparently, her new boyfriend has passed a comment about her legs being hairy, and she wanted to do something about it before a party on Friday night.
(from 'Carol Francis Talks about Unwanted Hair Removal', an advertisement current in the 1980s)

You do not have to accept the writer's claim that hairy legs are a problem to recognize that the writer is reporting them as a problem; indeed many readers would claim that the writer is wrong in identifying hair as the problem and would suggest that the real problem was the boyfriend's attitude. In other words, a linguistic 'problem' need not be seen as a real-world problem by the reader, nor need the reader accept a linguistic 'solution' as a real-world solution. How then does the reader identify the writer's problem and solution? Presumably it is because they have been presented as such in the language itself. It is no counterargument to point out that they are presumably realities to the writer; the writer's realities in this case and in most others are only accessible through the language he or she uses. Put simply, it is normally the structure that tells us of the reality, not the reality that helps us create the structure. In the next few sections, we shall look at several aspects of signalling in a discourse of a Problem–Solution structure.

VOCABULARY 3

In a detailed study of the metalanguage of English, Winter (1977a) shows that relationships between clauses can be signalled in one of three ways: by subordination, which he terms Vocabulary 1; by sentence connectors, which include conjuncts, and which he terms Vocabulary 2; and by lexical items, which he terms Vocabulary 3. He notes that items from all three vocabularies can frequently be used to paraphrase each other. So for example *by -ing*, *thus* and *instrumental* may all be used to indicate the logical sequence relation of instrument:

15 *By* appeal*ing* to scientists and technologists to support his party, Mr Wilson won many middle-class votes in the election.
16 Mr Wilson appealed to scientists and technologists to support his party. He *thus* won many middle-class votes in the election.
17 Mr Wilson's appeals to scientists and technologists to support his party were *instrumental* in winning many middle-class votes in the election.

(all three examples from Winter 1977a)

He points out that the differences between these possibilities lie not in the relations they represent but in the contexts in which they would most naturally appear. Since Vocabularies 1 and 2 are closed-system, their Vocabulary 3 paraphrases must, he suggests, share some of their closed-system features. He goes on to show how these closed-system Vocabulary 3 items with the grammatical appearance of open-system lexis operate and how they may be identified.

The notion of Vocabulary 3 is crucial to our understanding of how a discourse signals to its reader/listener what structure it has. Although Winter's main concern is to show the operation of lexical signalling at the level of the paragraph or below, he makes mention of its operation at a larger level.

> I have included the following five items which represent a larger clause-relation in English. My reason for doing so is that these relations may sometimes exist as clause relations within the unit of the *paragraph*. The items are *situation*, *problem*, *solution*, *observation*, and *evaluation*.
>
> (Winter 1977a:19)

It is this extension of the notion of Vocabulary 3 to cover whole discourses which enables us to demonstrate the ways in which discourses signal their structure.

LEXICAL SIGNALLING AND THE 'SENTRY DUTY' DISCOURSE

We can now see that one of the features that contributes to the unreality of our 'sentry duty' example as a discourse is the total absence of any lexical signalling.

A more natural telling of the same story might have been the following:

18 I was on sentry duty. I saw the enemy approaching. To prevent them coming closer, I opened fire. This way I beat off the enemy attack.

In this version the purpose clause in the third sentence is a two-way signal. It indicates that what follows is Response and that what precedes it is Problem; this is achieved by the item *prevent* and grammar of purpose, *to x*. *This way* is also a two-way signal, indicating that what follows it is Result and what precedes it is Response. Thus Response is signalled twice in this version before we begin to use the question tests.

THE EVALUATIVE NATURE OF LEXICAL SIGNALLING

There is one more point that needs to be made about lexical signalling before we move on to the examination of a complete real text. Vocabulary 3 signalling is essentially evaluative, whether in signalling sentences, clauses or phrases, though not at the level of the overall structure. So:

19 A: I saw the enemy approaching.
B: How did you evaluate this?
or
What did you feel about this?
A: It (This) was a problem.

