

**The Computational Codification
of the Semantic Aspects of Style**

Mark B.P. Ryan

**Technical Report CSRI-231
August 1989**

**Computer Systems Research Institute
University of Toronto
Toronto, Canada
M5S 1A1**

The Computer Systems Research Institute (CSRI) is an interdisciplinary group formed to conduct research and development relevant to computer systems and their application. It is an Institute within the Faculty of Applied Science & Engineering, and the Faculty of Arts & Sciences, at the University of Toronto, and is supported in part by the Natural Sciences and Engineering Research Council of Canada.

The Computational Codification of the Semantic Aspects of Style

by

Mark B. P. Ryan

**Department of Computer Science
University of Toronto
Toronto, Ontario, Canada
August 1989**

**A Thesis submitted in conformity with the requirements
for the degree of Master of Science**

Copyright ©1989 Mark B. P. Ryan

Abstract

Style is an important aspect of language, but current analyses of style are not adequate for computational implementations. This thesis presents a system for codifying some of the semantic aspects of style. This system uses DiMarco's (1989; DiMarco and Hirst 1988) approach to the computational analysis of style as a starting point. The way the centre of attention (or *focus*) changes from sentence to sentence in a paragraph is used to determine which stylistic goals the paragraph satisfies.

I begin by discussing the literature in the areas of *text*, *focus*, and *style*. In the course of this discussion I show that the connection between semantics and style can be examined at the paragraph level. I continue by defining rules (the *focus partial ordering*) that determine the focus of a sentence on the basis of grammatical role and sentence structure. I then show how the foci of individual sentences can be used to define a pattern that describes how the focus changes or remains the same from sentence to sentence in a paragraph, the *pattern of focus*. I define the *grammar of abstract elements of style*, which relates patterns of focus with *abstract elements of style*, terms that describe style according to three central characteristics: *balance*, *position*, and *dominance*. The *grammar of stylistic goals*, which relates abstract elements of style with specific stylistic goals such as *clarity*, is then defined. The resulting *semantic stylistic system* takes as its input a paragraph of text, and produces as its output the stylistic goals that the paragraph satisfies.

Acknowledgements

I would like to express my gratitude to my supervisors, Graeme Hirst and Chrysanne Di-Marco, for their guidance and support during my research. Graeme helped me to bring together my wandering trains of thought, and he is largely responsible for any coherence that the research has. He evaluated my written work both promptly and accurately, and his command of the language displayed professionalism and craftsmanship that most writers can only envy. Chrysanne not only suggested the topic for this thesis, but also acted as an understanding advisor, proofreader, and, indeed, friend. Without her unique approach to style, this research would not have been possible, and her encouragement has sustained it through many difficult periods.

I owe a great debt to Ian Lancashire for his careful analysis of this research and for his helpful recommendations.

I wish to thank Kem Luther and Rick MacLean for the use of their parser. Many others have also made valuable contributions to this research. Dan Lyons, in particular, helped me solve many technical and theoretical problems. To Dan, and to all the other people in DCS who helped me overcome the large gaps in my competence, I am deeply grateful.

I cannot hope to list all of the friends to whom I am indebted for emotional support, but Laurence Mussio, Peter Moroney, and Cathy Meloche are among those who have helped to bring this research to fruition. Finally, I wish to thank my family, particularly my mother, for their encouragement and prayers.

Contents

1 Introduction	1
1.1 The Problem: Connecting Semantics and Style	1
1.2 The Semantic Stylistic System	2
1.3 An Outline of the Thesis	3
2 Background	5
2.1 Text	6
2.1.1 Text and sentence	8
2.1.2 Text and paragraph	10
2.1.3 Halliday and Hasan	11
2.1.4 Morris	16
2.2 Style	18
2.2.1 What is style?	18
2.2.2 A computational stylistics application	21
2.3 Focus	23
2.3.1 What is focus?	23
2.3.2 A linguistic approach to focus: van Dijk	25
2.3.3 Focus in discourse: Grosz	26
2.3.4 Focus and anaphora: Sidner	28
2.3.5 Focus and sentence structure: Derr and McKeown	33
2.4 Discussion	35
2.4.1 Sentence	35
2.4.2 Paragraph	36
2.4.3 Text and discourse	36
2.4.4 Style	37
2.4.5 Focus	37
3 Determining Focus: Sentence-level Processing	39
3.1 General Strategy	39
3.2 The Noun Phrase Groupings	40
3.2.1 Focal-assured	40

3.2.2	Focal-prevented	41
3.2.3	Focal-allowed	43
3.3	The Focal-Allowed Rules	43
3.4	An Application of the FPO	44
4	Patterns of Focus: Paragraph-level Processing	46
4.1	What is a Pattern of Focus?	46
4.1.1	Co-specificational and specificationally related NPs	47
4.1.2	Atomic patterns of focus	47
4.1.3	Composite patterns of focus	51
4.2	Semantic Stylistic Shapes	53
5	Associating Patterns of Focus with Stylistic Goals	56
5.1	The Stylistic Metalanguage	56
5.2	The Grammar of Abstract Elements of Style	58
5.2.1	The GAES rules: an explanation	59
5.3	The Grammar of Stylistic Goals	63
5.3.1	Defining the stylistic goals	63
5.3.2	How the GSG works	66
5.3.3	The GSG rules: an explanation	69
5.4	Some Complete Examples	72
5.4.1	Sentence-level processing for example (5.3)	73
5.4.2	Paragraph-level processing for example (5.3)	77
5.4.3	Analysis of the results for example (5.3)	77
5.4.4	Sentence-level processing for example (5.4)	79
5.4.5	Paragraph-level processing for example (5.4)	80
5.4.6	Analysis of the results for example (5.4)	80
6	A Computational Application: BOGUE	82
6.1	The Organization of BOGUE	82
6.2	Limitations	84
6.3	Potential for Further Development	85
7	Conclusions	88
7.1	Goals	88
7.2	Shortcomings	89
7.3	Future Work	90
A	Examples of the Composite Patterns of Focus	91
B	A Test of the Relationship Between Focus and Grammatical Role	97

C An Example of BOGUE's Processing

100

References

104

Chapter 1

Introduction

Style is as pervasive as it is illusive. Every piece of language has a dimension beyond its structure, beyond its meaning, and beyond the makeup of its individual words. Every writer, consciously or unconsciously, makes choices that, while they do not directly affect the message of what is being written, make an impression on the reader. Style can be described as the sum of these choices.

The illusiveness of style comes, in part, from the fact that it is the result of the interaction of many separate aspects of language, including syntax, semantics, and lexis. It is not easy to determine exactly what gives a piece of text a certain stylistic flavour or tone. The research described in this thesis is an attempt to isolate some of the elements of semantics that influence style in order to create a system that can determine to some extent the stylistic content of a given piece of text.

In this chapter, the problem that I am attempting to solve is described. I will then provide a brief outline of the remainder of the thesis.

1.1 The Problem: Connecting Semantics and Style

DiMarco and Hirst (1988) define a computational approach to style that is based on three *stylistic grammars*: one that deals with the syntactic aspects of style, one that deals with the semantic aspects, and one that deals with lexical choice. The purpose of my research is to create a *semantic stylistic system* that will codify some of the connections between the semantic content of a piece of text and its stylistic effect. Of course, I do not attempt to capture *all* of the aspects of semantics that influence style. Neither do I attempt to describe all the stylistic effects caused by the limited body of semantic characteristics that I do describe. Instead, I deal only with a particular aspect of the semantic content of a piece of text, the way that the centre of attention changes or stays the same from sentence to sentence. This particular semantic aspect is correlated with a small set of specific stylistic goals, such as *clarity* and *emphasis*. Thus, while this thesis does not attempt to codify all the semantic aspects of style, it does address a challenging and difficult problem.

The problem of connecting semantics and style has two major sub-problems. The first is to ~~identify some semantic aspects of written language that have stylistic effect.~~ The second is to create a computational *mechanism* to associate such aspects of written language with specific stylistic goals. Since the result is intended to be a semantic stylistic system that fits into DiMarco's framework for an overall codification of style, these two problems will be solved in a manner that is complementary with her work.

Now that the problem has been defined, it is appropriate to list some of the things that the codification of the semantic aspects of style should be able to do. It should be able to use the semantic content of a piece of text to identify which stylistic goals are achieved in the text. It should be flexible enough to accommodate new stylistic goals. It should be compatible with DiMarco's computational stylistics application. This last goal means that it should use as much of her vocabulary and methodology as possible. At the same time, the codification should not assign stylistic values to the purely syntactic or lexical aspects of a piece of text. In order to achieve its purpose, the codification should only deal with the connection between semantics and style. All of these goals must be achieved in a manner that is adaptable to a computational application.

One might ask why this problem is worth solving. After all, style is usually not considered to be essential to communication, and there are many extant problems in computational linguistics that *are* central to effective communication. The first reason for wanting to solve the problem is that computational linguists are only just beginning to examine style. If computational linguistics is going to look at the complete scope of natural language, then style must be dealt with. Codifying some of the semantic aspects of style is a step towards a complete computational analysis of style. A systematic description of the connection between semantics and style is also important because the purely linguistic literature on style tends to be vague and inexact. Since style is pervasive, describing it precisely and systematically *is* a valid goal. The problem addressed in this thesis is worthwhile, finally, because its solution has several significant applications. Machine translation is the application which inspired DiMarco's work, and the codification of the semantic aspects of style complements her codification of the syntactic aspects of style. The quality of machine translation output can be improved if a codification of style (including both the semantic and syntactic aspects) is used to test whether or not the stylistic goals of the source text have been preserved in the target text. A codification of style can also be useful as part of a prescriptive "style checker" that tells the user whether a given piece of text achieves the stylistic goals that are appropriate for the context.

1.2 The Semantic Stylistic System

Before outlining the contents of the thesis, I will provide a brief summary of what the semantic stylistic system does. The semantic stylistic system takes as its input a paragraph of text, and produces as its output a description of the paragraph in terms of a limited set

of stylistic goals. To begin with, each sentence in the paragraph is parsed. This produces the *focus set*, the set of those noun phrases that are most likely to form the focus of the sentence. The focus sets from all the sentences in the paragraph are then compared to determine the output *pattern of focus* that describes how the centre of attention changes or remains the same from sentence to sentence. These two steps (the *sentence-level processing* and the *paragraph-level processing*) constitute the semantic stylistic grammar that DiMarco (1989) envisions for her overall stylistic grammar. Together with the grammars that relate patterns of focus to specific stylistic goals, the sentence-level processing and the paragraph-level processing make up the semantic stylistic system.

Despite its name, the semantic stylistic system described above performs only very limited semantic analysis. As we shall see in chapter 3, the focus sets of individual sentences, upon which the entire system is based, are derived using mostly syntactic information, such as grammatical role and sentence structure. The semantic connections between the focus sets of different sentences are established, for the most part, using a lexicon that is independent of the text itself. With the exception of pronominal reference and repetition, all of the semantic relationships that the system recognizes are encoded in the lexicon.

1.3 An Outline of the Thesis

Chapter 2 presents the background for looking at the connection between style and semantics by discussing literature in three relevant areas: text, style, and focus. In the area of text, we will look at theoretical work on the subject. The discussion of style includes definitions of the concept itself, as well as a description of DiMarco's computational stylistics application. The section on focus includes theoretical work on focus as well as a description of computational applications dealing with focus. The chapter concludes with a list of definitions of the key terms to be used in this thesis.

Chapter 3 describes the sentence-level processing of the semantic stylistic system. The *focus partial ordering* (FPO), which determines the *focal potential* of each noun phrase in a sentence, is defined. The focal potential of a noun phrase is the likelihood that it will be the focus of the sentence. The FPO uses the structure of the sentence and the grammatical role of the noun phrases to rank the noun phrases according to focal potential.

In chapter 4, the paragraph-level processing of the semantic stylistic system is described and the concept of *patterns of focus* is formally defined. A pattern of focus describes how the centre of attention changes or remains the same from sentence to sentence in a series of sentences. All the different patterns of focus are defined, and examples of actual texts that display these patterns are provided.

Chapter 5 describes the intermediate levels that connect the patterns of focus created by the paragraph-level processing with specific stylistic goals, such as *clarity* and *emphasis*. The first such level is the *grammar of abstract elements of style* (GAES) which associates the patterns of focus with *abstract elements of style*. These abstract elements of style

are in turn associated with specific stylistic goals by the *grammar of stylistic goals* (GSG). Together with the sentence-level processing and the paragraph-level processing, the GAES and the GSG form a partial codification of some of the semantic aspects of style.

Chapter 6 describes BOGUE, a computational application of the semantic stylistic system, and chapter 7 contains the conclusions of the thesis.

Chapter 2

Background

This thesis describes an attempt to codify the semantic aspects of style. This codification establishes the connection between the semantic content of written language and a selected set of specific stylistic goals. I deal only with the stylistic effects that can be described using these goals, that is, I take a *goal-directed* approach to style. In order to associate specific stylistic goals with a given input paragraph, this codification determines the way in which “what is being talked about” changes or remains the same from sentence to sentence in the paragraph. Such an approach is based on two specific claims about the relationship between style and semantics. In this chapter I will justify these claims by appealing to literature in three topic areas: text, style, and focus. My research is primarily concerned with *style* and its connection to semantics, but before I can define my approach to style, I must first discuss the concept of *text*. In the area of text, I will look at the effect semantic variation at the sentence level has on style, the difference between sentences and text, and the importance of paragraphs. Once this background in text has been established, I will look at various definitions of *style* as well as DiMarco’s (1989; DiMarco and Hirst 1988) computational stylistics application. *Focus* will be examined by looking at a purely linguistic approach to focus as well as some computational applications. A list of definitions of some of the key terms used in this thesis will conclude the chapter.

This is the first of the two claims about the relationship between semantics and style:

Any stylistic effects that are dependent on semantics are evident *between* sentences rather than *within* individual sentences.

In order to support this claim, I will first look at some of the literature on the organization of text. I will then examine some of the different viewpoints on style, as well as a specific computational application dealing with style.

The following is the second claim:

If there is a stylistic effect associated with how “what is being talked about”

changes or remains the same from sentence to sentence, then such a stylistic effect is part of the connection between semantics and style.

Focus is another word for "what is being talked about", and thus I will look at a purely linguistic approach to focus, as well as a variety of computational applications of focus, in order to back up this claim.

Justifying these two claims is not the only reason for looking at some of the literature on text, style, and focus. I also want to examine some existing work that relates to this thesis, especially the computational work by Grosz, Sidner, DiMarco, and Derr and McKeown. DiMarco's work is of particular importance since the research described in this thesis stems from it.

2.1 Text

In order to explain my approach to describing the connection between semantics and style, it is necessary to examine the concept of *text*. In order to do this, I begin by looking at stylistic variation at the sentence level. I continue by comparing the concept of *text* with that of *sentence*, and by discussing what Cha and Bertinetto have to say about text. I then discuss the concept of *paragraph* and summarize Mitterand's ideas on the subject. Halliday and Hasan's description of the semantic relationships between sentences in text is examined next. I conclude by discussing Morris's work on lexical cohesion in text.

I decided to study the connection between semantics and style at the level of paragraphs, rather than at the level of individual sentences. This was the most fundamental decision made during this research, and it requires some substantiation. The simplest reason for this choice is that stylistic variation within individual sentences comes from syntactic or lexical choice rather than from semantic variation. DiMarco's research, which is described later in this chapter, shows that syntactic variations at the sentence level have significant stylistic effects. In order to see the connection between style and lexical choice in individual sentences, consider the following example:

(2.1) The fat cat is always hungry.

(2.2) The obese domestic feline is in constant need of sustenance.

There is obviously a stylistic difference between these two sentences, and this difference is due to the different lexical choices made in each sentence.

If syntactic and lexical variation in individual sentences results in stylistic variation, then why is the same not true of semantic variation? The reason for this is that semantic variation in individual sentences is just that, *semantic* variation. Consider the following example:

(2.3) Ivan hit his little brother.

(2.4) Ivan thumped his little brother.

