FOREWORD

The present volume contains articles about the micro and macro connectivity/coherence of texts. In compiling it, we aimed at presenting as many aspects of the problems involved and as many different methods of approaching them as possible. Even if we could not cover the whole field, we hope to have succeeded in providing an extensive and intensive analysis of a number of micro and macro aspects of connectivity/coherence.

1.

The first part of the article "Conjunction: The Logic of English text" ('Paradigmatic Relation') provides a systematic description of English connective expressions illustrated with a number of examples. These examples (about 250!) illustrating the application of the different connective expressions may be helpful and informative even for those not dealing with the English language. The second part of the article ('Syntagmatic relations') discusses the question of how it is possible to represent texts as connective nets ('reticula')

2.

The article "Functional Connectivity and the Communicative Structure of Text" is concerned with the investigation of theme-ridge structure. A presentation of the views of the representatives of the Prague School is followed on one hand by an analysis and classification of the theme-ridge structures (the thematic-progression) which can manifest themselves in sentence-chains and, on the other hand, by an analysis of how the methods of the theory of graphs can be applied to the analysis and representation of these structures.

The article "On the Status of Theme in English: Arguments from Discourse" confronts the views of the Prague School with those of the so-called systemic linguistics. The author demonstrates by analyzing a number of texts that the choice of what information is to be treated as theme is not determined by the choice of what information it to be treated as given or new. He also shows how the thematic progression correlates with the structure of the text.

The views of the Prague School also underline the article "Functional Paragraph Perspective" -- as the title already indicates implicitly. It goes beyond them by extending them to paragraphs. Investigating the information structure of paragraphs, it analyses primarily their initial and final positions. During the analyses the author tries to establish parallelsisms between her results and the results of psycholinguistic research.
FUNCTIONAL PARAGRAPH PERSPECTIVE

Rachel Giora

This study concerns the linear ordering of text constituents. Specifically, it is an investigation of how texts proceed, get segmented, and end. Of the various principles that govern text organization, we deal here with linearity or, rather, the ordering of information units in accordance with the serial positions of a text segment such as a paragraph.

We analyse the informational structure of the paragraph to account for text-segmentation, paragraph-cohesion and the functions of the various serial (final vs prefinal and initial) positions of a text segment larger than a sentence.

Our approach is functional. It is inspired by the works of the Prague functionalists, Danes (1974) and Fipras (1974) in particular, and by studies from the viewpoint of Functional Sentence Perspective in general. The analysis adopted here derives from the pragmatic notion of 'dominance' as delineated by Erteschik-Shir & Lappin (1979) but extends it to segments larger than a sentence. In addition, we take into account findings of psycholinguistic research into information processing.

Before discussing the informational structure and functions of paragraph final vs. initial positions we consider (Section 1 below) the nature of the paragraph in terms of thematic and pragmatic unity respectively.

1 The Paragraph as a Unit.

(a) Thematic Unity

It is widely agreed among linguists (Longacre 1979, Chafe 1979, Sanford & Garrod 1981) as well as those associated with text theory (Hrushovski 1974) that the boundaries of a formal segment such as a paragraph are determined by the boundaries of its semantic theme. They all seem to hold the view that there is an overlap between such formal and semantic units. Longacre (1979: 118) states explicitly that the thematic unity of a paragraph is made manifest by coreferential expressions which occur at least twice in the paragraph and constitute its alleged unity.

Following Gardel (1976), Longacre maintains that the topic or the theme of a paragraph is a paragraph-level feature which gives cohesion to a paragraph by indicating what topic is being developed in the paragraph as a whole, as can be demonstrated with reference to a paragraph such as the following:
In the Soviet Union several cases have been reported recently of people who can read and detect colours with their fingers, and even see through solid doors and walls. One case concerns an eleven-year-old schoolgirl, Vera Petrova, who has normal vision but who can also perceive things with different parts of her skin, and through solid walls. This ability was first noticed by her father. One day she came into his office and happened to put her hands on the door of a locked safe. Suddenly she asked her father why he kept so many old newspapers locked away there, and even described the way they were done up in bundles.

Vera’s curious talent was brought to the notice of a scientific institute in the town of Ulyanovsk, near where she lives, and in April she was given a series of tests by a special commission of the Ministry of Health of the Russian Federation. During these tests she was able to read a newspaper through an opaque screen and, stranger still, by moving her elbow over a child’s game of Lotto she was able to describe the figures and colours printed on it; and, in another instance, wearing stockings and slippers, to make out with her foot the outlines and colours of a picture hidden under a carpet. Other experiments showed that her knees and shoulders had a similar sensitivity. During all these tests Vera was blindfolded, and, indeed, except when blindfolded she lacked the ability to perceive things with her skin. It was also found that although she could perceive things with her fingers this ability ceased the moment her hands were wet.

Eric de Mauny Seizing Hands from The Listener (Cited in Alexander, 1967a)

Passage (1) concerns Vera’s ability to detect colours with her fingers and through solid doors. Following the first two sentences which introduced Vera’s special ability are sentences whose topics are coreferential with the paragraph topic roughly delineated above as ‘Vera’s ability to detect colours with her fingers etc. . . .’ or, alternatively, as ‘Vera Petrova, who has normal vision but who can also perceive things with different parts of her skin’ (see 1’s-8). The paragraphs in (1) above exhibit thematic unity in that the thematic participant who is referred to in the first two sentences forms part of the sentence topic of each of the subsequent sentences. Thematic unity is a surface structure feature, then. It requires that at least two sentence topics be cohesive or partly cohesive with the thematic participant introduced in paragraph initial position.