If we accept this, it follows that our structures and relations themselves are also evaluative, for example:

20 A: I opened fire. I beat off the enemy attack.
B: What is your evaluation of these two facts?
A: I feel they are related in a solution-result way (or, on a different level, an instrument-achievement way).

This would mean that a fuller representation of the Problem–Solution structure would be as follows:

Situation	——	Evaluation of Situation
Situation	——	Evaluation of Situation as *Problem*
Situation	——	Evaluation of Situation as *Response* or *Solution*
Evaluation		

The italicized elements represent the structural elements of the text.

It follows from the essentially evaluative nature of the discourse structure that its parts can be signalled by purely evaluative means. So, for instance, in the following extract the Problem is signalled initially by the negative evaluation *poor*:

21 If thyristors are used to control the motor of an electric car, the vehicle moves smoothly but with *poor* efficiency at low speeds.
(from Technology Review, *New Scientist*, 1970)

THE SIGNALLING OF THE PROBLEM–SOLUTION STRUCTURE IN REAL DISCOURSES

We are now in a position to examine how the discourse structure we have been describing operates in a complete discourse. The discourse we have chosen is drawn from the Technology Review, in the *New Scientist*; each sentence is numbered for convenience of reference.

22 Balloons and Air Cushion the Fall

(1)(a) Helicopters are very convenient for dropping freight by parachute (b) but this system has its problems. (2) Somehow the landing impact has to be cushioned to give a soft landing. (3) The movement to be absorbed depends on the weight and the speed at which the charge falls. (4) Unfortunately most normal spring systems bounce the load as it lands, sometimes turning it over.

(5) (a) To avoid this, Bertin, developer of the aerotrain, has come up with an air-cushion system (b) which assures a safe and soft landing. (6) It comprises a platform on which the freight is loaded with, underneath, a series of 'balloons' supported by air cushions. (7) These are fed from compressed air cylinders equipped with an altimeter valve which opens when the load is just over six feet from the ground. (8) The platform then becomes a hovercraft, with the balloons reducing the deceleration as it touches down.

(9) Trials have been carried out with freight-dropping at rates of from 19 feet to 42 feet per second in winds of 49 feet per second. (10) The charge weighed about one and a half tons, but the system can handle up to eight tons. (11) At low altitudes freight can be dropped without a parachute.

(from Technology Review, *New Scientist*, 1970)

This text has the following basic structure:

The first half of sentence (1) (1a)	Situation
Sentences (1b)–(4)	Problem
Sentences (5)–(8) (excluding 5b)	Response
Sentences (5b) and (9)–(11)	Evaluation

The following sections seek to provide an account of the signalling of this structure (and in so doing a justification for identifying such a structure).

SITUATION AND EVALUATION

Example 22 begins with a very short Situation clause which is couched in evaluative terms. By this we mean that the first half of sentence (1) (1a) is an example of the possibility described on page 35, namely, Situation–Evaluation of Situation. This can be shown if it is paraphrased into two separate sentences thus:

23 Helicopters are used for dropping freight by parachute. They are very convenient for this.

where the first sentence is Situation and the second is Evaluation of Situation. It is not uncommon to have an evaluative element within a Situation. Another example of a Situation with such an element was 21, repeated for convenience below:

24 If thyristors are used to control the motor car, the vehicle moves smoothly

where *smoothly* evaluates positively the control of the motor car, in preparation for the negative evaluation to follow – *but with poor efficiency at low speeds*. As we shall see, much the same contrast of 'good' and 'bad' evaluations is present in our main text. The function of a 'good' evaluative element within the Situation is to put the Problem – which is a 'bad' aspect of the Situation – into the larger context of 'good' aspects of the Situation. (Else why 'solve' the Problem at all?[4])

THE SIGNALLING OF SITUATION IN THE SAMPLE DISCOURSE

The function of (1a) can be identified as Situation in the following ways.

(a) *Verb tense*: One reason for treating sentence (1a) as Situation is that the verb is in the simple non-past form. Context by its nature does not normally involve a moment in time, unless it is a summary of events or a recapitulation. We would *a priori* expect therefore that the verb form for Situation would be one that indicated a period of time rather than a point in time. When the Situation is part of either a narrative or is itself a recapitulation of past events, the verbs are, however, normally of the simple past type.