It can be argued that *hit* and *thumped* mean exactly the same thing in the context of these two sentences. If this is the case, then we can indeed talk about the stylistic difference between them, but this stylistic difference is due to lexical variation rather than semantic variation. If *hit* and *thumped* have the same meaning, then no semantic variation exists between the sentences. If, however, a variation in meaning can be discerned between *hit* and *thumped*, then the difference between the two sentences is simply semantic. To call such a difference a matter of style reduces all semantic variation to stylistic variation.

Sentences with more than one main clause present a problem. It is possible to look at such a sentence as a set of sentences that has been grouped together by punctuation. If stylistic effects that depend on semantics occur between sentences, then there is no reason why they cannot occur between main clauses in the same sentence. If there is a stylistic effect caused by the semantic content of these two sentences:

(2.5) Jack coughed. James shouted.

then the same kind of stylistic effect should occur between the main clauses of this single sentence:

(2.6) Jack coughed, and James shouted.

A complete definition of *sentence* is provided in section 2.4.1, but for now it is sufficient to note that I use the term *sentence* to refer to constructions with a single main clause. Thus, example (2.6) above contains two sentences according to the definition used in this thesis.

If main clauses should be dealt with separately, then what about dependent clauses? I decided to deal with a main clause and all its dependent clauses as a unit for two reasons. The first is that dependent clauses, by their very nature, tend to have some semantic relationship to their main clauses. There are, of course, cases where there is a shift in focus between a main clause and the dependent clause that is attached to it, but on the whole dependent clauses tend to elaborate on the focus of the main clause rather than introduce new topics. Thus, if the semantic stylistic system were to deal with dependent clauses separately, its results for most texts would not change much, since the system's analysis is based on focus shifts. The second reason is that lumping together a main clause with all of its dependent clauses makes the analysis of a piece of text more direct since there are fewer sentences to deal with than there would be if each dependent clause were dealt with separately.

Because of the definition I use for sentences (that is, a single main clause along with all of its dependent clauses), semantics and style are not connected at the level of individual sentences. The codification of the semantic aspects of style must, therefore, operate at another level. The two obvious choices are the level of text and the level of paragraph. In order to decide which of these two levels is appropriate, it is first necessary to look at the concept of *text*.

2.1.1 Text and sentence

To understand the idea of *text*, we must first distinguish it from the idea of *sentence*. The concept of *sentence* is both more intuitive and more concrete than that of *text*. It is more *intuitive* because speakers and, especially, writers are constantly and consciously making up sentences. The intuition about what constitutes a sentence is reinforced by formal sentence grammars. In contrast, the creation of a text is less often conscious, especially in spoken language, and the intuition about what constitutes a text is correspondingly weaker. The concept of sentence is more *concrete* than that of text because of the rich body of research in sentence linguistics. Extensive grammars have been written that cover large subsets of the set of all English sentences. Text, by its nature, is less concrete, and the language of text linguistics is much more nebulous and imprecise than that of sentence linguistics.

One author who has made a thorough comparison of sentence linguistics and text linguistics is Cha (1985). She distinguishes sentence linguistics from text linguistics by stating that the former is represented by the transformational grammars of the Chomsky school, systemic grammars, and stratificational grammars, while the latter is represented by systemic grammars, stratificational grammars, and the European text grammars (Cha, 1985, p. 7). The overlap between these two paradigms may cause some confusion when one attempts to analyse text. Since most researchers are more familiar with sentence linguistics, there is a tendency to view sentence linguistics as the model into which text linguistics must fit.

Cha's definitions of *text* and *discourse* are interesting because she suggests that text is a theoretical concept of linguistics while discourse is not. This means that Cha sees text as a formal, structured way of looking at a naturally occurring phenomenon, discourse. Since *text* and *discourse* are used in so many different ways in the literature, the applicability of Cha's blanket statement is questionable. Nevertheless, her recognition of the overlap between the text linguistic and sentence linguistic paradigms is significant.

Another author who contrasts *sentence* and *text* is Bertinetto (1979). He clearly distinguishes the study of text from that of sentences by claiming that text cannot be defined in purely linguistic terms. In his view, text has too many pragmatic aspects for it to be defined as simply as sentences are defined. One such aspect is context. Bertinetto emphasizes the importance of context by saying that "any given sequence of verbal signs can be a text given the right context" (Bertinetto, 1979, p. 160). While I agree that context is important in defining what can be a text, it is not clear that, given a suitable context, *all* sequences of verbal signs can indeed constitute a text. Is there any context in which fifty repetitions of the word *went* form a text? It is not hard to make up other examples of sequences of verbal signs that stretch the credibility of Bertinetto's statement.

Bertinetto implies that attempts to construct a "text grammar" along the lines of existing sentence grammars are bound to fail because of the pragmatic aspects of text. He claims, in fact, that textual competence, unlike (sentence) linguistic competence, is not

based on native speakers' judgements. This raises the question, which Bertinetto does not really answer, of what textual competence is based on. It seems that without some grounding in native speakers' judgements, definitions of textual competence will be too vague to be of any real value.

After discussing the pragmatic nature of text, Bertinetto returns to its basic definition. He seems to refute his earlier statement that anything can be text given the right context when he defines text as a set of one or more sentences that is (Bertinetto, 1979, pp. 161-162):

- Thematically coherent.
- Endowed with a communicative function that depends on a well-defined illocutionary potential.
- Produced within a "concrete communicative performance". This means that a text is produced in a finite amount of time and at a particular location.

This definition, like the one used in section 2.4.3 below, makes no specific claims about the degree of unity in a text. Unlike the definition provided below, Bertinetto's specifies that textual unity is thematic in nature. I do not agree with this specification because it rules out texts that do not have thematic unity, but are held together by other means. A text in which the sentences are thematically unrelated may still have a certain degree of unity if, for instance, these sentences all have the same structure.

Bertinetto's definition, however, is relevant because it emphasizes the fact that texts are made up of sentences. If texts are composed of sentences, then it is no longer an issue whether or not fifty repetitions of the word *went* are a text. A *sentence* definition can be adopted that includes sentence fragments and other unorthodox structures. If we choose a *sentence* definition that allows fifty repetitions of the word *went*, then this constitutes a text. This does not simply mean that the problem of deciding what is and what is not a text is passed on to another level of language. There are precise and well-developed tools available to the sentence linguist to help to define what is and what is not a sentence.

There is one more concern brought up by Bertinetto's work. What happens if we have fifty repetitions of the word *went* that are punctuated and capitalized so that each word is in a sentence by itself? If we choose a *sentence* definition that includes the sentence fragment *Went*, then the problem of whether or not this is a text is no longer covered by sentence linguistics. Do fifty repetitions of the sentence fragment *Went* constitute a text? Perhaps there is a context that makes such a sequence of sentences a text. The point of this example is that it is not always easy to determine whether a given sequence of sentences is a text.

Thus, text and sentence are distinct concepts. There are rules that can be used to combine separate components, such as noun phrases and verb phrases, into sentences, but corresponding rules for combining sentences to create texts do not necessarily exist. Nevertheless, when text is defined to be made up of sentences, then the difficult problem of deciding what is and what is not a text is partially solved.

2.1.2 Text and paragraph

One of the more controversial aspects of the work described in this thesis is the selection of the paragraph as the basic unit of text to which stylistic value is assigned. Why not assign a stylistic value to the text as a whole? The main practical reason for not dealing with texts as a whole is that texts can be a single word long or hundreds of pages long. A codification that could deal with this range of lengths would probably be too general to be of any practical value. If texts as a whole cannot be dealt with, and individual sentences are not appropriate (as shown by the discussion at the beginning of this section), then what should be the basic unit for looking at the connection between semantics and style? The paragraph is the obvious alternative, but this choice requires some substantiation.

If the stylistic value that texts intuitively contain is to be described in terms of the paragraphs that make up texts, then one must first insist that texts are indeed made up of paragraphs. Is this a reasonable qualification? The previous section established that texts are made up of sentences, and, in the vast majority of written English texts, these sentences are organized into paragraphs. There are, of course, anomalous examples of texts that have no paragraph structure, but these can be ignored without losing generality. Texts that are too short to have any paragraph breaks, including isolated sentences, can be thought of as single paragraphs. This means that short texts can, in fact, be dealt with as a whole. In general, however, the stylistic value of texts will be extracted from their constituent paragraphs.

Now that we have established that texts are made up of paragraphs, the next step is to show that stylistic value can be legitimately assigned to the paragraph. Mitterand's (1985) discussion of the nature of the paragraph can help us with this. He states that a paragraph is simply a sentence or a series of sentences delimited by indentations. This "typographical" definition is somewhat disturbing at first glance, but Mitterand goes on to show the importance of the indentation in text: "A series of sentences gets its sense of cohesion from a typographical device, indentation" (Mitterand, 1985, p. 85, my translation). Unlike terminal punctuation, which can tell the reader if the sentence is a question or an exclamation, the indentation that marks the end of a paragraph does not indicate the *type* of the paragraph. Nevertheless, both indentation and terminal punctuation are typographical delimiters of units of language. Mitterand also claims that the paragraph is like the sentence in that it is a unit of intonation; indentation marks a pause for the reader. Most of the time, the paragraph is also a unit of meaning, although a series of semantically unrelated sentences can have unity by prosodic and syntactic means.

Mitterand's work is important because it makes a legitimate claim about the importance of the paragraph as a unit of text while at the same time recognizing its typographical definition. Mitterand's definition also recognizes that paragraphs can be made up of semantically unconnected sentences. This freedom to stray from the traditional paragraph (that is, an introductory sentence, several well-connected content sentences, and a concluding sentence)

is especially significant. I claim that paragraphs that differ from this traditional model create specific stylistic effects. This claim will be substantiated in chapter 5, but for now the important point is that non-conventional paragraphs are still paragraphs.

A text, therefore, is made up of paragraphs. Each of these paragraphs is a series of sentences set off from the rest of the text by a typographical device such as indentation. Because of the generality of the definition, it may seem like the paragraph is not an appropriate entity to which stylistic value can be assigned. This, however, is not the case. The definition must be general because there are paragraphs in actual texts that contradict all the other qualifications, such as semantic connectedness, that we might want to add to the definition. The fact that such paragraphs go against the conventional intuition about what constitutes a paragraph suggests that they have a distinct stylistic effect. More will be said about the connection between breaking the norms and style in section 2.2.1 below, but for now we can conclude that it is valid to assign a stylistic value to a paragraph.

2.1.3 Halliday and Hasan

Now that we have looked at the concepts of *text*, *paragraph*, and *sentence*, it is time to look at the relationships that occur between sentences in texts and paragraphs. In the last section, I established that it is appropriate to study the connection between semantics and style at the paragraph level. The idea of the semantic connectedness of a paragraph was introduced informally, and I noted that the lack of such connectedness has a distinct stylistic effect. In fact, this statement is an application of the second claim made at the beginning of this chapter, that if the way in which focus varies from sentence to sentence has a stylistic effect, then such a stylistic effect is part of the connection between semantics and style. The question that now presents itself is how to measure such variations in focus. In order to do this, we need a detailed description of the semantic relationships that occur between different sentences. Halliday and Hasan (1976) provide just such a description, and I begin this section by discussing the five *cohesion* relationships that they use to describe the semantic connections between sentences. The two general categories of semantic closeness (*co-specificational* and *specificationally related*) are then defined. I complete the discussion of Halliday and Hasan's work by dividing their cohesion relationships up into the two categories of semantic closeness. These two categories of semantic closeness will be used in chapter 3.4 to describe how the focus changes or remains the same from sentence to sentence in a paragraph.

Halliday and Hasan (1976) discuss the semantic relationships that occur between sentences. They state that:

Cohesion occurs where the interpretation of some element in the discourse is dependent on that of another. The one presupposes the other, in the sense that it cannot be effectively decoded except by recourse to it (Halliday and Hasan, 1976, p. 4).

They divide cohesion into five general categories:

- **Reference** — Items that refer to something else for their semantic interpretation instead of having their own. Halliday and Hasan discuss three types of reference, but only personal reference is relevant to this discussion. Personal reference includes personal pronouns (*I/me, you, she/her, it*), possessive determiners (*my, your, her, its*), and possessive pronouns (*mine, yours, hers*) (Halliday and Hasan, 1976, pp. 31–38). I group possessive determiners, possessive pronouns, and the use of the *s*-genitive (*Sandra's, the cat's, life's*) together as *possessive reference*.
- **Substitution** — The replacement of one item with another. While reference is a relation at the semantic level, substitution is a relation at the grammatical level. Only nominal substitution is within the scope of this research. Nominal substitution consists of substituting *one* or *ones* for the head of a noun phrase (Halliday and Hasan, 1976, pp. 88–95).
- **Ellipsis** — A special kind of substitution where the element is simply omitted instead of being replaced by *one* or *ones* (Halliday and Hasan, 1976, pp. 142–146). Again, only nominal ellipsis is relevant to this research.
- **Conjunction** — Not relevant to this research.
- **Lexical cohesion** — The cohesion that results from specific vocabulary choices. The two kinds of lexical cohesion are *reiteration* and *collocation*. Reiteration includes the repetition of the same lexical item, the use of synonyms, the use of near-synonyms, superordination (replacing an item, such as *Rolls Royce*, with its general class, such as *car*), and the use of *general nouns*. General nouns are a small class of nouns that can be used to refer to large groups of nouns in a major noun class. For instance, *child, woman, and person* are all general nouns referring to the “human” noun class. Collocation is the relationship that exists between lexical items that regularly co-occur, such as *boy* and *girl* (Halliday and Hasan, 1976, pp. 274–288).

Given two elements that occur in different sentences, there are two ways they can be semantically related: either they refer to the *same* entity, idea, or action, or they refer to entities, ideas, or actions that are *semantically close* to each other. Halliday and Hasan (1976, p. 3) call elements in the former group *co-referential*, while those in the latter group are called *referentially related*. These terms, however, present some problems for a computational application, and therefore I use the terms *co-specificational* and *specificationally related* to describe the relationships between elements in different sentences. Sidner's concept of *specification* will be explained in more detail in section 2.3.4, but for now we can say that two elements are co-specificational only if they are co-referential, and two elements are specifically related only if they are referentially related. The only difference between these two sets of terms is that the formal definitions of *co-specificational* and *specificationally*

related are based on abstract representations of real-world entities rather than the entities themselves.

Co-specificational elements

The following is a list of the relationships defined by Halliday and Hasan that are co-specificational:

- **Repetition** — A lexical element in one sentence is repeated in another sentence. Like the used of synonyms and near-synonyms, repetition is a kind of reiteration. Consider the following example of repetition:

(2.7) Trent mentions that someone named Larry didn't get into film school. The music comes out over the speakers and I try to listen to it, but Trent's still talking about Larry and Rip is cracking up hysterically in Trent's room.¹

In these two sentences the proper noun phrase *Trent* is repeated.

- **Pronominal reference** — There is a common referent for a personal pronoun (*I/me, you, she/her*) and its antecedent. Consider the following example:

(2.8) This was too much for Pooh. "Stay there!" he called to Eeyore, as he turned and hurried back home as quick as he could; for he felt that he must get poor Eeyore a present of *some* sort at once, and he could always think of a proper one afterward.²

Pooh in the first sentence and *he* in the second sentence have a common referent.

- **Synonyms** — Two words have the "same meaning in context". Whether or not there are any true synonyms in English is debatable. True synonyms are words that can replace each other in any context without affecting meaning. For the purposes of this work, it will be assumed that certain words will be identified in the input as "synonyms", which means that they can be treated as synonyms in the context of the input text. Consider the following example:

(2.9) Mitterrand nonetheless firmly reminded Bonn that it was its move now. He pointed out that it was West Germany that asked for an extraordinary summit in Brussels on February 11-12 and it was Germany's turn now to take over the Community presidency for the next six months.³

¹Ellis, B. E. *Less Than Zero*. Penguin Books (1985): 111.

²Milne, A. A. *Winnie-the-Pooh*. Dell Publishing Company (1926): 77.

³Dhombres, D. and Tréan, C. "Slim pickings from Anglo-French summit", *Manchester Guardian Weekly* 138(6), 1988: 13.

In the context of this newspaper article on the European Community, *Bonn* and *West Germany* are considered to be synonyms. Of course, if the article were about the geography of central Europe, it is unlikely that these two words would be synonyms.