(b) Pragmatic unity

Going beyond Longacre I suggest that a paragraph be viewed as a semantic unit discussing a certain discourse-topic. The boundaries of a paragraph, as a formal segment, are determined by the boundaries of the topic which it is ‘about’. (See also Giora 1982a). Following Reinhart’s (1981: 79-80) attempt at a definition of pragmatic ‘aboutness’ in relation to sentence-topics, I take a paragraph-topic or discourse topic to be a kind of an entry under which the composer attempts some organization of propositions under an entry (in a given context set) represents the speaker’s knowledge ‘about’ that entry (in that particular context set).

Given this very rudimentary and rather intuitive notion of discourse-topic, it seems safe to maintain that ‘being about’ a certain topic does not require that the various sentences predating something about that topic be cohesive with it. The text in (2) below, for instance, may be read as a paragraph about ‘days when everything goes wrong’ (1’1). Yet this discourse-topic is never referred to in the subsequent sentences:

(2) We have all experienced days when everything goes wrong. What invariably happens is that a great number of things choose to get out of control at precisely the same moment. It is as if a single unimportant event set a chain of reaction. Let us suppose that you are preparing a meal and keeping an eye on the baby at the same time. The telephone rings and this marks the prelude to an unforeseen series of catastrophes. While you are on the phone, the baby pulls the table-cloth off the table, smashing half of your best crockery, etc. Meanwhile, the meal gets burnt. As if this were not enough to reduce you to tears, your husband arrives, unexpectedly bringing three guests to dinner ....

(Adapted from Alexander L.D. ‘Developing Skills’ p. 84)

It follows that a paragraph unit can be interpreted as predating something about a discourse-topic without that topic being referred to with any subsequent anaphora thereof. Such a paragraph retains pragmatic unity in that it revolves around a discourse-topic defined in terms of ‘aboutness’ rather than
in terms of coreference. Under such a description, the notion of pragmatic unity (viewed elsewhere as 'coherence'; see, for instance, Giora 1982a) substitutes for the notion of semantic thematic unity (generally viewed as 'cohesion'; see, for instance, Reinhart, 1980) in an attempt at an adequate account of the paragraph unit.

1.1 Two types of paragraph unit

If, as we suggest, a paragraph unit is in fact determined by the boundaries of the discourse-topic unit it is interpreted as being 'about', it follows that a text will be divided up into paragraphs according to its discourse-topics vary. A paragraph will then be cut off immediately before the presentation to the text of a new discourse-topic. This is illustrated in (3) below, where the underlined material is taken to represent the distinct discourse-topics of each paragraph and their subsequent coreferences:

(3)
The gorilla is something of a paradox in the African scene. One thinks one knows him very well. For a hundred years or more he has been killed, captured, and imprisoned in zoos. His bones have been mounted in natural history museums everywhere, and he has always exerted a strong fascination upon scientists and romantics alike. He is the stereotyped monster of the horror films and the adventure books, and an obvious (though not perhaps strictly scientific) link with our ancestral past.

Yet the fact is, we know very little about gorillas. No really satisfactory photograph has ever been taken of one in a wild state, no zoologist, however interpid, has been able to keep the animal under close and constant observation in the dark jungles in which he lives. Carl Akeley, the American naturalist, led two expeditions in the nineteen-twenties, and now lies buried among the animals he loved so well. But even he was unable to discover how long the gorilla lives, or how or why it dies, nor was he able to define the exact social pattern of the family groups, or indicate the final extent of their intelligence. All this and many other things remain almost as much a mystery as they were when the French explorer Du Chaillu first described the animal to the civilized world a century ago. The Abominable Snowman who haunts the imagination of climbers in the Himalayas is hardly more elusive.

Alan Moorehead No Room in the Ark
(Cited in Alexander, 1967a)

In (3) each paragraph discusses the discourse-topic presented at its outset. The first paragraph can be viewed as a discourse unit discussing our purported knowledge of the gorilla (*One thinks one knows him very well* 1 1-2). The second paragraph can be interpreted as being about 'our ignorance of the gorilla's real nature' (*Yet the fact is we know very little about gorillas* 1 11). Both paragraphs are interpretable as a text unit discussing 'the paradoxical nature of the gorilla' (*The gorilla is something of a paradox in the African scene* 1 11). The result is a semantic and formal unit overlap, yielding a one-to-one correspondence between a paragraph unit and a semantic unit determined by a discourse-topic.

This, however, does not seem to be the only text division. In a previous study (Giora 1982b) I described a different type of paragraph unit. Checking a number of texts of different genres, I found that paragraphs, as well as other text segments such as whole chapters, tend to introduce the next discourse-topic in the rhyme/next position of a given discourse-topic segment. Subsequently, paragraphs may get segmented not just before the next discourse-topic is introduced but immediately afterwards. Consider the following sequence taken from *The Fight* by Dylan Thomas:

(4)
I was standing at the end of the lower playground and annoying Mr. Samuels, who lived in the house just below the high railings. Mr. Samuels complained once a week that boys from the school threw apples and stones and balls through his bedroom window. He sat in a deck chair in a small square of trim garden and tried to read the newspaper. I was only a few yards from him. I was staring him out. He pretended not to notice me, but I know he knew I was standing there rudely and quietly. Every now and then he peeped at me from behind his newspaper, saw me still and serious and alone, with my eyes on his. As soon as he lost his temper I was going to go home. Already I was late for dinner. I had almost beaten him, the newspaper was trembling in his hand, he was breathing heavily, when a strange boy, whom I had not heard approach, pushed me down the bank.