(b) *Lexical signalling*:[5] A second reason for identifying sentence (1a) as situation is that sentence (1b) (i.e. *but this system has its problems*) contains an anaphoric reference to (1a) in the phrase *this system*. *System* is an item which can be used to signal either Situation or Response, and in this case retrospectively indicates that sentence (1a) is to be regarded as Situational.

(c) *Position*: The position of (1a) is that of first clause in the discourse. The expectation of the first sentence of any discourse is that it will provide a context for subsequent sentences. It is, of course, quite possible to thwart this expectation, and position by itself cannot be allowed to carry too much weight.

THE SIGNALLING OF PROBLEM IN THE SAMPLE DISCOURSE

Sentences (1b)–(4) can be identified as constituting the *problem*. A number of features signal this as their function; most of these are sufficient by themselves to serve as an adequate indication of the three sentences' function within the discourse. All are instances of lexical signalling.

(a) *'but this system has its problems'*: The first and perhaps the most obvious signal of Problem is the signalling clause *but this system has its problems*. As a general statement, such a clause will normally be followed by particulars. In the absence of any evidence for a contrary reading, therefore, sentences (2)–(4) will be read as providing the particulars to the general statement about the existence of Problems.

Sometimes the signalling item Problem precedes even the Situation. In the following example, the item Problem requires further specification.

25 I doubt that many of the readers suffer from my problem. I am expecting our second baby but unlike most women who go off things like tea and coffee, I have completely gone off wine!
(from the letter column of *The Winemaker* February 1975)

(b) *Need*: A second signal of Problem in our main text is the verb phrase *has to* in sentence (2). This indicates a need. Indeed it is possible to paraphrase the sentence using *need to* in place of *have to*, viz.:

26 Somehow the landing impact needs to be cushioned to give a soft landing.

One definition of *need* might be *an aspect of situation requiring a response*, which we used as our alternative formulation of Problem on page 30.

(c) *'Somehow'*: A third signal of Problem in our main discourse is the use of *somehow* in sentence (2). The use of the indefinite adjunct of instrument *somehow* indicates that we have an unfulfilled Instrument–Purpose relationship. This can be shown by the following informal dialogue:

27 A: The landing impact has to be cushioned to give a soft landing.
B: How?
A: Somehow.
B: Yes, but how?

Somehow is the signal of a needed and missing Response. It should be noted that even if no mention were made of Problems in the signalling clause, the missing instrument would still be sufficient to signal Problem:

28 Helicopters are very convenient for dropping freight by parachute, but somehow the landing impact has to be cushioned to give a soft landing.

The *but* left over from the signalling clause has a part to play in this; it indicates that the following clause (formerly sentence (3)) contains material that is incompatible with the positive evaluation of sentence (1a).

(d) *Negative evaluation*: In sentence (4), the item *unfortunately* indicates a negative evaluation in contrast to the positive one of sentence (1a). As a disjunct, however, it does not convert the whole sentence into an Evaluation, but remains a comment on the information carried in the clause to which it is attached. It can be paraphrased thus:

29 Most normal spring systems bounce the load as it lands, sometimes turning it over. This is unfortunate.

When an aspect of Situation is negatively evaluated, it is likely to involve the identification of *an aspect of situation requiring a response* especially in the context of a signalling clause such as (1b). Even without the signalling clause, though, we would still have an acceptable Situation–Problem pair:

30 Helicopters are very convenient for dropping freight by parachute. Unfortunately most normal spring systems bounce the load as it lands.

Another instance of the use of *unfortunately* to signal Problem is the following:

31 *Unfortunately*, it's only too human for a messenger (or a manager, come to that) to stop and chat about football. (Or simply to wait till enough paperwork has piled up before he thinks it's worth doing his rounds.)
(from an advertisement for D. D. Lamson current in 1978)

As was remarked on page 35, negative evaluation is a common signal of Problem.