Specificationally related elements

There are many ways that two elements can be specificationally related, and it is beyond the scope of this thesis to deal with them all. The following is a list of some of the forms such a relationship can take:

- **Possessive reference** — An element in one sentence appears in the possessive form in another. The possessive form can be either pronominal (*my/mine, your/yours, her/hers*), or the *s*-genitive (*Sandra's, the cat's, life's*). Consider the following example:

(2.10) Because every Heffalump that he counted was making straight for a pot of Pooh's honey, and eating it all. For some minutes he lay there miserably, but when the five hundred and eighty-seventh Heffalump was licking its jaws and saying to itself, 'Very good honey this, I don't know when I've tasted better,' Pooh could bear it no longer.⁴

The connection between *Pooh's honey* in the first sentence and *Pooh* is one of possessive reference.

- **Substitution** — The primary part of a noun phrase is replaced with *one* or *ones*. Consider the following example:

(2.11) At the table right next to me, there were these three girls around thirty. The whole three of them were pretty ugly, and they all had on the kind of hats that you knew they didn't really live in New York, but one of them, the blonde one, wasn't too bad.⁵

The noun phrase *the blonde one* is the result of substitution of *one* for *girl*. This noun phrase refers back to the noun phrase *these three girls around thirty* in the first sentence.

- **Ellipsis** — An element that is understood is omitted, where understood is taken in the special sense of "going without saying" (Halliday and Hasan, 1976, p. 142). The following is an example of ellipsis:

⁴Milne, A. A. *Winnie-the-Pooh*. Dell Publishing Company (1926): 64.

⁵Salinger, J. D. *The Catcher in the Rye*. Little, Brown and Company (1951): 90.

(2.12) I get out of the car and walk into the restaurant and sit at the bar and order a glass of red wine. After I finish it, I order a second and by the time Rip arrives, I've had three glasses.⁶

In the noun phrase *a second* in the second sentence, it is understood that the meaning is *a second glass of red wine*, even though *glass of red wine* is left unsaid.

- **Superordination** — One element is the name of a more general class including the other. Consider the following example:

(2.13) I sit there a little longer and the couple in the Jaguar finally honk their horn and drive off. I get out of the car and walk into the restaurant and sit at the bar and order a glass of red wine.⁷

The term *car* in the second sentence is the superordinate of *Jaguar* in the first sentence. The fact that the *car* being referred to in the second sentence is not the *Jaguar* from the first sentence is irrelevant; the relationship is between the class of *cars* and the class of *Jaguars*, not between any particular members of these classes.

- **General nouns** — Certain closed sets of nouns have generalized reference within major noun classes. Halliday and Hasan (1976, p. 274) provide the following examples:

- *people, person, woman, girl, man, boy, child* (human)
- *creature* (non-human animate being)
- *thing, object* (inanimate concrete, count noun)
- *stuff* (inanimate concrete, mass noun)
- *business, affair, matter* (inanimate abstract)
- *move* (action)
- *place* (place)
- *question, idea* (fact)

Consider the following example of a general noun being used:

(2.14) In case you don't live in New York, the Wicker Bar is in this sort of swanky hotel, the Seton Hotel . . . Then, when she was all done whispering and being cute as hell, she'd sing some dopey song, half in English and half in French, and drive all the phonies in the place mad with joy.⁸

In the second sentence, *the place* is a general noun that refers to *the Wicker Bar* in the first sentence.

⁶Ellis, B. E. *Less Than Zero*. Penguin Books (1985): 105.

⁷Ellis, B. E. *Less Than Zero*. Penguin Books (1985): 104-105.

⁸Salinger, J. D. *The Catcher in the Rye*. Little, Brown and Company (1951): 184.

- **Collocation** — Two lexical items that regularly occur together. Collocation includes the relationship between lexical items that have a kind of oppositeness, such as *man* and *woman*. It also includes the relationship between pairs of words from ordered lexical sets, such as *Monday* and *Friday*, or unordered lexical sets, such as *red* and *blue*. One of the most important relationships in collocation is that which exists between what Halliday and Hasan call “hyponyms of the same superordinate term” (Halliday and Hasan, 1976, p. 285). For instance, *Jaguar* and *Lotus* are both hyponyms of the superordinate term *car*. This is by no means an exhaustive list of what constitutes collocation, but it does include some of the most common forms of collocation. Consider this example:

(2.15) Rip drives up soon after in his new Mercedes and also seems to know the attendant and when I introduce Rip to Griffin they laugh . . . Alana and Kim and Blair drive up in someone’s convertible Cadillac.⁹

Both *Mercedes* and *Cadillac* are hyponyms of the superordinate term *car*.

Halliday and Hasan’s research provides a framework for describing the semantic relationships between sentences. They note that cohesion occurs when an element in one sentence depends on an element in another sentence for its interpretation. The cohesion relationships that they define can be divided into two categories, those between elements that are *directly* semantically related, and those between elements that are *indirectly* semantically related. These cohesion relationships will be used later in the thesis to determine how much the focus varies or stays the same between sentences. This ability to quantify, to a certain extent, the degree to which the focus changes or stays the same will be the backbone of the semantic stylistic system.

2.1.4 Morris

Morris (1988) takes a closer look at Halliday and Hasan’s concept of *lexical cohesion*. She states that lexical cohesion in text is the result of groups of related words that cover a topical unit of a text. Morris (1988, p. 3) calls such groups of related words *lexical chains*.

Morris describes how a thesaurus can be used to build lexical chains, which can in turn be used to determine the structure of text. The method she describes is interesting because, unlike much previous work in computational text analysis, it is not domain-specific.

The formation of lexical chains begins with the identification of candidate words. Words that belong to a closed set, such as pronouns, and very common words, such as *good*, *do*, and *taking* are not considered because their presence does not say anything specific about the structure of the text (Morris, 1988, p. 22–23). Once the non-candidate words in a text have been eliminated, the remaining words can be related with the help of a thesaurus. The

⁹Ellis, B. E. *Less Than Zero*. Penguin Books (1985): 73.

thesaural relations cannot, however, be used in an unlimited way. If unlimited transitivity is allowed for relations between words, then almost every word in the thesaurus will end up being related, albeit indirectly, to every other word in the thesaurus. Some degree of transitivity should, however, be allowed. If a word *a* is related to another word *b* which is in turn related to a third word *c*, then is *a* also related to *c*? Morris (1988, p. 27) claims that this is indeed the case, and that one such *transitive* link between words is sufficient to capture the "intuitive" lexical chains in her text examples.

The next question that Morris answers is how many sentences can separate two potential candidates of a lexical chain before they should be considered unrelated. In the text examples that she analyses, up to 19 sentences can separate a pair of related words. It seems that she was unable to arrive at a simple bound for the number of permissible intermediate sentences between two related words, but she does introduce the concept of *chain strength* as a measure of the prominence of a lexical chain. She proposes that chain strength is affected by three factors: the number of reiterations, the density of the chain elements (the number of chain elements per sentence), and the closeness of the words in the chain (Morris, 1988, p. 27-29).

Morris goes on to describe how her algorithm for detecting lexical chains can be used for text analysis. She claims that the lexical chains delineate structural units in the text. In order to test this claim, she compares the text structure that her scheme produces for five text examples with the structure produced by Grosz and Sidner's (1986) intentional theory. Intentional theory is described in more detail later in section 2.3.3, but for now it is sufficient to say that the intentional structure of a text describes the purpose of the text as a whole as well as the purposes of its constituent segments. Morris shows that lexical chains do in fact correspond fairly closely to the intentions produced by Grosz and Sidner's scheme.

The main drawback of Morris's work is its exclusion of some of the most common types of anaphora. It is certainly reasonable to assume that pronouns referring back to a given word should be part of the same lexical chain as the word. Of course, if we require that a lexical chain has to include all the anaphoric references to its member words, then the simplicity and generality of Morris's scheme are diminished. The thesaurus is a useful tool because it provides a complete network of connections between words without the need for extensive external reasoning. A competent anaphor resolution scheme, on the other hand, requires a good deal of reasoning, and this would make Morris's system less simple. In addition, an anaphor resolution scheme would require a certain amount domain-specific knowledge. There are certain contexts, such as a story about the family pet having kittens, where a female cat would be referred to using the pronoun *she*, and there are other contexts, such as newspaper article on the effect of feral cats on the environment in New Zealand, where such an animal would be referred to using *it*. This shows that a competent anaphor resolution scheme must make use of some domain-specific information, which means that the generality of Morris's system would be reduced if it were to include such a scheme.

Despite its exclusion of pronoun anaphora, Morris's work is relevant to my research because many of the lexical chains she finds in her examples are contained entirely within paragraphs. In one example, for instance, six of the nine lexical chains have all of their member words in a single paragraph. This supports my view that the paragraph is a legitimate unit of text.

2.2 Style

In the last section, I began to justify the first claim from the beginning of this chapter, namely that any stylistic effects that are dependent on semantics are evident between sentences rather than within individual sentences. It was established that semantic variation in individual sentences cannot cause stylistic variation, and that stylistic value can be assigned to paragraphs. In order to fully substantiate this first claim, it is necessary to look at what constitutes style. This will not only complete the justification of this claim, but it will also set the stage for justifying the second claim: if the way in which focus varies from sentence to sentence has a stylistic effect, then such a stylistic effect is part of the connection between semantics and style.

This section begins with a discussion of what constitutes style. We look at the definitions provided by Ellis, Bureau, and Enkvist. This is followed by a detailed look at the computational stylistics application from which the work in this thesis stems, DiMarco's stylistic grammar.

2.2.1 What is style?

The purpose of my research is to codify in some way the connection between semantics and style. An important, and difficult, question presents itself immediately: what is style? If the literature on text tends to be vague and nebulous, then the literature on the study of style, *stylistics*, is even more so. It is not easy to find a definition of style in the stylistic literature that is both precise and computationally practical. As a starting point, I will examine what some authors have to say about style.

The question of what constitutes style is so contentious that some authors even deny its existence. Ellis (1970, p. 75), for instance, claims that the ideas of *style* and *stylistics* are of no use in linguistics. He suggests that the term *stylistics* be replaced by *synthetic linguistics*. He goes on to suggest that synthetic linguistics deals with the study of text, while *analytic linguistics* is the study of language in general. Bureau (1976, p. 9), however, claims that Ellis's objection is only a matter of terminology, and that the division between analytic and synthetic linguistics is artificial since text is as much a part of "language in general" as any other aspect of language.

Bureau, for his part, has no doubt about the existence of style. The definition he provides, however, is not particularly precise (Bureau, 1976, p. 26, my translation):

Style can be defined as the collection of deliberate redundancies and deliberate omissions and ellipses in a text that make up a supplementary structure on top of the linguistic structure itself.

This is a typical definition of style. It is of little use in telling whether or not a specific aspect of language is or is not a matter of style.

Enkvist (1985) takes a different, and more useful, approach to defining style. He states that style is choice. Once an initial choice is made, however, subsequent choices become more and more limited. Why is this choice-based definition more useful than that of Bureau? Because it states that there is a discretionary element to language, that there is more than one way to say the same thing.

We have seen that there are lexical and syntactic choices that have stylistic effect at the sentence level (see the beginning of section 2.1). We have also seen that there are no corresponding semantic choices. Since any stylistic effects that are dependent on semantics must depend on semantic choice, the first claim is now substantiated, namely that any such effects occur between sentences rather than within individual sentences.

The question remains, of course, whether or not there *are* any stylistic effects that are dependent on semantic choices. I claim that such effects do indeed exist, and the bulk of this thesis consists of their codification.

Enkvist's work is of interest not only for the choice-based definition of style it contains, but also for the summary of some different approaches to style it provides. Enkvist mentions these approaches to stylistic variation (Enkvist, 1973, p. 15):

- **Departure** — Stylistic variation is achieved by departing from the norm. This means that deviations from conventional, unmarked linguistic structures have stylistic significance. Consider the following example of a departure from the syntactic norm for adjective placement:

(2.16) Alert, the captain paced the deck and watched the stars.

The departure can also be lexical or semantic.

- **Addition** — Stylistic variation is achieved by adding elements to expressions that are stylistically neutral. This approach assumes that any given expression has a stylistically neutral form. The expression in question is derived from the stylistically neutral base expression by the addition of stylistically significant elements. The problem with this approach is that it is difficult to think of situations where words can be added to a sentence without changing its meaning. In other words, additions cause effects that are not purely stylistic. Redundant additions do, however, have a stylistic effect. Consider these two sentences:

(2.17) Cathy laughed.

(2.18) Cathy laughed and laughed and laughed.

It could be argued that these two sentences have essentially the same meaning, and that the redundancy in the second sentence is there for stylistic reasons.

- **Connotation** — Stylistic variation comes from the textual and situational environment of each linguistic feature. This means that the stylistic significance of a given linguistic feature depends on the context in which the feature appears. There are many examples of a given lexical choice, for instance, having a different stylistic effect in different contexts. Choosing *estate car* rather than *station wagon* in sentence (2.19) will have a markedly different stylistic effect depending on where the sentence appears:

(2.19) The new Montego estate car is now available.

In the context of automotive marketing, *estate car* is a technical term used to describe a particular kind of vehicle. For the average North American consumer who is unfamiliar with the jargon of the motor trade, however, *estate car* is a very formal term. This means that using *estate car* in an automotive trade journal will convey an exact, professional style, whereas making the same lexical choice in a newspaper advertisement, for instance, will convey a prestigious, elevated style. The stylistic effect of the lexical choice depends on the context in which it is made.

Enkvist recognizes the validity of all three approaches, but he favours the third when he says (1973, p. 17) that style is:

that type of linguistic variation which correlates with context in a wide sense of the term, including both textual context and situational context.

The importance Enkvist places on textual context¹⁰ leads him to address the question of style in text linguistics. He begins his discussion of style and text linguistics by introducing the idea of text well-formedness, or *textuality*. Just as there is a concept of well-formedness for sentences, the idea of well-formedness applies to texts as well. Some writers break the rules of sentence grammar for stylistic effect, and some writers break the rules of textuality for stylistic effect. Enkvist states that textually deviant sequences of sentences are used in certain contexts, and that this suggests that the way in which individual sentences are strung together into texts is stylistically significant. This leads him to conclude, "In linguistic stylistics we should therefore try to develop concepts and frames for the description of different types of sentence sequences" (Enkvist, 1973, p. 114).

Enkvist goes on to define *theme dynamics* as one such method of describing the different types of sentence sequences. Theme dynamics is the description of patterns of thematic consistency and variance in a sequence of sentences. It identifies how the themes of individual sentences are the same and how they differ as one goes from sentence to sentence in a text.

¹⁰ *Textual context* is the context provided by the contents of the text itself.

Does Enkvist's concept of theme dynamics provide any kind of justification for the second claim that semantics and style are connected through the way in which the focus changes or remains the same from sentence to sentence? To begin with, while focus and theme are not exactly the same, they are closely related, as will be shown by the definition in section 2.4.5. Some authors, in fact, use the terms interchangeably. This means that Enkvist's observation that there is a connection between the stylistic significance of a sequence of sentences and the way the *theme* changes or remains the same can be extended to the relationship between stylistic significance and the way the *focus* changes or remains the same.

If this is the case, then why not discard focus altogether and use Enkvist's idea of theme dynamics as it stands? The reason is that I am looking for the connection between *semantics* and style. I claim that the concept of *focus* is more purely semantic than that of *theme*. *Theme* is defined as the elements in a sentence that give a common ground for the participants. The theme is identified by its position at the beginning of the sentence. Focus, on the other hand, is simply "what is being talked about". While there are syntactic clues that can help to identify the focus, the final say on what constitutes the focus has nothing to do with sentence position. Rather, it is purely semantic. My assertion that focus is more semantic than theme is not the only reason to choose focus for the application described in this thesis. In addition, there is a sizable body of computational research dealing with focus to draw upon, including work by Grosz (1977), Sidner (1983), McKeown (1985), and Carter (1987).

What has been established so far is that there is a connection between style and the way in which the focus changes or remains the same in a sequence of sentences. It has also been asserted that focus is a fundamentally semantic concept. What remains to be shown is that changes in focus occur from sentence to sentence, rather than within individual sentences. In order to do this, we need to look at focus more closely, but first we will examine Chrysanne DiMarco's work, the work upon which the research in this thesis is based.