I threw a stone at his face. He took off his spectacles, put them in his coat pocket, took off his coat, hung it neatly on the railings, and attacked. Turning round as we wrestled on the top of the bank, I saw that Mr. Samuels had folded his newspaper on the deck chair and was standing up to watch us. It was a mistake to turn around. The strange boy rabbit-punched me twice. Mr. Samuels hopped with excitement as I fell against the railings. I was down in the dust, hot and scratched and biting, then up and dancing, and I butted the boy in the belly and we tumbled in a heap. I saw through a closing eye that his nose was bleeding. I hit his nose. He tore at my collar and spun me round by the hair.

(Dylan Thomas, 1965: 39)
2. Paragraph-Final Position

2.1. Pragmatic vs. recall tests

I will later argue (2.2) that, all other things being equal, paragraph-final position is a parameter of dominance. I consider as dominant a constituent which is not the topic of the given discourse-segment and also - following Erteschik-Shir & Lappin (1979: 47-48) - one to whose intension the speaker intends to direct the attention of his hearer/reader. Specifically, for such a constituent to be dominant it must be a potential topic of further discussion; if it is pragmatically impossible to continue the discussion with the said constituent as topic. This means that it was not dominant in the previous segment.

Erteschik-Shir & Lappin propose a pragmatic test for dominance in the form of a predicate which assigns a truth-value to a sentence. This shows that the proposition expressed by that sentence can be taken as that which the speaker wants to pick out for his hearer for the purpose of further discussion. The applicability of such a predicate to an utterance helps identify the dominant constituent within that utterance. It provides a method for determining the possibilities of dominance within a given matrix sentence by actualizing these possibilities. The test they use, which they assign to Ross, involves the predicate 'which is a lie' as illustrated in (6) below:

(6) Bill said: John believes that Orcutt is a spy.
   a: which is a lie - he doesn't
   b: which is a lie - he isn't

(6) shows that both the matrix and its complement can be interpreted as dominant. However, this is not the case in (7):

(7) Bill said: John carefully considered the possibility that Orcutt is a spy.
   a: which is a lie - he didn't (consider it carefully)
   b: which is a lie - he isn't (a spy)

The fact that (7b) is not acceptable here shows that the complement cannot be considered dominant and thus cannot be proposed as a topic for further discussion (unless certain procedures indicating digression from a given or proposed discourse-topic are applied, as discussed in Giora, 1982a). In other words, a constituent \( g \) in utterance \( y \) is dominant iff it is not the topic of the discourse-segment in question and it has the property of being a possible topic of further discussion.

However, no tests are available for testing dominance at the level of texts longer than a sentence. Experiments of the relative prominence of message contents are all based on recall measures (with the exception of Kieras 1980, as discussed in...
Meyer 1975). For our purpose such tests are deficient in that they cannot measure the effect of paragraph-serial position in and of itself. They cannot isolate the effect of paragraph-serial position on memory from the relative effect of the semantic load of the various propositions; nor can they predict the effect of serial position on memory regardless of the narrative structure of the recalled prose segment.

Besides, there is no basis to the assumption that such tests can yield the criterion for distinguishing 'important' from 'unimportant' material in the text. Consider the serial position curve for stories presented in Appendix 1. The category best recalled is that of "Setting", although "Setting" cannot be regarded as 'important' in any of the senses assigned to this notion in the literature. It is not 'important' in the sense used by Kieras (1980) in that it cannot be considered the 'topic' or 'theme' of the passage; it is not what the composer intends to continue talking about. Nor is it 'important' in the sense used by van Dijk (1977a) in that it does not seem the "most important fact of the story" or "the fact which is a condition of facts later in the discourse".

One reason that "Setting" is relatively well recalled may be explained in terms of a Gestalt view of the process of perception, in the sense that we cannot perceive figure or foregrounded material outside of setting of background information (Reinhart 1982). Thus "Setting" is a necessary condition for text elements and ranks among the best recalled categories in terms of perceptual rather than of informational processing.

In view of the deficiencies of recall measures noted above, but primarily for lack of an appropriate measure of 'important' vs 'unimportant' material in the paragraph unit, I suggest that we change the direction of our research. Instead of asking what is the most 'important' piece of information in a given discourse, we should ascertain which information in a given discourse-segment constitutes a potential discourse-topic of the text-segment. Before we consider how this issue of thematic progression might be related to questions of 'importance', we describe experiments conducted to test the former.

2.2 Function of Paragraph Final Position - experimental approach

In order to confirm my claim that paragraph-final position is a parameter of dominance in the sense assigned to this notion in Section 2.1, I conducted experiments to test dominance within text segments larger than a sentence. Specifically, the experiments test the effect of final mention or final-paragraph position on thematic progression. They measure native speaker’s judgements as to the preferred linear sequencing of texts. The goal of these experiments was to demonstrate that speakers introduce new future discourse-topics in segment final position rather than in segment/paragraph pre-final position.

Experiment 1

Aim: to show that speakers select paragraph-final position for the purpose of introducing into the discourse new material which will subsequently serve as topic of discussion.

Method: Subjects were presented with a set of four passages (8-11) below, each of which makes up a two paragraph sequence. The passages, originally in Hebrew, were adapted from a newspaper article discussing headaches. The various propositions seem equally weighted, semantically, and they are equally distributed between the different paragraphs, to obviate the factor of difference in length. The first pair of the set, (8) and (9), are identical in every respect apart from the order of the last two sentences of the first paragraph in each. In both, the discourse-topic of the second paragraph is information 'a', but in (8) the first paragraph ends with information 'a' (immediately preceded by information 'b'), while in (9), the first paragraph ends with information 'b' (immediately preceded by information 'a'). In the second pair (10-11), the reverse order is presented. The second paragraph in each of the passages discusses information 'b' as its discourse-topic but in (11) the first paragraph ends with information 'b' and in the other one (10) it ends with information 'a'. The test is so designed as to test subjects consistency too.