(e) *'Avoid'*: In sentence (5), the signalling clause *to avoid this* refers anaphorically to sentence (4) and retrospectively categorizes it as 'something to avoid'. *Avoid* is an item that may serve as a two-armed signpost, pointing to both Problem and Response, where what is to be avoided is categorized as Problem and what is to be adopted as the means of avoidance is categorized as Response. Another example of *avoid* being used in this way is:

32 Plaque is a sticky film that clings to teeth, causing decay and the unhealthy gum condition that dentists call gingivitis. To *avoid* this condition, use Inter-Dens Gum Massage Sticks regularly.
(from an advertisement for Inter-Dens Gum Massage Sticks current in 1978)

Other items that function similarly to *avoid* are *prevent* and *stop*, for instance:

33 What is required is something that can be brought into action very quickly to *prevent* flooding . . .
(from *New Scientist*, Note on the News, August 1967)

34 I have a small rug which is on a polished wood floor. It slides dangerously every time anyone steps on it, and I'm afraid someone will slip and hurt themselves. Can you tell me how to *stop* the rug from sliding?
(from *Living*, 'The Oracle', July 1978)

THE SIGNALLING OF SOLUTION (OR RESPONSE)

Sentences (5)–(8) comprise our next main functional element within the text, that of Solution (or Response). Some of the reasons for regarding these sentences as Solution also serve to provide further evidence for treating sentences (2)–(4) as Problem; that they are handled here rather than above should not be allowed to obscure that fact. We exclude from our analysis at this stage the subordinate clause in sentence (5); the reasons for this will become apparent shortly.

The main features that identify sentences (5)–(8) as Response are as follows:

(a) *Lexical signalling*: The phrase *to avoid this* explicitly signals the Response to a Problem, as has already been noted. The phrasal verb *come up with* is a Vocabulary 3 item signalling a Response to a Problem (normally), though perhaps more frequent in journalism than in technical writing. It is commonly used in phrases such as *come up with a solution*, *come up with an answer* and *come up with an idea*. A more common lexical item for signalling Solution (or Response) is *develop*. Examples of the use of *develop* in a similar context to that of *come up with* in our chosen discourse are as follows:

35 This is why the Vichy laboratories *have developed* Equalia.
(from an advertisement for *Equalia* current in 1978)

36 The North Holland Provincial Water Authority *has developed* an ingenious solution, in the form of an inflatable dam made of steel sheets and rubber-nylon fabric.
(from the *New Scientist*, Notes on the News, August 1967)

(b) *Verb form*: The change of verb form that occurs in sentence (5) indicates the beginning of a new functional unit. The verb of sentence (5) is the form traditionally known as the present perfect, that is, *have -ed*. This verb form is used to describe happenings that either began or took place wholly in the past but that continue or have consequences of interest in the present. As such it is the natural tense for the description of Response since responses normally occur at a definable time in the past and by their nature have consequences for the present. Once, however, the general nature of the response has been described, the verb form reverts to the simple non-past since the method of response continues to be valid over a period of time extended beyond the present. This is totally compatible with the Responses being regarded as providing New Situation.[6] In scientific reportage the pattern of *have -ed* followed by simple non-past is a very common one for Response.

Further examples can be found in 35 and 36 just quoted, where *develop* combines with the *have -ed* form.

THE SIGNALLING OF EVALUATION IN THE SAMPLE DISCOURSE

In the above analysis we omitted the subordinate clause in sentence (5). This is because its function is that of Evaluation. The lexical item *assures* is used to express Evaluation; assurance can never be a matter of fact, only of assessment.[7] The evaluative clause appears where it does because it serves to provide an incentive to read on. By evaluating Bertin's solution as successful, the writer encourages the reader to find out more about it. This is quite common in popular scientific texts, particularly those reporting someone else's work. Winter (1976) refers to it as the previewing function.