2.2.2 A computational stylistics application

The work of Chrysanne DiMarco (1989; DiMarco and Hirst 1988) on a computational codification of style is important for two reasons. The first is that the research described in this thesis stems directly from her research. The second is that I use DiMarco's methodology as well as her vocabulary for describing style. Thus, by examining her work we shall see how the work in this thesis is both complementary and distinct.

DiMarco's research is motivated by the need for machine translation (MT) to take into account the effects of style. She proposes that the quality of the output of an MT system would be improved if its style corresponded to the style of the input. This correspondence consists of producing output whose style is both suitable for the target language and true to the writer's intentions. In order to achieve this correspondence, the *internal stylistics* of

the source and target languages need to be considered. For instance, French tends to be abstract and precise while English tends to be concrete and more lenient towards vagueness. This correspondence of style also depends on knowing how style in one language is related to style in the other (the *comparative stylistics* of the two languages) (DiMarco and Hirst, 1988, p. 148–149).

DiMarco defines style in a *non-literary, group-based, goal-directed* context. This means that she considers the style of a number of writers, as opposed to any individual, and that she relates specific syntactic structures with particular stylistic goals. In order to avoid the ambiguities of literary style, she insists on non-literary or *functional* style.

Using this restricted definition of style, DiMarco defines a *stylistic grammar* in the form of a three-part hierarchy. At the bottom of this hierarchy there are lexical, syntactic, and semantic stylistic grammars. In the middle there is a *grammar of abstract elements of style* (GAES), which groups the stylistic components produced by the bottom level grammars into *abstract elements of style*. These elements are in turn related to specific stylistic goals, such as *clarity* or *obscurity*, by the top level, the *grammar of stylistic goals* (GSG). The abstract elements that the GAES produces are part of a *stylistic metalanguage* made up of terms capturing the following essential elements of style (DiMarco and Hirst, 1988, p. 150):

- **Position** — The stylistic effect of the *placement* of a component.
- **Dominance** — The weight of the contribution of the component to the *overall* stylistic effect.
- **Balance** — The stylistic effect of the *relationship* between components.

DiMarco's research has concentrated on the syntactic stylistic grammar at the "bottom" of the three-part hierarchy. This syntactic stylistic grammar is built upon a basic "stylistic" grammar by Crystal and Davy (1969). In particular, their grammar notes the importance of pre- and post-modification in style, and this notion is elaborated upon in DiMarco's syntactic stylistic grammar.

The syntactic stylistic grammar identifies the *stylistic shapes* contained in the syntactic elements of individual sentences. A stylistic shape is a sentence component that has a particular stylistic effect (DiMarco and Hirst, 1988, p. 151). This definition is based on Quirk and Greenbaum's (1979) idea of *adjunctness*. DiMarco's term for this is *harmonic ordering*. Harmonic ordering refers to the degree of integrating effect that a sentence element has within a single level of the sentence structure. For example, a shape can be *conjunct*² (strongly integrating), *conjunct*¹ (less integrating, but still having a connective effect), *conjunct*⁰ (neutral), or *antijunct*¹ (having a disconnective effect). DiMarco's grammar also considers *hierarchic ordering*, that is, the architecture of sentences across multiple levels of subordination.

A key element of DiMarco's work is the development of a methodology for building a stylistic grammar. This methodology, which is also used in this thesis, is based on the

association of patterns of stylistic shapes with terms in the stylistic metalanguage, and the correlation of these terms with a selected set of specific stylistic goals.

My research essentially involved creating the semantic stylistic grammar at the bottom of DiMarco's three-part hierarchy. Rules for the top two levels, the GAES and the GSG, that dealt specifically with the output of the semantic stylistic grammar were also written. DiMarco's methodology and her vocabulary for describing style are used throughout this thesis. Nevertheless, there are some important differences between the two pieces of research. Syntax is naturally studied at the sentence level, and DiMarco's work on syntax and style has been mainly at the sentence level. The semantic effects of style, as we have seen, are evident between sentences, and so this thesis looks at text rather than individual sentences. The definition of stylistic shapes used in this thesis differs as well, as we shall see in chapter 4. These differences, however, do not prevent the work described in this thesis from complementing DiMarco's work on style and syntax.

In this part of the chapter we have looked at some different approaches to style and examined the computational stylistics application upon which this thesis is based. The stage is now set to examine the concept of focus more closely. The second claim from the beginning of this chapter can be substantiated by examining focus, and the relationship between focus and style can be described in more detail.

2.3 Focus

In the last two sections we looked at text and style. We are now ready to examine the concept of *focus*. By examining focus in more detail, the second claim, namely that the connection between semantics and specific stylistic effects can be seen in the way the focus changes or remains the same from sentence to sentence in a text, can be substantiated.

This section begins with some definitions of the term *focus*. This is followed by a discussion of van Dijk's approach to focus. I conclude with an examination of the computational applications dealing with focus by Grosz, Sidner, and Derr and McKeown.

2.3.1 What is focus?

The term *focus* is not easy to define. Before I attempt to define it, I will examine some related terms used to express the same idea. Linguists have discussed the idea of "what a sentence is about" in terms of *topic* and *comment*, *theme* and *rheme*, and *given* and *new*:

- **Topic and comment** — This pair of terms is used to describe the difference between what a speaker is talking about (*topic*) and what he or she has to say about it (*comment*) (Lyons, 1968). In the following example, the topic is underlined and the rest of the sentence is the comment:

(2.20) The big red truck is carrying produce to market.

The term *topic* can also be applied to an entire text. Van Dijk makes the distinction between *sentence topic* and *discourse topic*. A sentence topic is what the speaker is talking about in an individual sentence. In the example above, *the big red truck* is the sentence topic. The discourse topic, on the other hand, is a proposition that summarizes some text (van Dijk, 1980). Such a proposition does not have to appear explicitly in the text itself.

- **Theme and rheme** — These are the two terms used to describe the difference between elements in a sentence that give a common ground for the participants (theme) and elements that convey the information to be imparted (rheme) (Fibras, 1974). In the following example, the theme is underlined:

(2.21) The milk you left on the table has turned sour.

- **Given and new** — These two terms are used to describe the difference between what has already been established in the text and what new information the sentence imparts. This distinction is close to the theme/rheme distinction except that a sentence *must* have a theme, but it need not have any given information (Halliday, 1967). In the following example, the given part of the sentence is underlined:

(2.22) That book has been banned in the United Kingdom.

These definitions are by no means universal. In fact, both *topic* and *theme* are used by some authors to mean essentially the same thing as *focus*. The term *focus* itself is used in the literature in four general ways (Carter, 1987, pp. 91–92):

1. The **word or expression** in a sentence that is the centre of phonological prominence.
2. The **state** of the participants' attention at a given moment. (In a discourse, the participants are one or more speakers and one or more listeners. In a text, the only participant is the reader. This definition of focus is based on temporal change, and since the writer's state of attention is frozen, as it were, at the time the text is written, he or she is not considered to be a participant.)
3. The **entity**, in the world, on which the participants, as described in the previous definition, are centring their attention.
4. The **process** of transferring attention from one set of entities to another.

In this research, *focus* will be used in the sense of definition (3). The idea described by definition (1) will be called *phonological focus*. The process described in definition (4) will be called *focusing*.

It is important to note that focus is the denotation of a word or phrase rather than the word or phrase itself, but in order to avoid a lot of awkward references to denotation, I will

speak of words and phrases being the foci of sentences. By this I mean that the *denotations* of these words and phrases are the foci.

There is another dimension of focus that applies to definitions (2), (3), and (4): the distinction between *global* and *local* focus. *Global* focus refers to the centre of attention of an entire text. *Local* focus refers to the centre of attention of individual sentences in a text, and it is local focus that will be dealt with in this thesis.

2.3.2 A linguistic approach to focus: van Dijk

Before I discuss some of the computational applications that deal with focus, it is useful to look at a purely linguistic approach to the concept. Van Dijk (1981) discusses the concept of *focus* at length. He begins by considering a "psychological" definition of focus, "focus is the object of the act of focusing" (van Dijk, 1981, p. 144), where objects that are under focus are those that are consciously processed, while other objects are not. The problem with this definition is that everything that appears in a text is in focus to some extent. Thus, van Dijk discards this definition because it is too general to be useful. In formulating a new definition, he begins by distinguishing between:

- **Pragmatic focus** — The elements in the text that are most important for effective communication, and the elements that are most relevant to the reader in a given situation.
- **Semantic focus** — The elements in the text that are given the most prominence due to the relationship between facts and objects mentioned in the text, independent of the context.

The distinction between *semantic* and *pragmatic* focus is a valid linguistic concept, but I believe that the idea of pragmatic focus is not practical for computational applications. The complete context of a text includes not only surrounding texts, but also the real-world situation in which the text is read. Such a context is usually too complex to codify properly using current computational methods, and thus pragmatic focus is not relevant to computational applications.

Van Dijk goes on to observe that we focus on facts as well as objects and attributes. In other words, focus does not apply solely to entities and their characteristics. This supports the choice of *specification* rather than *reference* to describe the relationships between elements in a text. The intuitive approach to reference says that an element in a text *refers* to a real-world entity. Reference creates a connection between words and objects. Of course, the formal definition allows elements in a text to refer to ideas as well as objects, but this ability to refer to ideas is not readily obvious because the existence of ideas in the real world is not as evident as the existence of objects.¹¹ Specification, on the other hand, creates a

¹¹Of course, it could be argued that the existence of ideas in the real world is just as evident as the existence of physical objects, and that the special kind of sensory stimulus that physical objects provide for

connection between words and abstract structures in a knowledge representation scheme. These structures, since they do not have any direct connection to the real world, can be seen to represent ideas as easily as they represent objects. In my opinion, this lack of a direct connection to the real world makes specification a more intuitive way to deal with the connection between words and ideas, and van Dijk claims that a system that deals with focus must, in fact, deal with ideas. Nevertheless, the advantage of using specification is not all that great, and one could substitute "reference" for "specification" throughout my research without affecting its validity.

On the subject of how to detect focus, van Dijk (1981, p. 150) makes the following claim:

Elements in focus are not specifically indicated in linguistic surface structure, but only a change of focus.

By this van Dijk means that it is not always possible to identify the focus of a sentence, but it is possible to tell if the focus of a sentence differs from that of the sentences it follows. I claim that this is not entirely true. While it may not be possible to select the *unique* element in a sentence that constitutes the focus, I believe that it is possible to use linguistic surface structure to select a set of elements in a given sentence that will include the focus. Furthermore, I claim that there are linguistic clues, such as sentence structure, that eliminate certain elements from consideration. These claims will be substantiated in chapter 3.

Van Dijk provides a non-computational approach to focus. This means that some of the concepts he deals with, such as pragmatic focus, are not relevant to a computational application such as the one described in this research. In addition, I disagree with his claim that only shifts in focus, as opposed to focus itself, are indicated by surface structure. Nevertheless, he provides some support for the choice of specification over reference, and his discussion of focus is a good background for looking at the computational work by Grosz, Sidner, and Derr and McKeown.

2.3.3 Focus in discourse: Grosz

Grosz has done a great deal of work on computational applications of focus. In this section we will look at three particular pieces of work, Grosz 1977, 1981, and Grosz and Sidner 1986. In her initial application of focus to computational linguistics, Grosz (1977) describes the role of global focus in dialogue understanding. As stated above, global focus refers to the centre of attention of an entire discourse, as opposed to the centre of attention of any individual sentence. Here, focus is used to impose some structure on the dialogue and to identify the sections into which the dialogue can be divided. The sample discourse, which appears again in Grosz's later work, consists of a dialogue between an "apprentice" who is assembling an air pump and an "expert" who is telling him how to do it.

humans is not important from a philosophical point of view.

In order to represent global focus, the knowledge base for this application is partitioned into individual subsets containing entities that are in focus (*focus spaces*). By doing this, Grosz limits the search for antecedents to a subset of the knowledge base. A focus space is called *open* if it contains an entity that has recently been mentioned. Entities that are related to those in an open focus space but have not themselves been mentioned are *implicitly* in focus. When an item that is implicitly in focus is mentioned, its focus space becomes open. The focus spaces are organized as a stack, and an open focus space is closed only when the dialogue returns to a focus space lower down on the stack (Grosz, 1977).

Grosz (1981) also examines focus in multi-person dialogues. She claims that the action of changing focus is always done by one of the participants in the discourse. The idea of a focus stack is again used. Once a significant shift in focus takes place, the focus space containing the old focus is closed, and one containing the new focus is opened. The members of closed focus spaces are not directly available to the processes working in the model.

Grosz's (1981) model deals with discourses for which a good deal of general knowledge is available. For instance, the constituents of each task described in the dialogue are known. This means that when a task is focused on, the subactions and objects involved in the task can also be focused on.

Grosz observes that there are linguistic clues to shifts in focus. The use of the word *but* at the beginning of a clause, for instance, indicates that a shift in focus will probably take place. The recognition of such clues is significant. Nevertheless, it is an unrealistic assumption that a large amount of general knowledge about the discourse is available, and the sample dialogue from which Grosz gets her examples (the "air pump" dialogue described above) is not representative of discourse in general. These drawbacks, as well as the emphasis on the role of the participants in a discourse, limit the relevance of this work for my research.

Grosz and Sidner (1986) collaborated on a theory of discourse that emphasizes the role of purpose and processing in discourse. While this theory deals with some aspects of discourse, such as interruptions, that are not relevant to my work, the view of discourse structure that it describes is applicable. This theory says that discourse is composed of three distinct but related elements (Grosz and Sidner, 1986, pp. 175-176):

- **The utterance structure** — A discourse can be divided into *discourse segments* that are themselves made up of individual utterances. Grosz and Sidner draw an analogy between the way utterances make up discourse segments and the way words make up phrases. A similar comparison is made between the way that phrases fulfil certain roles in a sentence and the way that discourse segments serve particular functions in the discourse as a whole.
- **A structure of intentions** — Grosz and Sidner claim that all discourses have an overall purpose. A scheme for describing discourse structure must take into account this purpose. The intentional structure captures the purpose of the discourse as a

whole as well as the purposes of its constituent segments.

- **An attentional state** — At each point in the discourse there are some entities and relations that are closer to the centre of attention of the participants than others. These elements make up the attentional state of the discourse. A set of focus spaces is used to model the attentional state.

Of these three elements, the intentional structure and attentional state are relevant here.

Grosz and Sidner (1986) observe that all discourses have a primary purpose, and that some of these purposes serve to delineate discourses and identify incoherent discourses. The primary purpose of a discourse is called its *discourse purpose* (DP). A discourse is composed of discourse segments, each of which has its own *discourse segment purpose* (DSP). The DSP shows how the discourse segment helps to achieve the overall discourse purpose. Only intentions that are expected to be recognized can serve as discourse or discourse segment purposes. The discourse segment purposes are organized in a *dominance hierarchy*. In this hierarchy, a DSP that requires the satisfaction of other DSPs in order to be satisfied *dominates* those DSPs (Grosz and Sidner, 1986, pp. 178–179).

The attentional state is an abstract representation of the focus of attention of the discourse participants. It is modelled by a set of focus spaces. Shifts in attentional state are modelled by rules for the addition and removal of focus spaces. A focus space containing all the currently relevant entities is associated with each discourse segment. These focus spaces also contain the DSP for the discourse segment. As in the earlier work described above, the focus spaces are organized in a stack. The relationship among DSPs determines pushes and pops on this stack. There is a push when the DSP of a new discourse segment contributes to (is dominated by) the DSP of the preceding discourse segment. If a DSP contributes to an intention that is higher in the dominance hierarchy, then several intervening focus spaces are popped before the new DSP is inserted (Grosz and Sidner, 1986, pp. 179–182).

Grosz and Sidner (1986) describe a detailed and complex model of discourse. This complexity, and the assumption that a large amount of real-world knowledge about the discourse is available, make this model an impractical one to apply to the problem of semantics and style. Nevertheless, it does provide some support for my approach to codifying style because it identifies the focus structure of discourse, the attentional state, as one of the three main components of discourse. If focus is in fact this central, then it makes sense to use focus to find a connection between semantics and style.