Subjects: The subjects were (I) 27 high school students majoring in sociology, aged 17-18; (II) 16 college students in a special course for college entrance exams, aged 22-25; and (III) graduate students majoring in journalism, aged 25-40. The subjects were divided into two groups one of which was asked to start with the first pair (8-9) and proceed with the second (10-11). The other group was required to start with the second (10-11) and proceed with the first (8-9). They were asked about their preferences as to the more natural sequence and were told to rely on their intuitions as native speakers who know the language naturally.

Results: As shown in Table (1) below, of the first pair (8-9), 81% subjects preferred the passage in which the second paragraph discusses the information which ends the first paragraph. Of the second pair (10-11), 70% preferred the passage in which the second paragraph discusses the information occupying final position in the previous paragraph.

Experimental passages

(8) The medical significance of headaches is not easy to define. These aches may be an indication of some disease, or a meaningless reaction to daily troubles. Of all those applying for medical attention who report of headaches, some suffer from diseases whose symptom is a headache. Some suffer from headaches whose cause is migraine.
The term 'migraine' indicates a phenomenon of repeated attacks of headaches, located mostly on one side of the head, which begin at an early age and decrease in the course of time ... 

(9) The medical significance of headaches is not easy to define. These aches may be an indication of some disease, or a meaningless reaction to daily troubles. Of all those applying for medical attention who report of headaches, some suffer from headaches whose cause is migraine. Some suffer from diseases whose symptom is a headache.

The term 'migraine' indicates a phenomenon if repeated attacks of headaches, located mostly on one side of the head, which begin at an early age and decrease in the course of time ... 

(10) The medical significance of headaches is not easy to define. These aches may be an indication of some disease, or a meaningless reaction to daily troubles. Of all those applying for medical attention who report of headaches, some suffer from diseases whose symptom is a headache. Some suffer from headaches whose cause is migraine.

The diseases which may cause headaches include general illnesses, infections of the tissues inside the skull, eye disease, etc. ...

(11) The medical significance of headaches is not easy to define. These aches may be an indication of some disease, or a meaningless reaction to daily troubles. Of all those applying for medical attention who report of headaches, some suffer from headaches whose cause is migraine. Some suffer from diseases whose symptom is a headache.

The diseases which may cause headaches include general illnesses, infections of the tissues inside the skull, eye disease, etc. ...

Conclusions: The position that is preferred for newly introduced future discourse-topic is segment final. By locating information at paragraph-final position the speaker indicates to his hearer/reader the discourse-topic he has selected for further discussion.

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<thead>
<tr>
<th>Subjects</th>
<th>I (N=27)</th>
<th>II (N=16)</th>
<th>III (N=20)</th>
<th>Total</th>
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<tr>
<td>N</td>
<td>8</td>
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<td>10</td>
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<td>38</td>
<td>42</td>
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<th>Paracrine</th>
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<td>19</td>
<td>22</td>
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Table (1) Percentaging subjects' preferences by type of subjects and text organization subjects


Experiment 2

Aim: to show that speakers locate prominent material (taken here as a primitive nonlinguistic concept) in a paragraph independently of segmentation or presentation of the next discourse-topic; that is, speakers prefer a paragraph in which the relatively most prominent message occupies paragraph-final position.

Method: Subjects were presented with a set of two narrative passages - see (12, 13) below - each a one paragraph story originally written in Hebrew. Passage (12) is structured in such a way that it suspends the new and most surprising piece of information - i.e. the information that is intuitively most prominent - till the end of the story. In passage (13) this piece of information is transferred to a pre-final-paragraph position in a way that need not impair understanding, since it distorts neither logical nor narrative order.

Subjects and procedure: The subjects were (I) 28 high school students majoring in the humanities, aged 17-18, (II) 26 high school students majoring in math, aged 16-17, and (III) 20 graduate students majoring in journalism, aged 25-40. The subjects were divided into subgroups each of which started with a different passage. They were asked to indicate preferences as which was the more natural paragraph sequence, and were told to rely in their intuitions as native speakers who know the language naturally.

Experimental texts

(12) There are dark days in London when the city is swept by stale darkness ... and nobody dares leave his place ... and on just such a day a man was urgently called up to attend to his sick son in a far away hospital at the end of the city. The man opened the door and stepped outside into the dark to look for help. But there was nobody there. Suddenly, a strange hand was laid upon his shoulder, and a man whose face was hidden by the dark night said to him: I shall lead you. And indeed, the stranger led the man from one end of the city to the other, unhesitatingly. Only here and there he confidently remarked: Here to the left. Mind the steps. Watch the slope. When finally they arrived at the hospital the father asked: How can you manage in the dark? - The darkness and the fog don't bother me, said the stranger, because I am blind.

(Adapted from Amos Oz, in Hebrew).

(13) There are dark days in London when the city is swept by stale darkness ... and nobody dares leave his place and on just such a night a man was urgently called up to attend to his sick son in a far away hospital at the end of the city. The man opened the door and stepped outside into the dark to look for help. But there was nobody there. Suddenly, a strange hand was laid upon his shoulder and a man, whose face was hidden by the dark night said to him: I shall lead you. The father asked him: how can you manage in the dark. The darkness and the fog don't bother me, said the stranger, because I am blind. And indeed, the stranger led the man from one end of the city to the other, unhesitatingly. Only here and there he confidently remarked: here to the left. Mind the steps. Watch the slope, until they arrived at the hospital.