Another example of a Solution being immediately evaluated is:

37 The North Holland Provincial Authority has developed an *ingenious* solution . . .

The evaluation need not be positive, in which case the Solution is better termed a Response, for example:

38 So he went all over the world looking for one. But every time there was *something the matter.*
(from Hans Andersen's *The Princess on the Pea*, trans. by Reginald Spink (1960) Everyman Library, J M Dent)

As we have already seen, a negative evaluation may signal a Problem. In such circumstances a recursive structure may occur where the Evaluation of Response is New Problem, thus:

	Situation			
	Problem			
	Response			
(negative)	Evaluation =	Problem		
		Response		
	(negative)	Evaluation =	Problem	
			etc.	

The beginning of the Hans Andersen story just quoted manifests in a simple form such a recursive structure.

Sentences (9)–(11) of our *New Scientist* text combine with the evaluative clause in sentence (5) to form the Evaluation of the discourse. Sentences (9) and (10a) are not in themselves evaluative but provide the Basis for the evaluative clause in sentence (5). What this means is that we have a clause relation at paragraph level which we can term Evaluation Basis, which in turn comprises (part of) the evaluation at discourse level:

Situation – Problem – Response – Evaluation

Evaluation Basis[8]

The most important evidence for such an analysis comes from the question test. Nevertheless two features are present which help to signal the functions of sentences (9) and (10a).

(1) There is a change in verb form from simple non-past in sentences (6), (7) and (8) to present perfect in sentence (9) and simple past in sentence (10a). As has elsewhere been remarked, a change of verb form is frequently a signal of structural change.
(2) The term *trials* is one of a set also including *test* and *experiment* used to indicate Basis for Evaluation. These are frequently collocated with the verb *carry out.*

Sentences (10b) and (11) are also part of the Evaluation, but unlike sentences

(9) and (10a), they are evaluative in themselves. This is in part signalled by:

(a) the change of tense to simple non-past;
(b) the use of *can*. *Can* is an evaluative item used to assess possibilities. *Can he do it?* asks for an evaluation of a man's capability, and the reply *Yes, he can* is taken as such.

THE USE OF THE DIALOGUE TEST

In the previous five sections we have described the signalling system of the discourse under discussion. In this section, we briefly demonstrate the applicability of the question test outlined on pages 29–31. There are two reasons for such an order of presentation. First, in one sense the signalling system is prior to and more important than the implicit question–answer system of the discourse in that the signals are already there as a physical part of the discourse, whereas questions involve the introduction into the discourse of what is not explicit. Second, since the question test does involve the introduction into the discourse of artificially regulated signals, it is necessary at times for the signals already present in the discourse to be removed if a superfluity of signals is not to result. The discourse can be projected into dialogue form as follows:

39 A: What is the situation (for which helicopters are suited)?
B: Helicopters are very convenient for dropping freight by parachute.
A: What aspect of this situation requires a response?
or
What is the problem?
B: Somehow the landing impact has to be cushioned to give a soft landing. The movement to be absorbed depends on the weight and the speed at which the charge falls. Unfortunately, most normal spring systems bounce the load as it lands, sometimes turning it over.
A: What response has there been?
or
What solution has been proposed?
or
Who has proposed a solution?[9]
B: Bertin, developer of the aerotrain, has come up with an air-cushion system.
A: How successful is it?
B: It assures a safe and soft landing.
A: What are the details of this solution?
B: It comprises a platform on which the freight is loaded with, underneath, a series of 'balloons' supported by air cushions. These are fed from compressed air cylinders equipped with an altimeter valve which opens when the load is just over six feet from the ground. The platform

then becomes a hovercraft, with the balloons reducing the deceleration as it touches down.

A: What evidence have you for saying it is successful?

B: Trials have been carried out with freight dropping rates of from 19 feet to 42 feet per second in winds of 49 feet per second. The charge weighed about one and a half tons.

A: What is it capable of?

B: The system can handle up to eight tons. At low altitudes freight can be dropped without a parachute.

POINTS OF INTEREST

Several points of interest arise out of the analysis of this text. First, it will be noticed that there is a crude approximation between the functional units Situation, Problem, Solution (Response) and Evaluation and the orthographic unit of the paragraph. Similar (and closer) approximations can be found in many other texts.