2.3.4 Focus and anaphora: Sidner

Sidner built on Grosz's early work by looking at *immediate* or local focus. In this section, we will take a brief look at Sidner's (1979) earlier work and a more detailed look at her more recent research (1983). In the earlier work, Sidner (1979) uses focus to disambiguate definite anaphora. Sidner uses the term *focus* to refer to the element in the discourse on

which the speakers centre their attention. In order to keep track of local focus, three kinds of information are needed:

- **Current focus** — The local focus of the sentence.
- **Potential focus list** — The elements of a sentence that are potential candidates for replacing the current focus.
- **Focus stack** — The past local foci.

This information can be used to detect how focus shifts from sentence to sentence. According to Sidner, the speaker has four options for shifting focus from sentence to sentence:

- **Current focus unchanged** — Continue talking about the same thing.
- **Current focus taken from potential focus list** — Switch to a subject that was just introduced.
- **Current focus popped from focus stack** — Return to a previous subject.
- **General world knowledge used** — Discuss an element implicitly related to the current focus.

When the dialogue returns to a member of the previous potential focus list, the old focus is pushed onto the focus stack, and the current focus becomes the new focus (Sidner, 1979).

Sidner (1983) builds on her earlier work in order to create a model for the resolution of definite anaphora that exploits the role of *focusing* in discourse. *Focusing* is the process of transferring attention from one entity to another. She redefines *focus* to be the output of a theoretical process rather than an independently defined concept (Sidner, 1983, p. 278). This means that the focus of a sentence is taken to be whatever Sidner's model says it is. I think that using this kind of a definition is a bad idea since it essentially says that the model can never be wrong.

Sidner defines discourse as "a connected piece of text or spoken language of more than one sentence spoken by one or more speakers" (Sidner, 1983, p. 273). Given this definition and the one for focus, it is obvious that Sidner is not looking at exactly the same kinds of problems as those described in this thesis. Nevertheless, her work is worth looking at in detail for two reasons. First, she provides an example of a well-developed application of focus to a specific problem, definite anaphor resolution. Second, she consolidates her earlier work and that of Grosz.

Sidner begins by showing that anaphor interpretation does not simply mean finding the appropriate antecedent, since the anaphor and its antecedent do not always co-refer, as the following example shows (Sidner, 1983, p. 268):

(2.23) My neighbour has a monster Harley 1200.

(2.24) They are really huge but gas-efficient bikes.

In this example, *they* refers to Harley 1200's as a group, not to the specific Harley 1200 referred to in (1). In order to deal with this problem, Sidner introduces the idea of *co-specification*. Phrases in the discourse are said to *specify* cognitive elements in the hearer's mind. For instance, consider this sentence (Sidner, 1983, pp. 267):

(2.25) I think green apples taste best and they make the best cooking apples too.

The noun phrase *green apples* could look like this in a given knowledge representation:

string: "green apples"
context: speaker1 think * tastes best

The cognitive element this phrase specifies could look like this in a given knowledge representation:

Apples
super-concept: apples
colour: green
used-for: cooking

Now we can say that **Apples** is the *specification* of *green apples*. Specifications are said to *represent* real-world objects in that they have a well-structured correspondence with them. Two phrases that specify the same cognitive element are said to *co-specify* the element. Unlike co-reference, co-specification does not deal directly with real-world entities. Thus, it allows one to create and manipulate abstract representations. Anaphor interpretation, according to Sidner, means determining which phrase co-specifies with the anaphor.

Now it could be argued that the distinction between reference and specification is simply a matter of terminology, that the direct connection that reference makes to real-world entities is not important. In section 2.3.2, I discuss the difference between reference and specification, and I state that "reference" could be substituted for "specification" through my research without really affecting it. Nevertheless, I think that the concept of specification recognizes some of the current limitations in computational linguistics. A linguist can indeed claim that the specific motorcycle referred to in (2.23) and the class of motorcycles referred to in (2.24) are both part of the same real-world idea. For the computational linguist, however, things are not quite so simple. The connection between the individual object in (2.23) and the group of objects in (2.24) must be indirect because knowledge is usually represented computationally in discrete structures. Of course, not all knowledge representation schemes include this kind of indirection, but many extant ones do. The concept of specification clearly recognizes this indirection. By using specification rather than reference, Sidner is recognizing the limits of many current computational applications.

Sidner claims that focusing is a phenomenon of discourse, not of single sentences. This statement does not mean that individual sentences do not have their own foci; rather, it means that the changes in attention from one entity to another occur from sentence to sentence rather than within sentences. There are, however, some problems with Sidner's position. What about multiple main clauses that do not share any elements? Consider the following example:

(2.26) John eats bananas, but Jack prefers oranges.

Without getting into the details of how to determine the focus of a sentence, it is obvious that the two main clauses in (2.26) cannot have the same focus because they do not have any elements in common. This means that, given the traditional definition of *sentence*, changes in focus can indeed occur within sentences. In this thesis, however, each main clause is considered to be a *sentence* in its own right. Whether or not two main clauses are joined by a conjunction or split by terminal punctuation (a period, an exclamation mark, a question mark, or ellipsis) does depend in part on the semantic content of the clauses, as we shall see in section 2.3.5. Nevertheless, whether or not two or more main clauses are grouped together is really a matter of punctuation. Because of this, and because of the definition of *sentence* used in this thesis, it is true that my focusing model is a phenomenon of discourse, and not one of individual sentences.

Sidner's process model for focusing has three parts, each of which is applied to each sentence in a discourse. The first part uses what the speaker initially says to select foci. The second part then uses these foci and anaphor interpretation rules to interpret anaphoric expressions. The third part uses the anaphoric interpretations from the second part to update the focus. Thus, there is a "cyclic" relationship between focusing and anaphor interpretation, with focusing used to interpret anaphora, and anaphor interpretation used to determine focusing.

The focusing process deals with several different types of focus. The *actor* focus is "a discourse item which is predicated as the agent in some event" (Sidner, 1983, p. 282). Although it is distinct from the main or *discourse* focus, the actor focus can also be referred to anaphorically. The *potential* focus and the *expected* focus will be defined below.

The first step in the focusing process is finding an initial discourse focus. This is done by selecting an *expected focus* from the first sentence in the discourse. This expected focus will be either confirmed or rejected depending on the anaphors that follow it. Sidner describes several sentence types that mark focus and can be used to select the expected focus. In the following list of sentence types, the elements in focus are underlined (Sidner, 1983, pp. 284-287):

- **Pseudo-cleft**

(2.27) (agent) The one who ate the rutabagas was Henrietta.

(2.28) (object) What Henrietta ate was the rutabagas.

- Cleft

(2.29) (agent) It was Henrietta who ate the rutabagas.

(2.30) (object) It was the rutabagas that Henrietta ate.

- There-insertion

(2.31) (agent) There once was a prince who married a frog.

(2.32) (object) There was a tree which Sanchez planted.

- Is-a

(2.33) (subject) The Personal Assistant group is a research group that is designing pieces of a personal assistant program.

When the initial sentence of a discourse is not one of these types, the focus is chosen on the basis of the semantic category of the verb. The category most likely to be the focus is *theme*. Theme is close to the syntactic direct object, but includes “semantic” direct objects that are embedded in prepositional phrases. The theme in the following sentence is underlined (Sidner, 1983, p. 284):

(2.34) Mary took a nickel from her toy bank yesterday.

There is no order of preference for the categories in a sentence with no theme, but *agent* category is *not* preferred. The verb phrase can also be the expected focus, but it is even less preferred than the agent.

Once an expected focus has been selected, inferences about general knowledge are used to determine if the expected focus is in fact the focus of the discourse. If, for instance, the second sentence contains a pronoun and has no anaphors that co-specify with the expected focus, then the expected focus is discarded and another one is selected.

Sidner describes a detailed algorithm for focusing that confirms or rejects the expected focus and replaces the expected focus when it is rejected. This algorithm makes use of a *potential focus list* and a *focus stack*. The potential focus list for the current sentence includes any new terms introduced into the discourse in the previous sentence. If an element of the potential focus list does not become the discourse focus after the interpretation of the current sentence, then it is dropped from the potential focus list. The focus stack contains all the elements in the discourse that have been the discourse focus. The maintenance of the focus stack is important because it allows digressions where one element is the discourse focus, then another takes its place, and finally the original element becomes the discourse focus again.

Focus *movement* is described using the same focus confirmation algorithm described above (Sidner, 1983, p. 299). Thus, the same algorithm is used to confirm or reject the expected focus *and* to handle focus movement in general. When choices for a possible discourse focus are made in the focusing algorithm, the current discourse focus is considered

first, followed by the members of the potential focus list, followed finally by the elements in the focus stack. Focus movement and focus confirmation look suspiciously similar, and it is not clear exactly what kind of distinction Sidner wishes to make between them. Since they seem to differ only in the terms used to describe them, it is not surprising that focus confirmation and focus movement use the same algorithm.

Sidner (1983) makes several points that are pertinent to the present research. The first is that focusing occurs over the course of two or more sentences, not within the sentence itself. This point, however, seems to apply more to my focusing process than it does to Sidner's. The second is that there are specific sentence types that clearly mark the focus. Sidner makes no clear justification for the *thematic* marking of focus, but the preference for the *theme* semantic category corresponds with the position of the direct object in the focus partial ordering described in chapter 3. Finally, the idea of specification is better suited to a computational application than the idea of reference, since specification makes no direct references to real-world entities.

2.3.5 Focus and sentence structure: Derr and McKeown

Derr and McKeown (1984) describe how focus can be used to solve the text generation problem of whether an underlying semantic representation should have a single complex sentence or a series of simple sentences as its surface representation. Derr and McKeown are not alone in applying aspects of pragmatics (of which style is a part) to the problem of *realization*, that is, creating a surface representation of a conceptual representation. Watt's (1988) ELOQUENCE system, for instance, also makes use of pragmatic information, such as rhetorical goals, to determine the kind of realization a conceptual representation should receive. Derr and McKeown's work is of specific interest here, however, because of its use of focus.

Before describing Derr and McKeown's work, I wish to make a clear distinction between the way they use the term *sentence* and the way it is used in this thesis. Derr and McKeown's definition includes sentences with more than one main clause, whereas the definition used elsewhere in this thesis does not. In this section, therefore, the term *sentence* will include groupings of more than one main clause.

Derr and McKeown's model of generation involves two stages. The first of these is determining the semantic content of what is to be generated. The second stage is creating a surface structure based on the semantic content. The *surface generator* performs the second stage by using syntactic and lexical information to translate the semantic representations into English (Derr and McKeown, 1984, p. 319).

The surface generator makes decisions about whether or not to use the passive voice and when to pronominalize. This means that the same underlying meaning can have more than one surface representation. Consider the example that Derr and McKeown (1984, p. 320) provide of three different expressions of the same semantic content:

(2.35) John gave Mary a book.

(2.36) Mary was given a book by John.

(2.37) A book was given to Mary by John.

Whether not these three sentences really *do* mean the same thing is beyond the scope of this thesis. The relevant point is that Derr and McKeown make use of local focus to determine sentence structure. Earlier work by McKeown (1982) showed that focus can also be used to make decisions about pronominalization and about use of the passive voice.

Derr and McKeown (1984, p. 321) cite the following example of the importance of focus in selecting complex sentence structure over simple sentence structure:

If a speaker wants to focus on a single concept over a sequence of utterances, s/he may need to present information about a second concept. In such a case, a temporary digression must be made to the second concept, but the speaker will immediately continue to focus on the first. To signal that s/he is *not* shifting focus, the speaker can use subordinate sentence structure in describing the second concept.

If two propositions have different foci, then the decision to combine them in a single sentence in the final surface representation depends, in part, on whether or not subsequent propositions share the focus of either of the first two propositions. Consider the following propositions (Derr and McKeown, 1984, p. 320):

proposition 1:

predicate = give

protagonist = John

goal = book

beneficiary = Mary

proposition 2:

predicate = need

protagonist = Mary

goal = book

Now if a third proposition has the same focus as proposition 1, the surface representation should show that proposition 2 is a digression. This is done by making proposition 2 a subordinate clause:

(2.38) John gave Mary a book that she needed. He is usually not that generous.

If, however, the third proposition has the same focus as proposition 2, then proposition 1 and proposition 2 should be generated as two separate sentences:

(2.39) John gave Mary a book. She needed it but was unable to afford it.

Derr and McKeown's system has some limitations. No gradation of focus is allowed: either two propositions have the same focus or they do not. Cases where the focus shifts slightly are not dealt with. In addition, it is not clear how their system would deal with cases where there is a digression longer than a single proposition. If a proposition is followed first by two propositions that have a different focus and then by a proposition that has the same focus, should the two middle propositions become subordinate clauses in the surface structure or should they become separate sentences? Derr and McKeown do not answer this question. In fact, their generator only looks for focus shifts over a sequence of three propositions. Despite these limitations, Derr and McKeown make a point that is relevant to the present research: sentences tend to have some kind of consistency of focus among their clauses.

2.4 Discussion

Now that we have looked at a purely linguistic approach to focus as well as several computational applications, what can we say about the second claim, that if variances in focus have stylistic significance, then a connection between semantics and style is shown by these variances? According to the definitions used here, focus changes occur between sentences rather than within them. This means that the significant consistencies and variances in focus can be measured between sentences. Furthermore, focus is an essentially semantic quality. I claim that variances in focus do indeed have a stylistic effect. This idea will be discussed at length in chapter 4, but its validity has no real effect on the validity of the second claim. Focus is a semantic quality and therefore any stylistic effects resulting from focus variation represent a connection between style and semantics. This completes the substantiation of the second claim from the beginning of this chapter. This section summarizes the ideas presented in this chapter by giving final definitions for some of the key terms. With solid definitions for these terms we will be ready to begin the description of the semantic stylistic system itself in the next chapter.

2.4.1 Sentence

In order to include as many instances of *textual sentences* as possible, the definition of a *sentence* must be carefully worded. A textual sentence is a sequence of words from an existing written text that has the first letter in the first word of the sequence capitalized and has a *terminal punctuation mark*. A terminal punctuation mark, in English, is a period, an exclamation mark, a question mark, or an ellipsis. A traditional, "grammar book" definition for sentences might state that they are made up of clauses, which are themselves made up of noun phrases and verb phrases, which can in turn be made up of noun phrases and prepositional phrases. Such a definition would *not* consider individual subordinate clauses

to be sentences. In addition, a group of phrases must follow certain ordering and agreement rules in order to be considered a sentence under such a definition. The definition that I adopt is much less stringent. In order to recognize many of the sentences that appear in real examples of written language (spoken language would require an even looser definition of the sentence), the definition must include individual noun phrases, verb phrases, and prepositional phrases that stand alone, as well as subordinate clauses. Thus, the definition for a sentence used in this thesis covers not only the traditional sentence (a main clause with optional subordinate clauses, each of which is made up of noun phrases and verb phrases), but also any identifiable constituent of such a sentence that is punctuated as a sentence. This definition does not allow, therefore, sentences within sentences. A noun phrase, for instance, can only constitute a sentence if it appears alone as a textual sentence; it cannot be a sentence if it is not punctuated as one. The definition also excludes groupings of more than one main clause. Each main clause in such a grouping is considered to be a sentence itself. A *sentence*, therefore, is a series of one or more phrases that together do not break any of the English rules of agreement and order, and that together do not form more than one main clause.

2.4.2 Paragraph

The definition of a *paragraph* must also be carefully chosen. There is an intuitive sense of "paragraphness" that parallels the traditional definition of the sentence. We have a sense that a paragraph should consist of sentences that are semantically connected and that relate a complete thought. In actual examples of written language, however, paragraphs quite often consist of semantically unconnected sentences that do not constitute any kind of semantic unit. In fact, I claim that such unconnected paragraphs are stylistically significant. Thus, I define a paragraph to simply be a sequence of sentences that is set off from the surrounding sentences by such typographical devices as indentation or blank lines. This definition makes no claims about semantic connections between the sentences in a paragraph, and thus it covers all of the paragraphs that occur in real written language, not just the "style book" paragraphs that follow the traditional conventions of expository writing.

2.4.3 Text and discourse

For *text* I adopt Muller's (1977, p. 7) definition. Text is:

any utterance or any succession of utterances, any use of speech or fragment of speech, with no restriction on its extent, produced by a single speaker or writer and displaying a certain unity.