Result: As shown in Table (2) of the two passages, 78% preferred the one which ends with the most prominent message.

Conclusion: Segment-final position is preferred for relatively prominent information. (Note particularly the results of group III, where subjects are training to be newspaper editors, and are presumably more sensitive to linguistic style and organization of text).

Discussion: We have shown that paragraph-final position serves to introduce potential discourse-topics (Experiment 1), and that the preferred position for prominent material is segment-final (Experiment 2). It seems, then, that constituents which occupy paragraph-final position are dominant in accordance with the two conditions for dominance postulated in Section 2.1 above. We have seen (Experiment 2) that when a message-content is relatively more prominent, suggesting that the author intends to draw the attention of his reader to its intensity, it is located in segment-final position. We have further seen (Experiment 1) that only constituents in segment-final position are potential discourse-topics (with the exception of text-segments which go on discussing the previous discourse-topic). Note that the discourse segments marked as pragmatically inappropriate (9, 10) are those in which the discourse-topics are not the topic of the previous paragraph, nor has their material previously been presented in paragraph-final position.

The experiments thus establish a correlation between paragraph-final position and dominance, showing that the dominant position in the paragraph is its final position.

2.3 Functions of Paragraph-Final Position

A previous study (Giora 1982b) showed that a text may get segmented immediately after new future discourse-topics have been
introduced into it. It was also noted that information which is segment-final has the makings of prominent material in and of itself, outside of its paragraph serial position. Consider, for instance, the examples cited in this study, for the tendency to locate prominent or so-called 'foreground' material in segment-final position. 'Foreground' information can be characterized, inter alia, as being new (Firbas, 1975), unpredictable or highly informative (Atteave, 1954), and 'transitive' (Hopper & Thompson, 1980). 'Foreground' information in the sense, say, of Hopper (1979) or Talmy (1978) can be dominant in that it is asserted in such a way as to draw the attention of the reader to the intension of the asserted constituent, in Ereschik-Shir & Lappin's terms (1979).

Consider, for instance, the first paragraph of (4). The propositions preceding the very last clause are mostly non-foreground material. The set of verbs used are either stative (know, be, see), intransitive (stand, sit, live, complain, try, pretend, peep) or of intransitive aspect (progressive, perfect), voice (passive) or tense (habitual past tense), all being markers of non-foregrounding (see Hopper & Thompson 1980). The set of participants, too, is non-foreground, since all the NPs are definite (Mr. Samuels). The final clause, however, contains new foreground information, expressed by an indefinite NP (a strange boy), and has high 'transitivity' due to the use of a verb (push) which affects the participant highly.

Similarly, the final message content in the first paragraph of (1) is foregrounded by use of the foregrounding marker 'suddenly', and the second paragraph of (1) ends with totally new information. The first paragraph of (5) ends with the introduction of new information that is also the discourse-topic of the next text-segment. The second paragraph of (4) ends with a set of verbs that are more 'transitive' than the verbs preceding them.

In cases where new paragraphs do not pick up the most available material as their discourse-topic, this does not mean that such material, being segment-final, is not dominant. Rather its dominance is simply not actualized by further thematic progression. In such cases, the text chooses to elaborate on a different discourse-topic, for which purpose it deploys other connective techniques. See, for instance (3), where the new discourse-topic is introduced by an explicit semantic connector (yet) as described by Reinhart (1980).

In sum, dominant information is segment final and, conversely, the content of a message becomes dominant, all other things being equal, when it is positioned at the end of a text-segment. Segment-final position is found, furthermore, to correlate with foreground information. Together, this suggests that segment-final position is functional in that (i) it marks future discourse-topics, and (ii) it is the position where (potentially) dominant or prominent information is introduced (see also Shen, 1980: 34).
2.4 On the Motivation for Segmentation

Given that paragraph-final position is a dominant position (as demonstrated by experiments 1 and 2 above), presenting information at the end of a paragraph endows the latter with dominance status. Segmenting a text into paragraphs and chapters thus entails not only a decision about the boundaries of the discourse units - which vary in accordance as discourse-topics vary - but also a decision about what constitutes the dominant positions of the text.

Various texts of different character make use of segment-final position for the purpose of presenting future topics to the discourse. Their motivation is communicative: the presentation of dominant information in a dominant position.

In this view, the purported cohesive function of such prior concatenation (Krashnovski, 1976: 25) is only a by-product. Cohesion, unlike informational status, is not affected by the serial position of the connected material. Material at the beginning of a given paragraph seems to be as connected as material at the end of the paragraph once such material is selected as the topic of the following discourse segment. They differ only in as much as one is dominant due to final position and one is not. That a text chooses to get segmented after the presentation of the next discourse-topic and not before it is a choice made at the level of informational structure only.

The following are a number of texts varying in genres and historical background which provide support for our claim that segment-final position has a communicative function.