Second, it is also worthy of note that a reasonable skeleton summary of the text can be achieved by the simple expedient of taking the first full sentence of each functional unit, as long as we (1) exclude the signalling clauses *but this system has its problems* and *to avoid this*, and (2) either exclude the evaluative element of sentence (1a) or include the conjunction *but* that follows it. This gives us 40 and 41:[10]

40 Helicopters are used for dropping freight by parachute. Somehow the landing impact has to be cushioned to give a soft landing. Bertin, developer of the aerotrain, has come up with an air-cushion system which assures a safe and soft landing. Trials have been carried out with freight-dropping at rates from 19 feet to 42 feet per second in winds of 49 feet per second.

41 Helicopters are very convenient for dropping freight by parachute but somehow the landing impact has to be cushioned to give a soft landing. Bertin, developer of the aerotrain, has come up with an air-cushion system which assures a safe and soft landing. Trials have been carried out with freight-dropping at rates of from 19 feet to 42 feet per second in winds of 49 feet per second.

DISCUSSION AND CONCLUSIONS

The following claims have been made in this chapter:

(1) There are three types of sentence sequence: unmarked, marked and incoherent.

(2) Each sentence in a complete text has a function in the structure as a whole either in itself or as part of a larger unit, and not just in relation to the preceding sentence.

(3) All structural functions can be defined only in terms of each other and the whole.
(4) Normally each structural function is overtly signalled linguistically.
(5) Some clauses and sentences have as their main function the clarification of the structure of the discourse to which they belong.
(6) Each structural function can be isolated by means of the projection of the discourse into question–answer dialogue or by the insertion of appropriate lexical signals.
(7) One common discourse structure in English (though not the only one) is that of Situation–Problem–Solution (or Response)–Result–Evaluation.

The discourse structure outlined in this chapter is not confined to the types of discourse illustrated. It can be applied effectively, for example, to discourses as disparate as fairytales (see Grimes 1975) and interviews. The signalling system, however, varies in detail somewhat from discourse type to discourse type, though not in underlying nature.

In general terms, what this chapter has attempted to do has been to show how the English language indicates to the reader/listener the functions of a particular discourse's constituent sentences. Lack of space has prevented the examination of discourses whose use of the language's signalling facilities is 'faulty'. Nevertheless such discourses do exist and problems of comprehension can be shown to arise from 'faulty' or missing signalling. If this is accepted, important practical consequences can be glimpsed for the field of rhetoric. In particular, the thorny question of how to improve the communicative skills of student scientists and technologists might in part be answered by demonstrating to them not only the typical Problem–Solution structure but also the signalling system available to make clear the structure of whatever they write.

NOTES

1 As will be seen below, Situation is definable both in terms of its relationship with the other elements of the structure and in terms of its typical signals. Although it has some features in common with Setting as used by Gleason (1968) and Grimes (1975), it differs from that category in being wider (including events at times) and in being defined structurally as well as internally.
2 The parentheses indicate fusion of elements of the structure.
3 Chronological sequence underpins the whole structure. Sentences (2) and (3) can both be seen as answering the question 'What happened (next)?' Interestingly, another question that could elicit *I beat off the enemy attack* is 'How did it all end?' (I am indebted to Eugene Winter for this point.)
4 This analysis is oversimplified in fact. It is possible to analyse these sentences in terms of Problem–Solution–Evaluation. The Evaluation is of the use of helicopters (Solution) to meet the need (Problem) of dropping freight by parachute.
5 Here and elsewhere the signals discussed should in no way be considered exhaustive. Situation, for example, is often signalled by the items *occasion*, *place*, *background* and, of course, *situation*, none of which appear in the discourse under discussion. Further discussion of the signals of Problem–Solution can be found in

Hoey (1983); Jordan (1984) also contains detailed discussion of the pattern and its signalling.

6 A Response or Solution is a change in situation; when the details are given, they are often couched in situational form, reflecting their status as New Situation.

7 *Assures* is not a paraphrase of *yields* but of *makes certain*.

8 The Basis can itself be further analysed into component parts relating to the structure of the trial.

9 Each question presupposes a slightly different emphasis in the answer.

10 That is, the first sentence of the Situation, Problem, Solution and Evaluation. The first sentence of Basis is also given.