This definition is important because it notes that text, as opposed to discourse, is produced by a single participant, and because it makes no specific claims about the degree of cohesion needed in text. I simply view text as a series of one or more paragraphs.

Discourse is a term that is sometimes used interchangeably with *text*. Here, *discourse* will have a more specific meaning. A discourse is a series of utterances, produced by two or more *participants* (speakers or hearers), that has some degree of semantic cohesion. Once again, no claim is made about the degree of cohesion needed. Discourse is usually considered in the context of spoken language, and while a written transcription of a spoken discourse is still a discourse, the original interaction between the participants usually occurs as spoken language.

2.4.4 Style

Style is a basic constituent of pragmatics. Therefore, I must first say something about pragmatics as a whole before I define style. The intuitive approach would be to claim that pragmatics is any aspect of language that does not fit neatly into syntax, semantics, or lexis. One of my basic assumptions is that style is in fact affected by syntax, lexis, and semantics. Like other pragmatic concerns, style is plagued by imprecise definitions. I think that Enkvist's (1985) characterization of style as *choice* best captures the essence of the concept. Style is that part of language that is, in effect, "left up to the author". Communicative effectiveness is most certainly affected by style, but a given message can be expressed in many different ways depending on the stylistic effect the author wishes to convey.

In order to deal with style in a computational context, DiMarco's (1989) approach is used in this thesis. It is *non-literary*, *group-based*, and *goal-directed*. It is non-literary in order to avoid the problems of ambiguity and nuance in literary style. This thesis does contain examples of text taken from novels, but the inclusion of these texts is not meant to presume that the system described herein is necessarily capable of dealing with literary language as a whole. The approach is group-based in order to avoid the difficult problem of identifying the stylistic characteristics of individual writers. The most important aspect of DiMarco's approach to style is that it is goal-directed. Instead of trying to deal with the whole range of stylistic effects, DiMarco limits herself to three specific goals, *concreteness*, *clarity*, and *dynamism*. DiMarco chose these goals for her analysis of style in machine translation because they mark three important areas where English style differs from French style. Compared to French, English tends to be concrete, dynamic and more tolerant of vagueness, while French is more abstract, static, and precise. In order to keep the work in this thesis compatible with DiMarco's work, her definition of style has been adopted. I deal with the stylistic goals of *clarity*, *dynamism*, and *emphasis* (rather than *concreteness*) because *concreteness* depends on lexical choice.

2.4.5 Focus

Focus is not easy to define since, as we saw in section 2.3, the term is used to mean several different things. Of the four common uses provided by Carter (1987), I selected the

following:

The entity on which the reader of a text is centring his or her attention.

This definition, however, is not quite complete. As van Dijk (1981) pointed out, the centre of attention need not be an entity.¹² It can also be an idea. In addition, I am interested in the centre of attention of individual sentences, the *local* focus, rather than the centre of attention of the text as a whole, the *global* focus. These two qualifications produce the following revised definition for focus:

The entity or idea in an individual sentence on which the reader of a text is centring his or her attention.

These entities or ideas must have words or phrases in the sentence to denote them. In other words, only the denotations of words or phrases that actually appear in a given sentence, or are implicit in ellisions, can be the focus of the sentence.

¹²Van Dijk uses *entity* to refer to physical objects and *idea* to refer to cognitive objects. Some other definitions of *entity* include cognitive as well as physical objects.

Chapter 3

Determining Focus: Sentence-level Processing

The semantic stylistic system is divided into three parts: the sentence-level processing, the paragraph-level processing, and the grammars that relate patterns of focus to stylistic goals. In this chapter, I describe the sentence-level processing, which has as its output the NPs that are most likely to be the focus in a given sentence.

In chapter 5, I use the way that focus changes from sentence to sentence in a paragraph to describe the semantic aspects of style. In order to describe how the focus changes, I must first have some way of determining which noun phrases in a given sentence constitute the focus. The mechanism used to do this is the *focus partial ordering* (FPO).

The FPO is divided into two parts. The first part, the noun phrase grouping, puts all the noun phrases in a sentence into three groups: *focal-assured*, *focal-prevented*, and *focal-allowed*. The second part, the focal-allowed rules, ranks the focal-allowed noun phrases according to their *focal potential* (how likely they are to be the focus of the sentence). This chapter begins with a discussion of the general strategy behind the FPO. I will then look at the three noun phrase groups defined in the first part of the FPO. The rules that are used to rank the *focal-allowed* noun phrase group are then described. I conclude by applying the FPO to some a sample sentence.

3.1 General Strategy

There are several strategies that can be used to determine the focus of a sentence. Sidner's (1983) strategy, described in section 2.3.4, uses the sentence type and the semantic category of the noun phrases, with respect to the main verb of the sentence, to determine the focus. The strategy used in the FPO is similar to Sidner's, but it relies on grammatical role rather than semantic category. The grammatical role of noun phrases can be determined with a less complex parsing process than is required to determine the semantic category.

The FPO is applied separately to each sentence in a sequence of sentences. This process results in a *focus set*, the set of noun phrases that are most likely to be the focus of the sentence. These focus sets are later used to determine how the focus changes or stays the

same from sentence to sentence.

It is important to note that I am only dealing with noun phrases. Other sentence constituents, such as verb phrases and adverbials, can also be the focus of a sentence, but these constituents are usually not referred to anaphorically as often as NPs. Ellipsis, for instance, is used to refer anaphorically to a verb phrase or part of a verb phrase. Consider the following example:

(3.1) John likes kiwis. I don't.

In the second sentence, the latter part of the verb phrase *don't like kiwis* is elided. This kind of anaphora, while it is common, does not occur as frequently as noun phrase anaphora, and it usually only occurs between two adjacent sentences. Noun phrase anaphora, on the other hand, can stretch across many sentences. Pronouns with a common antecedent, for instance, can appear in many sentences.

I am limiting my investigation to noun phrases for three reasons. The first is that the focus of a sentence is most often a noun phrase. The second is that noun phrase anaphora is more common than anaphora involving other kinds of constituents, such as verb phrases. The third and most important reason is that dealing only with NPs simplifies the codification. It would, of course, be possible to include sentence constituents other than NPs in this analysis of focus, but it would make the codification much more complex.

3.2 The Noun Phrase Groupings

Now that we have looked at the general strategy behind the FPO, we can examine the three NP groupings: *focal-assured*, *focal-prevented*, and *focal-allowed*.

3.2.1 Focal-assured

Focal-assured noun phrases are those that are in focus regardless of their grammatical role. These noun phrases are immediately placed in the focus set for the sentence in question. Sidner (1983, p. 284–287) identifies the sentence types (cleft, pseudo-cleft, *there*-insertion, and *is-a*) that explicitly mark focus. Taglicht (1984, p. 11) notes that *this* and *that* noun phrases are more likely than other noun phrases to constitute the focus. This means that the following types of noun phrases are focal-assured:

- The complement of *to be* in pseudo-cleft sentences — For example:

(3.2) The one who makes the beds is George.

- The complement of *to be* in cleft sentences — For example:

(3.3) It is George who makes the beds.

- The complement of *to be* in *there*-insertion sentences — For example:

3.4 An Application of the FPO

In order to illustrate how the FPO works, I will apply it to the following sentence:

(3.25) I hand him the joint and the book of matches from the Ginger Man.¹

This sentence has the following noun phrases:

- **Subject** — *I*
- **Direct object** — *the joint and the book of matches from the Ginger Man*
- **Indirect object** — *him*
- **Object of preposition** — *matches, the Ginger Man*

All of these noun phrases are focal-allowed. After we apply the rules in table 3.1 to them, we get a the following relationships:

I > *him* by rule (2)
I > *the Ginger Man* by rule (3)
the joint and the book of matches from the Ginger Man > *matches* by rule (4)
the joint and the book of matches from the Ginger Man > *I* by rule (1)
the joint and the book of matches from the Ginger Man > *him* by rule (5)
the joint and the book of matches from the Ginger Man > *the Ginger Man* by rule (4)

Since *the joint and the book of matches from the Ginger Man* is the only NP that is not subordinate to any other NP, it is the only one in the focus set.

Of course, not all sentences will have only focal-allowed noun phrases. Here is a sentence with all three categories of noun phrases:

(3.26) Julian says that there are some problems ...²

This sentence has the following noun phrases:

- **Subject** — *Julian, there*
- **Direct object** — *some problems*
- **Indirect object** — [none]
- **Object of preposition** — [none]

These noun phrases fall into the following categories:

¹Ellis, B. E. *Less Than Zero*. Penguin Books (1985): 159.

²Ellis, B. E. *Less Than Zero*. Penguin Books (1985): 165.

(1) direct object \succ subject	(4) NP1 \succ NP2 if NP2 is a constituent of NP1
(2) subject \succ indirect object	(5) if A \succ B and B \succ C then A \succ C
(3) subject \succ object of preposition	

Table 3.1: The FPO Focal-allowed Rules

What about general pronouns with no specific referent? In sentences like the following the pronouns *you*, *they*, and *one* refer to a body of opinion or a general, undefined group of people.

(3.22) You have to learn how to walk before you can run.

(3.23) They say that the streets of London are paved with gold.

(3.24) One can never be too brief or too polite.

Can the vague denotation of such an NP be the focus of a sentence? I claim that it cannot because it is so general, and because it therefore does not really have much meaning.

3.2.3 Focal-allowed

All the noun phrases in a sentence that are neither focal-prevented nor focal-assured are focal-allowed, and thus the majority of noun phrases in most sentences will be focal-allowed. A particular focal-allowed noun phrase may or may not appear in the focus set of the sentence in question, depending on how it is ranked.

3.3 The Focal-Allowed Rules

Once the focal-allowed noun phrases in a sentence have been identified, they are ranked in a partial ordering according to the relation \succ described in table 3.1. This is a *partial* ordering of the focal potential of noun phrases because relationships are identified only between the specified pairs of noun phrases. Nothing is said about the relationship between noun phrases that are not explicitly related by the partial ordering rules.

Those focal-allowed noun phrases that are not subordinate to any other noun phrases, that is, they do not appear on the right hand side of any \succ relationship, become part of the focus set. Thus, the focus set consists of all the focal-assured noun phrases and all the focal-allowed noun phrases that are not subordinate to any other noun phrases.

The justification for the focal-allowed rules comes from the results of the test described in appendix B. This test established the relationship between grammatical role and focal potential. While the results were not sufficient to establish the absolute correctness of these rules, the accuracy for a given sentence is not critical because the output of the FPO is a *set* of noun phrases (the focus set) with the most focal potential, rather than a single, unique, noun phrase constituting the focus.

(3.4) There is an unmade bed in the guest room.

- ~~The subject of *to be in is-a* sentences — For example:~~

(3.5) Our friend George is a maker of beds.

- *This* and *that* noun phrases — For example:

(3.6) You're the one who got me into this mess.

(3.7) Those idiots are going to get themselves killed.

How can I be certain that the types of NPs listed above are, in fact, focal-assured? In the cleft, pseudo-cleft, and *there*-insertion sentences, the complement of the verb has a special prominence because of the sentence structure. In a very real way, the rest of the sentence is “about” the complement of the verb. In the same way, the remainder of an *is-a* sentence is “about” the subject. *This* and *that* are used in order to give their referents prominence or to distinguish them from the referents of other NPs. This prominence means that such NPs are more likely to constitute the focus of a sentence than other NPs.

3.2.2 Focal-prevented

Focal-prevented noun phrases are those that never appear in the focus set, regardless of their grammatical role. These noun phrases do perform a syntactic role but do not carry much semantic information. Because of this, they cannot form the centre of attention of the sentence in which they occur. The following types of noun phrases are focal-prevented:

- The subject of *to be* in pseudo-cleft sentences — For example:

(3.8) The one who makes the beds is George.

- The *it* in cleft sentences — For example:

(3.9) It is a pleasure to see you.

- The *there* in *there*-insertion sentences — For example:

(3.10) There are two ways to do things, my way and the right way.

- The understood *you* in imperative sentences — For example:

(3.11) [you] Give me the screwdriver on the desk.

- Personal pronouns with no specific referent — For example:

(3.12) You never can tell.

(3.13) They say that money can't buy happiness.

If a sentence has no noun phrases at all, or if it has only focal-prevented noun phrases, then its focus set will be empty.

How can I be sure that these NPs are focal-prevented? In cleft and pseudo-cleft sentences, the subjects do not convey any semantic information. A noun phrase that only fulfills a syntactic role without having any real semantic value cannot be the centre of attention of a sentence. Furthermore, the complement of the verb in both types of sentences is strongly marked for focus, as noted in the previous section. With such a strongly focal noun phrase in the sentence, it is safe to ignore the subject in the focus selection process.

The argument for considering *you* in imperative sentences to be focal-prevented is a little more involved. The definition of focus in section 2.4.5 states that only denotations of phrases that actually appear in the sentence can be the focus. It could be argued that *you* in imperative sentences is elided, and that it can therefore be the focus. I claim, however, that normal NP ellision is different from the omission of *you* in imperative sentences. Consider the following pair of sentences:

(3.14) Cathy had white wine, but I had red.

(3.15) Cathy had white wine, but I had red wine.

In (3.14), *wine* is omitted, but understood, after *red*. I claim that these two sentences have exactly the same meaning. Now consider the following two imperative sentences:

(3.16) Take out the garbage.

(3.17) You take out the garbage.

I claim that these two sentences do *not* have the same meaning. The second one is, I think, clearly more emphatic. Sentence (3.17) is also ambiguous (it could be a statement that the person being spoken to is in the habit of taking out the garbage) while (3.16) is not. Furthermore, there are discourses where (3.17) could not be substituted by (3.16) without changing the discourse significantly. Consider this exchange between two, admittedly juvenile, participants:

(3.18) Participant 1: I took out the garbage last week. Why don't you do it?

(3.19) Participant 2: No, you take out the garbage.

(3.20) Participant 1: You take out the garbage.

(3.21) Participant 2: No, you.

I claim that in this discourse (3.16) could not replace (3.20) without destroying the effectiveness of the discourse. In other words, the *you* that is missing from imperative sentences is not recognized as such by the average speaker, and thus when *you* is included in an imperative sentence the meaning of the sentence changes. Now, by appealing to the definition of focus, I can say that *you* in imperative sentences can be disregarded in the search for the focus, since only denotations of words or phrases that actually appear in a sentence can be the focus of the sentence.

- Focal-assured — *some problems*
- Focal-prevented — *there*
- Focal-allowed — *Julian*

Since there is only one focal-allowed NP, *Julian*, it is not subordinate to any other focal-allowed NPs. This means that the focus set for this sentence contains *Julian* and *some problems*.

In this chapter I have discussed the sentence-level processing of the semantic stylistic system. I have defined the mechanism, the FPO, that determines which NPs in a given sentence are most likely to be the focus. I have also defined the output of the FPO, the focus set. We are now ready for the next chapter, where focus sets are used to describe how the focus changes over the course of an entire paragraph.

Chapter 4

Patterns of Focus: Paragraph-level Processing

In the last chapter, I looked at the processing done by the semantic stylistic system at the sentence level. In this chapter, I discuss the part of the semantic stylistic system that deals with entire paragraphs. The output, a *pattern of focus*, is a description of how the focus changes or stays the same from sentence to sentence in a paragraph. The concept of patterns of focus has already been introduced informally, but in this chapter it will be defined in detail. The different types of patterns of focus will be discussed, and their relationship to DiMarco's concept of *stylistic shape* will be examined.

One of the cornerstones of DiMarco's syntactic stylistic grammar is the concept of *stylistic shape*. A stylistic shape is defined by DiMarco as a stylistic component with a particular stylistic effect. A postmodifying adjective is an example of a stylistic shape in the syntactic stylistic grammar. This particular stylistic shape has a discordant effect on the harmony of the sentence (DiMarco and Hirst, 1988, pp. 150–153). Since the semantic stylistic system is supposed to complement DiMarco's work, and because it was constructed using DiMarco's methodology, it is important to carefully define stylistic shape in the context of this research. In order to do this, the idea of *patterns of focus* must first be defined formally. Once this is done, it will be possible to say exactly what a stylistic shape is in the semantic stylistic system.