Russel (1919), for instance, presents the next chapter-topic at the end of a given chapter:

In the second place, as already observed, we want our numbers to be such as can be used for counting common objects, and this requires that our numbers should have a definite meaning, not merely that they should have certain formal properties. This definite meaning is defined by the logical theory of arithmetic. /p. 10/

CHAPTER II
Definition of Number

The question "What is a number?" is one which has been often asked, but has only been correctly answered in our own time. The answer was given by Frege in 1884, in his Grundlagen der Arithmetik. Although this book is quite short, not difficult, and of the very highest importance, it attracted almost no attention, and the definition of number which it contains remained practically unknown until it was rediscovered by the present author in 1901 /p. 11/

We have now given a definition of numbers which will serve for finite collections. It remains to be seen how it will serve for infinite collections. But first we must decide what we mean by "finite" and "infinite", which cannot be done within the limits of the present chapter. /p. 19/

CHAPTER III
Finitude and Mathematical Induction

The series of natural numbers, as we saw in Chapter I., can all be defined if we know what we mean by the three terms "o", "number", and "successor". But we may go a step farther: we can define all the natural numbers if we know what we mean by "o" and "successor". It will help us to understand the difference between finite and infinite to see how this can be done, and why the method by which it is done cannot be extended beyond the finite. We will not yet consider how "o" and "successor" are to be defined: we will for the moment assume that we know what these terms mean, and show how these and all other natural numbers can be obtained. /p. 20/

The purpose of the latter half of this chapter has been to suggest the subject which one may call "generation of serial relations". When such relations have been defined, the generation of them from other relations possesses only some of the properties required for series becomes very important, especially in the philosophy of geometry and physics. But we cannot, within the limits of the present volume, do more than make the reader aware that such a subject exists. /p. 41/

CHAPTER V
Kinds of Relations

A great part of the philosophy of mathematics is concerned with relations, and many different kinds of relations have different kinds of uses. It often happens that a property which belongs to all relations is only important as regards relations of certain sorts; in these cases the reader will not see the bearing of the proposition asserting such a property unless he has in mind the sorts of relations for which it is useful. For reasons
of this description, as well as from the intrinsic interest of the subject, it is well to have in our minds a rough list of the more mathematically servicable varieties of relations. /p. 42/

Note the way Montague (1952) introduces the next paragraph topic at the end of a given paragraph in (16) below: paragraph 3 provides evidence for the claim made at the end of the previous paragraph that women are about to emerge from the period of subjection:

(16) ... Haven't we, well-bred young women been educated for centuries in music? And how many among them have been great composers or instrumentalists? Composers - none of the first rank. Instrumentalists - well, in the recent period that have been such accomplished artists as Myra Hess and Wanda Landowska. Possibly there is a clue here to the answer to the question asked. May it not be that women are just about to emerge from the period of subjection during which they were the "niggers" of the masculine world?

3. The Royal Society of London has at last opened its doors and admitted women to the highest honor which it is in the power of the English scientific world to bestow - the Fellowship of the Royal Society. I well remember that when I was a youth, less than a quarter of a century ago - it was considered inconceivable that any woman would ever have brains enough to attain great distinction in science. Mme. Curie was an exception. But the half dozen women Fellows of the Royal Society in England are not. Nor is Lisa Meitner. And Mme. Curie no longer remains the only woman to share in the Nobel Price award for science. There is Marie Curie's daughter, Irene Joliot-Curie, and there is Gerty Cory (1974) for physiology and medicine. Nobel prizes in literature have gone to Selma Lagerloef, Grazia Deledda, Sigrid Undset, Pearl Buck, and Gabriela Mistral.

As an artist Mary Cassat (1845-1926) was every bit as good as her great French friends Degas and Manet considered her to be, but it is as if she took the rest of the world another fifty years grudgingly to admit it. Among contemporaries Georgia O'Keeffe can hold her own with the best.

(17) ... I refer to the chromosomal structure of the sexes. The chromosomes, those small cellular bodies which contain the hereditary particles, the genes, which so substantially influence one's development and fate as an organism, provide us with our basic facts. In the sex cells there are twenty-four chromosomes, but only one of these is a sex chromosome. There are two kinds of sex chromosomes, X and Y. Half the sperm cells carry X and half carry Y-chromosomes. All the female ova are made up of X-chromosomes. When an X-bearing sperm fertilizes an ovum the offspring is always female. When a Y-bearing chromosome fertilizes an ovum the offspring is always male. And this is what makes the difference between the sexes. So what? Well, the sad fact is that the Y-chromosome is but an iota of a remnant of an X-chromosome; it is a crippled X-chromosome. The X-chromosomes are fully developed structures; the Y-chromosomes is the merest comma. It is as if in the evolution of sex a particle one day broke away from an X-chromosome, and thereafter in relation to X-chromosomes could produce only an incomplete female - the creature we now call male. It is to this original chromosomal deficiency that all the various troubles to which the male falls heir can be traced.

10. In the first place the chromosomal deficiency of the Y-chromosome determines his incapacity to have babies. This has always been a sore point with men, though consciously they would be the last to admit it, although in some primitive societies, as among the Australian aborigines, it is the male who conceives a child by dreaming it, and then telling his wife. In this way a child is eventually born to them, the wife being merely the incubator who catches the egg placed there through the grace of her husband.

Journalists deploy this device as well. Note (18) in which Brazil's victory - the topic of the second paragraph - is introduced at the end of the first paragraph:

(18) Argentina came out smoking. Time and again the reigning world champions attacked the Brazilian goal, fighting to survive in a tournament they dominated just four years ago. But time and again they were repulsed. Shots would go wide. Brilliant, slashing runs would suddenly end with a defender magically stripping the ball
away. Then Brazil would launch its counter-attack: fluid, lightning fast, graceful as the samba rhythm pulsating through the stands. Now Zico snakes his way to the top of the penalty area and lays a perfectly timed pass to Falcao, who has somehow broken free on the right wing. Stunned, the Argentine defenders shift toward the ball, and Falcao lofts it almost lazily to Serginho on the opposite site. Score! And the stadium erupts in a sea of green-and-yellow flags and joyous cries of “Brazil! Brazil!”