4.1 What is a Pattern of Focus?

As noted in chapter 2, I codify the connection between semantics and style by describing the way the focus changes from sentence to sentence in a given paragraph. *Patterns of focus* are used to describe these changes in focus. The goal of the paragraph-level processing of the semantic stylistic system will be to describe the changes of focus in a given paragraph. In most cases, it will be possible to describe the entire paragraph with a single pattern of focus. There will, however, be certain paragraphs, especially very long ones, that can only be described by an *ordered set of patterns*.

The first pattern of focus in this ordered set will correspond to a sequence of sentences

that starts at the beginning of the paragraph, the next pattern will correspond to a sequence of sentences that starts immediately after the first sequence ends, and so on. Together, these constituent sequences of sentences form a partition of the set of sentences in the paragraph. Since there is not a one-to-one correspondence between patterns of focus and paragraphs, I will speak of associating a pattern of focus with a sequence of sentences rather than with a paragraph. This does not, however, diminish the importance of the paragraph as the appropriate level of text for the description of style. In cases where more than one pattern of focus is needed to describe a paragraph, these patterns are "bundled together" by the grammars that relate patterns of focus to stylistic goals (see description in chapter 5), and thus the paragraph remains the central unit of text for the analysis of style.

There are two major types of patterns of focus, *atomic* patterns of focus and *composite* patterns of focus. *Atomic* patterns of focus describe how the focus changes between two consecutive sentences, while *composite* patterns of focus describe how the focus changes over a sequence of two or more sentences. A sequence that is only one sentence long is defined to have no atomic pattern of focus, and will be defined to have a *neutral-focus* composite pattern of focus. Is this a reasonable statement? In light of the discussion on the connection between semantic and stylistic variation at the sentence level in section 2.1 it most certainly is. This discussion established that semantic variation in an isolated sentence (that is, a sequence that is only one sentence long) cannot result in stylistic variation.

In the remainder of this section I review Halliday and Hasan's (1976) cohesion relationships. The atomic patterns of focus are then defined. I conclude the section by defining the composite patterns of focus.

4.1.1 Co-specificational and specificationally related NPs

The patterns of focus are created from the cohesion relationships defined by Halliday and Hasan (1976). Because of this, we must review these relationships before defining atomic patterns of focus in detail. These relationships are classified according to Sidner's concept of *specification* discussed in chapter 2. According to the definitions provided in section 2.3.4, two noun phrases are said to be *co-specificational* if they specify the same cognitive elements in the knowledge base. Two noun phrases are said to be *specificationally related* if they specify two separate but semantically related cognitive elements in the knowledge base. The co-specificational cohesion relationships are *repetition*, *pronominal reference*, and *synonyms*. The specificationally related cohesion relationships are *possessive reference*, *substitution*, *ellipsis*, *superordination*, *general nouns*, and *collocation*. These relationships were defined in detail in section 2.1.3.

4.1.2 Atomic patterns of focus

Now that we have reviewed the cohesion relationships, we can examine how they are used to build the atomic patterns of focus. As one moves from one sentence to the next in a

sequence of sentences, the focus can remain the same, change slightly, or change completely. The three atomic patterns of focus that correspond to these possibilities are *static*, *shift*, and *jump*:

- **Static** — There are at least two NPs, one from the focus set of one sentence and one from the focus set of the other, that are co-specificational. Since the focus sets of the two sentences are related in this way it can be said that the focus does not change: it remains *static*. In the following example, the focus set of the first sentence is *Bonn*. The focus set of the second sentence contains *West Germany, an extraordinary summit in Brussels on February 11–12*, and *Germany's turn*. *Bonn* and *West Germany* are co-specificational.

(4.1) Mitterrand nonetheless firmly reminded Bonn that it was its move now. He pointed out it was West Germany that asked for an extraordinary summit in Brussels on February 11–12 and it was Germany's turn now to take over the Community presidency for the next six months.¹

- **Shift** — While the focus sets of the two sentences have no NPs that are co-specificational, there is a semantic relationship between an NP in one sentence and an NP in the other sentence. This means the focus changes slightly: it *shifts*. There are three possible ways to have a shift pattern of focus:
 - Two focus set NPs, one from one sentence and one from the other, are specificationally related.
 - An NP in the focus set of one sentence is co-specificational or specificationally related to a non-focus set NP from the other sentence.
 - Two non-focus set NPs, one from one sentence and one from the other, are co-specificational or specificationally related.

The following is an example of a shift pattern of focus caused by the second reason above. In this sequence, *Eeyore* is in the focus set of the first sentence, and *he*, which is not in the focus set of the second sentence, is co-specificational with *Eeyore*:

(4.2) But Eeyore wasn't listening. He was taking the balloon out, and putting it back again, as happy as could be.²

- **Jump** — Two adjacent sentences have no NPs that are specificationally related or co-specificational, and so the focus changes completely: it *jumps*. In the following example, no NP in the first sentence is specificationally related or co-specificational to any NP in the second sentence:

¹Dhombres, D. and Tréan, C. "Slim pickings from Anglo-French summit", *Manchester Guardian Weekly* 138(6), 1988: p. 13.

²Milne, A. A. *Winnie-the-Pooh*. Dell Publishing Company (1926): p. 89

(4.3) "Yes, she's really feeling fine." I'm tempted, for a moment, to tell him about the Ferrari parked in the driveway.³

It is important to note that a shift pattern of focus can only occur if none of the focus set NPs from one sentence is co-referential with any of the focus set NPs from the other, and that a jump pattern of focus can occur only if none of the NPs from one sentence is specificationally related or co-specificational with any of the NPs from the other. This means that one and only one atomic pattern of focus applies to any two consecutive sentences.

One might ask what method is used to detect the semantic relationships that lead to a static or shift pattern of focus. In chapter 6 there is a description of how the computational application actually determines if two NPs are co-specificational or specificationally related. For the "ideal" semantic stylistic system, one can imagine a knowledge base that contains all of the possible semantic relationships between cognitive elements (that is, the elements that the NPs themselves specify). Not every relationship will be appropriate for every context. For instance, in some contexts, such as a discussion of the role of the monarchy in Canada, *the Queen* and *Elizabeth Windsor* should be co-specificational, while in others, such as a discussion of recent Dutch history, they should not be co-specificational. This means that some relationships will have to be marked as invalid for some contexts. This is not, of course, the ideal way to determine the semantic relationships between NPs in a piece of text. The author can always invent new words, or invent new meanings for existing words. For instance, in the novel *A Clockwork Orange*⁴ the author creates an entire dialect that, while it contains many unfamiliar words and constructions, is still comprehensible. Granger (1977) proposes that this comprehensibility may be due to some special processing method that humans use to extract the meanings of words from context. Because meaning can be extracted from context, the transmission of meaning from author to reader need not have anything to do with the contents of any dictionary. This means that any system that depends on some external knowledge base, rather than the text itself, to establish the semantic relationships that exist between the words in the text and the entities that they specify will be flawed. I believe that extracting meaning directly from the text is, unfortunately, beyond the reach of contemporary computational linguistics.

There are other aspects of the paragraph-level processing that are less than ideal. One might well object to the coarseness of the measure of semantic closeness. How can just three atomic patterns of focus capture the full range of differences in meaning? To begin with, the static and jump patterns of focus seem to be valid; it is usually not too difficult to determine if two NPs "mean the same thing" or if their meanings are completely unrelated. The shift pattern of focus, however, presents a problem since it covers a wide range of closeness between NPs. If a focus set NP from one sentence is specificationally related to a focus set NP from another, then there is a shift pattern of focus between the two sentences.

³Ellis, B. E. *Less Than Zero*. Penguin Books (1985): p. 42.

⁴Burgess, A. *A Clockwork Orange*. Norton (1977).

At the same time, if a non-focus set NP from one sentence is specificationally related to a non-focus set NP from another, then there is also a shift pattern of focus between the two sentences. It seems that two sentences that have a shift pattern of focus between them because of a relationship between their focus set NPs are semantically closer than two sentences that have the same pattern thanks to a relationship between their non-focus set NPs. Dividing the shift pattern of focus into finer gradations would reflect this difference in semantic closeness, but it would also cause several significant problems. Consider, to begin with, the following two pairs of sentences:

(4.4) John is upset. His car is in the shop.

(4.5) The Grand Duchy of Warsaw is in rebellion. The Tsar will not be pleased.

The two sentences in (4.4) have a shift pattern of focus between them because *John* is specificationally related to *his car* by possessive reference. A shift pattern of focus also exists between the two sentences in (4.5) since *the Grand Duchy of Warsaw* and *the Tsar* are specificationally related by collocation. Now, it is my intuition that *John* and *his car* are semantically much closer than *the Grand Duchy of Warsaw* and *the Tsar*. In order to deal with cases like this one, I would like to be able to split the specificational relations into a series of subtle gradations of semantic closeness. The problem with such a gradation is that it is impossible to say authoritatively that a given pair of NPs is as close in meaning as another pair. Suppose that I add a third pair of sentences to the two already presented:

(4.6) Cathy has a red Land Rover. Sandra had a green one, but she sold it.

These two sentences have a shift pattern of focus between them because *a red Land Rover* and *a green one* are specificationally related by substitution. The question that must be answered is whether *John* and *his car* from (4.4) are more or less closely related than *a red Land Rover* and *a green one* from (4.6). An even more difficult question is whether there are any other pairs of NPs that are *exactly* as close as *a red Land Rover* and *a green one*. I could try saying that NPs related by the same cohesion relationships (that is, possessive reference, substitution, ellipsis, superordination, general nouns, and collocation) have the same semantic closeness, but there is too much variance in semantic closeness within these classes, especially collocation, for this to be valid.

In order to avoid the problem of saying exactly how close in meaning two NPs are, I simply say that those NPs that are not co-specificational, and yet do have some semantic relation, are specificationally related. The three atomic patterns of focus that result from this decision cannot, of course, capture all the nuances of semantic relationships, but they are superior to simply saying that two NPs are either semantically identical or semantically unrelated.

static ← static (static)*	jagged ← jump shift	final-jump ← static jagged
stepped ← shift (shift)*	jagged ← jagged (jagged)*	initial-shift ← stepped static
jagged ← jump (jump)*	final-shift ← static stepped	initial-jump ← jagged static
neutral-focus ← no atomic pattern of focus		
cycle ← the focus sets of the first and last sentences of the sequence (which is at least three sentences long) have co-specificational elements, and these elements are not co-specificational to any elements of the focus sets of the intervening sentences.		

Table 4.1: Composite patterns of focus

4.1.3 Composite patterns of focus

Now that the three atomic patterns of focus have been defined, we are ready to see how they can combine together to form composite patterns of focus. Composite patterns of focus describe how the focus changes or remains the same over a sequence of two or more sentences, and they are formed by combining the atomic patterns that exist between consecutive sentences in the sequence. Table 4.1 shows how the three atomic patterns of focus are joined together to form composite patterns. It is important to note that each of the three atomic patterns of focus has a corresponding composite pattern of focus. A sequence of two sentences with a *static* atomic pattern of focus, for instance, has a *static* composite pattern of focus as well. A sequence of two sentences with a *shift* atomic pattern of focus has a *stepped* composite pattern of focus. A sequence of two sentences with a *jump* atomic pattern of focus has a *jagged* composite pattern of focus. This means that atomic patterns of focus are only useful because they make up composite patterns of focus. Once the composite pattern of focus has been identified for a sequence of sentences, the atomic patterns of focus comprising it are no longer used.

The *cycle* composite pattern of focus is special because its existence does not depend directly upon atomic patterns of focus, but rather on a consistency of focus between the first and last sentences in a sequence that is at least three sentences long. When the first and last sentences of a sequence have co-specificational focus set NPs, and these same NPs are not co-specificational to any NPs in the focus sets of any of the intervening sentences, then the sequence has a *cycle* composite pattern of focus. This pattern is important because it captures the common paragraph structure of introducing a subject, making a digression from the subject, and returning to the subject again at the end of the paragraph.

The Composite Pattern Set

When the atomic patterns of focus for a paragraph are combined into composite patterns by the rules in table 4.1, an attempt is made to cover as many sentences as possible with a single composite pattern. In order to do this, an algorithm is applied that has as its output

a *composite pattern set*. This set contains the composite patterns of focus corresponding to the sequences of sentences that make up the paragraph. In most cases, the paragraph can be described with a single composite pattern of focus, and so the composite pattern set will only have one element. When the paragraph must be described in terms of its constituent sequences of sentences, however, the composite pattern set will contain one element for each such sequence. The algorithm has the following steps:

1. Define the *atomic pattern set* to be the ordered set of all the atomic patterns of focus that occur between pairs of consecutive sentences in the paragraph.
2. Apply all the rules from table 4.1 that can be applied, beginning with the first element of the atomic pattern set. Select the rule that consumes the most atomic patterns, call the composite pattern that appears on the left-hand side of this rule the *current composite pattern*, and remove all the atomic patterns that have been consumed from the atomic pattern set.
3. If the atomic pattern set is empty, then make the current composite pattern a member of the *composite pattern set*. The paragraph has been completely described by composite patterns of focus, so STOP.
4. If the atomic pattern set is not empty, then attempt to select the rule from table 4.1 that combines the current composite pattern with the most members of the atomic pattern set. Remove all the atomic patterns that this rule consumes from the atomic pattern set. Call the composite pattern that appears on the left-hand side of this rule the (new) current composite pattern. Go to step 3.
5. If the atomic pattern set is not empty, and there are no rules in table 4.1 that combine the current composite pattern with members of the atomic pattern set, then make the current composite pattern a member of the composite pattern set. Go to step 2.

Applying this algorithm to the atomic patterns of focus that occur between consecutive sentences in a paragraph should result in a minimal number of composite patterns of focus to describe the paragraph.

An example

Now that we have looked at the rules used to combine the atomic patterns of focus into composite patterns of focus, let us consider an example. In the following example, the noun phrases that are in the focus sets of their respective sentences are underlined. Ellided noun phrases are shown in square brackets. Note that according to the definition of *sentence* used in this thesis, each main clause constitutes a sentence:

(4.7) (1) I walk over to the window and (2) [I] tell him that I'm leaving in five days. (3) There are magazines lying out by the pool and (4) the wind moves

them, (5) [the wind] sends them flying across the concrete near the pool. (6) A magazine falls in. (7) Daniel doesn't say anything. (8) Before I leave I look at him lighting another joint, at the scar on his thumb and finger and (9) [I] feel better for some reason.⁵

There is a static pattern of focus between (1) and (2) since *I* is repeated in both main clauses. There is a jump pattern of focus between (2) and (3) since none of the NPs in (2) are specificationally related or co-specificational to any of the NPs in (3). Between (3) and (4) there is a static pattern of focus because *magazines* and *them* are co-specificational. There is also a static pattern between (4) and (5) because *them* appears in both sentences. Between (5) and (6) there is a shift pattern of focus because *them* and *a magazine* are specificationally related since the former is a pronominal reference to the superordinate of the latter. Sentences (6) and (7) have a jump pattern of focus between them because none of their NPs are co-specificational or specificationally related. Since an NP in (8), *him*, is a pronominal reference to a non-focus set NP in (7), *Daniel*, there is a shift pattern of focus between these two sentences. If *Daniel* were in the focus set of (7), there would be a static pattern of focus between (7) and (8). There is a shift pattern of focus between (8) and (9) since a non-focus set NP in (8), *I*, is repeated in (9).

From sentence to sentence, the atomic patterns of focus in this paragraph look like this:

(1) $\xrightarrow{\text{static}}$ (2) $\xrightarrow{\text{jump}}$ (3) $\xrightarrow{\text{static}}$ (4) $\xrightarrow{\text{static}}$ (5) $\xrightarrow{\text{shift}}$ (6) $\xrightarrow{\text{jump}}$ (7) $\xrightarrow{\text{shift}}$ (8) $\xrightarrow{\text{shift}}$ (9)

The rules in table 4.1 tell us and the algorithm described in the following section tell us that this paragraph has the following composite pattern set: (*final-jump*, *final-shift*, *jagged*, *stepped*).

This example shows how the focus sets defined for each sentence by the FPO (discussed in chapter 3) can be used to define the atomic pattern of focus between any given pair of consecutive sentences. These atomic patterns of focus can in turn be used to define the composite patterns of focus that make up the composite pattern set for the paragraph. A complete set of examples for all the composite patterns of focus is included in appendix A.