Freeze that moment. Place it carefully alongside those memories of Bjorn Borg and John McEnroe at Wimbledon, Muhammad Ali and Joe Frazier at the “Thrilla in Manila”. For whatever the outcome of next Sunday’s final match, Brazil’s 3–1 victory over Argentina last week can stand as a monument to the 1982 World Cup tournament. Temporarily, one could ignore the squabbles and half-empty stadiums that have marred Mundial ‘82. One could even forget that the match degenerated badly in its closing moments. The name of the game is soccer, and for perhaps 85 min. last week it was played at the summit.

Time, July 12, 1982.

An advertisement in the same paper is likewise illustrative:

(19) Wherever you go in the world, be it New York or Nairobi, and whatever you do, business or pleasure, be sure to take Thomas Cook Euro Travellers Cheques.

Thomas Cook Euro Travellers Cheques are sold in 153 countries.

Note, too, the final placement of dominant material in poetry, in (20) and (21) below:

(20) Domination of Black
At night, by the fire
The colors of the bushes
And of the fallen leaves
Repeating themselves
Turned in the room
Like the leaves themselves
Turning in the wind...
Yes: but the color of the hemlocks
Came striding
And I remembered the cry of the peacocks

The colors of their tails
Were like the leaves themselves
Turning in the wind,
In the twilight wind...
Wallace Stevens (1954: 9)

(21) Pale rain over the dwindling harbour
And over the sea wet church the size of a snail
With its horns through mist and the castle
Brown as owls
But all the gardens
Of spring and summer were blooming in the tall tales
Beyond the border and under the lark full cloud.
There could I marvel
My birthday
Away but the weather turned around.
It turned away from the blithe country
And down the other air and the blue altered sky
Streamed again a wonder of summer
With apples
Pears and red currants
And I saw in the turning so clearly a child’s
Forgotten mornings when he walked with his mother
Through the parables
Of sun light
And the legends of the green chapels
(Taken from Poem in October by Dylan Thomas, 1963: 29)

As a final note consider originally unsegmented texts dating back to the beginning of the 12th century. Their division into chapters and paragraphs, imposed on them by later editors, reveals that one of the commonest devices, particularly at the chapter level, is segmenting a text after the introduction of the next discourse-topic. Such texts which lack in formal devices abound in explicit linguistic markings. (22) and (23) below provide evidence for such indications:

(22) a: End of Chapter I:
And we have had enough of the interpretation of the form of the earth and we are starting with a bit of interpretation of the sky and its moves.

b: Title of Chapter II:
Of the forms of the sky and the moves of the circle on the earth...
(23) a: End of Chapter III:
And we are coming now to interpret matters of alternation among them from north to south and we are coming now to interpret matters of alternation among places which withdraw along the earth from east to west by God's help.

b: Title of Chapter IV:
Of the alternation found in places from east to west.
(Sefar Haibur, by Rabbi Avraham Bar-Hiia, in Hebrew pp. 89, 13-14.)
The division into paragraphs is likewise motivated as illustrated in (24) below:

(24) [THE BIBLICAL PERIOD]
From [the creation of] Adam until the Flood 1656 years
From the Flood until [the birth of] Abraham 292 years
From the birth of Abraham until his first departure from Haran 52 years
From his departure from Haran until the covenant between the pieces of flesh 18 years
He returned from Haran and remained there 5 years
Thus returning to the land of Cannan at age of 75.
From that time until the birth of Isaac 25 years
From that time until Jacob went down to Egypt 130 years
From that time until the death of Jacob 60 years
From that time until the death of Joseph 53 years
From the death of Joseph until the emergence of Ephraim and Gilead of the false prophets who misled Israel and were killed 100 years
From that time until the Exodus 30 years
The Exodus occurred in Nisan of the year 2449.
(The Book of Tradition by Abraham Ibn Daud, in Hebrew p. 3, translated by G.D. Cohen)

Examples (22) through (24) of medieval texts which were originally unsegmented by any external division into paragraphs, chapters, etc., provide particularly strong evidence for our claim, since they were 'self-consciously' segmented by later editorial decisions.

3 Paragraph-Initial Position
As this study is concerned primarily with paragraph-final position, the topic of paragraph-initial position is noted only insofar as it serves to illuminate the former. Given that [1] paragraph 'n' final-position is a parameter of dominance in that it serves to introduce the discourse-topic of paragraph 'n+1', it follows that [2] paragraph 'n+1' initial-position is where that discourse-topic is located. Thus, the examples used above to demonstrate (1): Numbers 4-5, 8-11 provide verification of (2) as well.

It was also shown that paragraph pre-final position is either nondominant (as shown by Experiment 1) or that it contains background information (see discussion of example (7) above). Paragraph-initial position has been extensively investigated by Kieras (1978, 1980). He reports of experiments in which readers marked initial sentences as those conveying the main idea, and maintains that speakers interpret initially presented information as thematic, or as what the passage is about.

It seems that paragraph-initial position is, in fact, a suitable location for the topic-sentence of the paragraph. Positioned initially, it functions as a reference point which the rest of the paragraph is a comment on. Such structure seems to facilitate processing (as suggested by Kieras, 1978), and might be determined by encoding mechanism. Various psychologists (see, for instance, Sherif 1935, Luchins 1942) showed that early familiarization with information establishes a frame of reference or a set in terms of which all subsequent information is assimilated and interpreted.

In a series of studies on literary dynamics (see Perry 1968, 1974, 1976, 1979, 1982) Perry discusses the effect of initial stages of reading in the text-continuum on subsequent processing of the text. He argues that the reading of the text is a process of constructing a system of hypotheses or frames. The reader does not wait until the end before beginning to understand the text, and hence hypotheses constructed at the beginning affect the organization of the material which follows them. Initially constructed frames determine the nature of procedures for filling-in gaps, to cite just one factor in text processing. In view of the primary effect in formation of impressions, Perry demonstrates both the dynamics of an inverted poem (1968, 1969, 1976) and those of an inverted story (1974, 1979) assuming, further (Perry 1979) that there is recency effect for the terminal point at which all options are sealed, although not without the counterpoint of initial-position primary effect.
The various intercorrelations noted above between the parameters of foreground/dominant vs background/thematic information on the one hand, and pre-final or initial vs final position on the other hand, can be accommodated with findings concerning the dynamics of memory.

The main thrust of psychological research on questions relating to the order of presentation of linguistic material is concerned with the effects of the parameters of 'primacy' and 'recency' on recall. The accuracy of recall of a list of unrelated words read to a subject is correlated with order of recall. The enhanced accuracy of the first few serial positions is said to present a primacy effect, and of the last seven or so, a recency effect. The middle items of the list are least likely to be recalled. (See Figure 1 below).

Murdock (1962) presented his subjects with various lists of unrelated English words that differed only in the number of items. The items most likely to be recalled were those at the end of the lists, while the probability of recall of the last three items did not vary much for lists of different length.

The question here is whether the functions of paragraph-final and initial positions may be accounted for in terms of the bimodal view of memory storage. The bimodal serial position curve in free recall is taken to demonstrate the existence of two separate memory stores: the recency section of the serial position curve is produced by output from short-term memory (STM), while the primacy effect is the result of retrieval from long-term storage (LTM) (Glanzer & Cunitz, 1966). Such dual process theorists consider recall of the initial section of the serial position curve to reflect recall from long-term memory. And in fact it seems reasonable to assume that (topic) sentences functioning as the reference point of the segment as a whole are meant to be carried in mind for a certain length of time (i.e. via LTM), and hence should occupy segment-initial position.

Dominant information, by contrast, which is provided in segment final position, is retrievable from short-term memory. Since it is positioned finally, such information owes its prominence to the recency effect of its serial position, and is produced by output from STM, to be taken up subsequently as the next text segment-topic.

Coda

This study of the effects of the serial position of paragraphs as units of discourse was undertaken, as noted, within the frame of reference established by the Prague School of Linguists and by proponents of Functional Sentence Perspective. In studying the role of paragraph-final position, specifically, we have extended theories devised to characterize material at the sentence level to segments larger than the single sentence. Our analysis demonstrates that paragraph-final position functions as a parameter of dominance, presenting to the text either prominent material or future discourse-topics which gain in dominance due to their occurrence in final position. And it is shown to be consistent with findings of psychologists and literary analysts regarding the encoding of discourse (Section 3) as well as with the psychological nature of the storage and retrieval of linguistic material (Section 4).

It is our belief that a unified theory of the information structure of texts can most profitably be pursued by integration of these various perspectives within a single framework. And it is our hope that this study as made some modest contribution along these lines.
Notes

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1. In considering paragraph boundaries, Longacre specifies the existence of paragraph initial and final "features" which serve to mark off paragraphs from each other. Following Gerdel (1976), Longacre notes that the paragraph topic occurs initially and often finally in the paragraph, thus indicating the beginning and the end of a topic and incidentally - the bounds of the paragraph.

In our examples (see 1 and 2 for instance), the paragraph topic is fully (i.e. not anaphorically) referred to in paragraph-initial position but not in final-position, thus indicating a kind of segmentation where different paragraphs do not disagree entirely from the previous discourse-topic. Thematic unity (i.e. cohesion) proceeds from one paragraph to another, but boundaries are marked off by an initial mention of the entire description of proper name of the participant in the new segment. (This last comment is due to Reinhart, personal communication).

2. Stalnaker (1978) defines the "context set" of a given discourse at a given point as the set of propositions which we accept to be true at this point. These propositions may be viewed as the speakers' presuppositions, and in a nondefective discourse speakers are assumed to share the same context set.

References


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APPENDIX
Serial position curve for stories

1. Basic Terms

Any dialogical discourse (e.g., conversation) may be conceived of as a set of monological discourses. The focus of my concern will be the monological discourse in its written form, which I shall call text. I shall also work with the term normalized sentence, which is to stand for that corresponding version of the text—sentence S that is obtained after replacing all positional signals in S (such as "that is why", "to start from", "last but not least", "finally", certain instaurators, etc.) by their positionally neutral equivalents.

Some authors deny the meaningfulness of the term "structure" with regard to hyper-sentential sequences (e.g., Halliday and Hasan 1976 prefer the term "texture"). However, I consider the difference to be rather terminological.

Here I presume that any discourse may be represented by a SDUCS, i.e., a set of discourse-underlying cohesive structures which is related to a SANSS, i.e., a set of acceptable normalized-sentence sequences, in such a way that the SANSS may be defined on the basis of the SDUCS.

In the following, I shall examine the SDUCS and some of the rules of correspondence between the two sets.

2. The discourse-underlying cohesive structures

I distinguish the following discourse-underlying cohesive structures:

a) The referential structure of entities (RSE)

RSE is a structure represented by a table diagram (Figure 1) in which the horizontal axis is an axis of sentences and the vertical axis is an axis of entities (logical individuals). All the sentences of the text and all the entities named in it have their corresponding number. The occurrence of an entity name in a sentence is listed in the corresponding square field of the table (for details cf. below Note 6).