4.2 Semantic Stylistic Shapes

Now that atomic and composite patterns of focus have been formally defined, we can discuss how they are used in the semantic application of an important concept from DiMarco's work, *stylistic shape*. DiMarco and Hirst (1988, p. 151) define a stylistic shape as a sentence component that has a particular stylistic effect. I define a *semantic* stylistic shape as a sequence of sentences with a particular stylistic effect. This stylistic effect is a result of the way that focus changes from sentence to sentence in the sequence. Since the system seeks to cover as many sentences as possible with a single pattern of focus, these sequences will

⁵Ellis, B. E. *Less Than Zero*. Penguin Books (1985): 161.

syntactic stylistic grammar	semantic stylistic system
sentence component connective effect	sequence of sentences pattern of focus

Table 4.2: Correspondences between the syntactic and semantic stylistic grammars

often be entire paragraphs. In some cases, however, the paragraph will not be described by any one pattern of focus. In such a case, it will be necessary to describe sequences of sentences in the paragraph with as few patterns of focus as possible, and each of these sequences will be a stylistic shape. Paragraphs and sequences of sentences that make up paragraphs, through their patterns of focus, have a particular stylistic effect in the semantic stylistic system.

How does this definition of stylistic shape compare with the one used by DiMarco? DiMarco's stylistic shapes are defined in terms of the connective or *integrating* effect of sentence components, while semantic stylistic shapes are based on patterns of focus. In DiMarco's scheme, a single sentence component, such as an adverbial, can have a stylistic effect regardless of what surrounds it, and a given sentence can have as many stylistic shapes as it has components. My model has only has one kind of component, the sequence of sentences (usually constituting a paragraph), and each sequence of sentences has only one stylistic shape. The patterns of focus in the semantic stylistic system depend on the relationship between sentences in the sequence. The corresponding element in DiMarco's work, the connective effect of sentence components, is not dependent on the relationship between sentence components; a component's connective effect is intrinsic to the component. These correspondences between the syntactic stylistic grammar and the semantic stylistic system are summarized in table 4.2.

In this research, there is another layer below the sequence of sentences, namely the sentence. There is no such layer in DiMarco's scheme since, unlike the sequence of sentences, the sentence component is atomic.

It can be seen that DiMarco's concept of stylistic shape is readily adaptable to the semantic stylistic system. The fact that I used her methodology for creating stylistic grammars is responsible for this. This methodology involves associating patterns of stylistic shapes with terms in the *stylistic metalanguage*, and the correlation of these terms with specific stylistic goals. The stylistic metalanguage, as noted in section 2.2.2, is used to describe the position and relative prominence of stylistically significant components of language. By using DiMarco's methodology, as well as much of her vocabulary from the stylistic metalanguage, I have built on a tested foundation. The fact that the important concept of stylistic shape can be adapted so easily from a syntactic context to a semantic one emphasizes this.

In this chapter, the paragraph-level processing of the semantic stylistic system has been described. The concept of patterns of focus has been formally defined. The three atomic

patterns of focus have been described, and the way they combine to form composite patterns of focus has been outlined. Finally, DiMarco's concept of stylistic shape has been adapted for the semantic stylistic system. We are now ready for the next chapter, where the connection between patterns of focus and specific stylistic goals is described.

Chapter 5

Associating Patterns of Focus with Stylistic Goals

The previous two chapters described the processing the semantic stylistic system does at the sentence and paragraph levels. The sentence-level processing (done by the FPO) produces focus sets for each sentence in the paragraph. These focus sets are used as input by the paragraph-level processing, which produces as its output the patterns of focus that describe the paragraph, the *composite pattern set*. This chapter now describes how the patterns of focus in the composite pattern set are associated with specific stylistic goals such as *clarity* or *dynamism*.

The connection between a paragraph's composite pattern set and the specific stylistic goals that it satisfies is made through the top two levels of DiMarco's three-part hierarchy (described in section 2.2.2). The first of these levels is the *grammar of abstract elements of style* (GAES), which associates the patterns of focus produced by the paragraph-level processing with elements of DiMarco's (1989) *stylistic metalanguage*. The second level is the *grammar of stylistic goals* (GSG), which takes the output from the GAES and determines the specific stylistic goals that it satisfies. It is important to note that DiMarco has created syntactic parts for both the GAES and the GSG, but I am only concerned with the semantic parts of these two grammars.

In order to describe the GAES and the GSG, I must first discuss in more detail DiMarco's stylistic metalanguage, which was introduced in section 2.2.2. The rules that make up the GAES are then presented. The chapter concludes with a description of the GSG and two complete examples of how the semantic stylistic system works.

5.1 The Stylistic Metalanguage

Since the GAES and the GSG use terms from DiMarco's stylistic metalanguage, I need to define the elements of this metalanguage in terms of the semantic stylistic system. The GAES associates the composite pattern set produced by the paragraph-level processing with *abstract elements of style*, such as *monopose*, that are in turn associated with specific stylistic goals, such as *clarity*, by the GSG. These abstract elements of style are part of

the stylistic metalanguage, and they describe style in terms of three central characteristics: *balance*, *position*, and *dominance*. *Balance* is the stylistic effect of the *relationship* between stylistically significant sequences of sentences in a paragraph. *Position* is the stylistic effect of the *placement* of stylistically significant sequences of sentences within a paragraph. *Dominance* is the stylistic effect of the *relative contribution* that each sequence of sentences makes to the paragraph as a whole. These three characteristics can be thought of as axes in a "stylistic space". A particular semantic stylistic shape will have separate abstract elements to describe its stylistic value in terms of balance, position, and dominance. Together, these three abstract elements of style will position the stylistic shape in the "stylistic space" defined by the three central characteristics. I have added three *neutral* abstract elements to describe those stylistic shapes that do not have any marked stylistic value with respect to balance, position, or dominance. A stylistic shape that is described by all three of these neutral abstract elements of style, such as a sequence of just one sentence, can be thought of as being at the origin of the "stylistic space". The following is a summary of the abstract elements of style that are used to describe each of the three characteristics:

- **Balance** — The stylistic effect of the *relationship* between stylistically significant sequences of sentences within a paragraph. The following abstract elements of style are used to describe balance:
 - **Monopoise** — A stylistic shape with no disturbance in the consistency of focus.
 - **Counterpoise** — A stylistic shape containing an offset which disturbs the consistency of focus.
 - **Homopoise** — A counterpoise in which the offset supports the overall stylistic balance.
 - **Polypoise** — A counterpoise in which the offset disrupts the overall stylistic balance.
 - **Neutral** — A stylistic shape which has no distinct effect with respect to balance because it has no focus structure at all.

- **Position** — The stylistic effect of the *placement* of stylistically significant sequences of sentences within a paragraph. The following abstract elements of style are used to describe position:
 - **Concord** — A stylistic shape that shows unity and agreement. At the end of a concord, there is no feeling that "something extra" is needed in order to resolve the shape.
 - **Discord** — A stylistic shape that shows disunity and incongruity. At the end of a discord, there is a feeling that something is missing without which the shape will not be resolved.

- **Resolution** — A shape containing a terminal modulation that moves from discord to concord.
 - **Dissolution** — A shape that ends with a discord.
 - **Neutral** — A shape that has no distinct effect with respect to position.
- **Dominance** — The stylistic effect of the relative contribution that each sequence of sentences makes to the paragraph overall. The following abstract elements of style are used to describe dominance:
 - **Monoschematic** — A sequence of sentences with a single, dominant shape.
 - **Diaschematic** — A sequence of sentences in which the components can be organized around a single stylistic shape. The difference between monoschematic and diaschematic shapes is discussed in detail in section 5.2.1.
 - **Polyschematic** — A sequence of sentences in which the components can only be organized into two or more stylistic shapes. A long paragraph that can only be described by two or more composite patterns of focus is polyschematic.
 - **Neutral** — A sequence of sentences with no distinct effect with respect to dominance.

The fact that elements of DiMarco's stylistic metalanguage can be used to describe semantic stylistic shapes is more evidence of the value of sharing her methodology. Of course, there are more than just three dimensions to style, but DiMarco's concept of describing stylistic shapes in terms of their balance, position, and dominance is rich enough to cover a wide range of stylistic variation without being untenably complex. By adapting her scheme to the semantic stylistic system, I have a tested, established method of describing style.

5.2 The Grammar of Abstract Elements of Style

Now that we have looked at the relevant elements of the stylistic metalanguage, we are ready to discuss the grammar of abstract elements of style (GAES). In DiMarco's work, the purpose of the grammar of abstract elements of style is to relate "constituent elements of style to patterns of syntactic stylistic shapes" (DiMarco and Hirst, 1988, p. 151). It is an intermediate step between the syntactic stylistic grammar at the bottom of her hierarchy and the stylistic goals at the top of the hierarchy. The semantic portion of the grammar of abstract elements of style has a slightly different role. It relates the abstract elements of style described in the preceding section to patterns of semantic stylistic shapes. Since many paragraphs can be described by a single pattern of focus (that is, the composite pattern set has only one element), many of the patterns of semantic stylistic shapes will have only one element. However, since some paragraphs can only be described by two or more patterns of focus, it is necessary to consider *patterns* of patterns of focus.

Table 5.1 contains the rules from the GAES that relate patterns of focus to abstract elements of style. There are three groups of rules in the grammar for balance, position, and dominance. For each paragraph, these rules will select an abstract element of style for balance, one for position, and one for dominance based on the composite pattern set assigned to the paragraph by the paragraph-level processing. Consider, for example, how the GAES deals with a paragraph whose composite pattern set contains only a *cycle* pattern of focus. It will use the rules in table 5.1 to assign the balance element *homopoise*, the position element *resolution*, and the dominance element *diaschematic*. Thus, the triple (*homopoise*, *resolution*, *diaschematic*) is the output produced by the GAES when given a *cycle* composite pattern of focus as input. This triple will in turn be used by the GSG to assign a specific stylistic goal to the paragraph.

5.2.1 The GAES rules: an explanation

The rules in the GAES relate elements of the composite pattern set with abstract elements of style. In this section, I will use the definitions of the stylistic metalanguage from section 5.1 to explain these rules. I will discuss the patterns of focus that correspond to each of the abstract elements of style that apply to balance, position, and dominance.

Before I discuss the correspondence between abstract elements of style and patterns of focus, there is one important concept that I must define, the concept of *terminal influence*. Terminal influence means that a stylistic effect that occurs at the end of a sequence of sentences tends to dominate the entire sequence. I claim, for instance, that a sequence of sentences has stylistic balance as long as it ends with stylistic balance. In the same way, a stylistic shape that ends with a discord is a dissolution. I have no psycholinguistic evidence to support this, but it is my intuition that the stylistic effect at the end of a sequence is the one that stays with the reader. In the following list, I appeal to the concept of terminal influence to justify some of the rules in the GAES.

• Balance

- **Monopoise** — Monopoise applies to stylistic shapes with no disturbance in the consistency of focus, and thus a *static* pattern of focus leads to monopoise since the sequence it describes has the same focus throughout.
- **Homopoise** — A stylistic shape that has inconsistencies in focus that support the overall stylistic balance displays homopoise. Sequences of sentences with either an *initial-shift* or an *initial-jump* pattern of focus have an inconsistency in focus at the beginning of the sequence. I claim that the consistency in focus that follows this inconsistency reinforces the stylistic balance of the sequence. I also claim that a sequence with a *cycle* pattern of focus (where the focus sets of the first and last sentences in a sequence share an element that is not in the focus sets of any of the intervening sentences) shows homopoise because the inconsistencies

Balance:

monopoise ← static	polypoise ← final-shift
monopoise ← (monopoise) ⁺	polypoise ← final-jump
monopoise ← monopoise neutral	polypoise ← jagged
homopoise ← initial-shift	polypoise ← polypoise neutral
homopoise ← initial-jump	neutral ← stepped
homopoise ← cycle	neutral ← (neutral-focus) ⁺
homopoise ← homopoise neutral	
homopoise ← (polypoise homopoise monopoise)* homopoise	
homopoise ← (polypoise homopoise monopoise)* (polypoise homopoise) monopoise	
polypoise ← (homopoise polypoise monopoise)* polypoise	

Position:

concord ← static	resolution ← initial-jump
concord ← concord neutral	resolution ← cycle
discord ← final-shift	resolution ← (discord) ⁺ (concord) ⁺
discord ← final-jump	dissolution ← (concord discord)* discord
discord ← jagged	neutral ← stepped
discord ← discord neutral	neutral ← (neutral-focus) ⁺
resolution ← initial-shift	
neutral ← (concord discord)* concord discord (concord) ⁺	

Dominance:

neutral ← neutral-focus	diaschematic ← initial-jump
monoschematic ← static	diaschematic ← final-shift
monoschematic ← stepped	diaschematic ← final-jump
monoschematic ← jagged	diaschematic ← cycle
diaschematic ← initial-shift	
polyschematic ← (monoschematic diaschematic) (monoschematic diaschematic) ⁺	

Notation:

(*pattern1* | *pattern2*) matches with one of *pattern1* or *pattern2*.
(*pattern*)^{*} matches with zero or more occurrences of *pattern*.
(*pattern*)⁺ matches with one or more occurrences of *pattern*.

Table 5.1: The grammar of abstract elements of style

in focus at the beginning and end of the sequence mark the intervening sentences as a digression and thus support the balance of the sequence. In the case of a composite pattern set with more than one element, I claim that if the paragraph ends with a sequence that displays homopose, then the paragraph as a whole displays homopose because of terminal influence.

- **Polypoise** — The *final-shift*, *final-jump*, and *jagged* patterns of focus all have inconsistencies in focus that disturb stylistic balance. For this reason, sequences of sentences with such patterns are said to display polypoise. In addition, a paragraph that ends with a polypoise shows polypoise as a whole due to terminal influence.
- **Neutral** — A sequence of sentences with a *neutral-focus* composite pattern of focus has neither consistencies nor inconsistencies in focus. Thus, the stylistic balance is neither maintained nor disturbed. This means that such sequences are assigned a neutral setting for balance. A *stepped* composite pattern of focus does contain minor offsets in focus, but, again, these neither reinforce nor destroy the stylistic balance for the sequence. Such sequences are, therefore, labelled as neutral.

• Position

- **Concord** — A concord is a stylistic shape that shows unity and agreement. Since a sequence of sentences with a *static* composite pattern of focus has no disturbances in its consistency of focus, such a sequence is a concord.
- **Discord** — A discord is a stylistic shape that shows disunity and incongruity. At the end of a discord there can be a feeling that something is missing. When a sequence of sentences ends immediately after a change in focus, there is a sense that something is missing. A sequence of sentences that has a composite pattern with a significant change in focus at the end (such as *final-shift* and *final-jump*) is, therefore, a discord because the change in focus creates the expectation that the newly introduced topic will be elaborated on. The jumps in focus between each sentence in a sequence with a *jagged* composite pattern create a sense of disunity, and thus such a sequence is a discord. The rules in table 5.1 show that all discords are also dissolutions. The term *discord* has been retained from DiMarco's stylistic metalanguage both to maintain as much consistency with her work as possible and to provide a term that is in apposition to *concord*.
- **Resolution** — A resolution is a stylistic shape that moves from discord to concord. Sequences of sentences that have a pattern of focus that begins with a change in focus and then remain static (such as *initial-shift* and *initial-jump*) are resolutions. The change of focus at the beginning is the discord, and the consistency of focus after this is the concord. A sequence of sentences with a *cycle*

pattern of focus is also a resolution. The change in focus from the first sentence to the second constitutes a discord (a change in focus must occur since the focus sets of the first and last sentences do not share any elements with the focus sets of the intervening sentences), while the change in focus from the second-last to the last sentence constitutes a concord. If a paragraph has more than one element in its composite pattern set, and it contains one or more discords followed by one or more concords, then it is a resolution.

- **Dissolution** — A dissolution is a stylistic shape that ends with a discord. This means that all of the patterns that result in a discord (*final-shift*, *final-jump*, and *jagged*) also result in a dissolution. In addition, whenever the final member of a composite pattern set results in discord, then the entire paragraph is a dissolution.
- **Neutral** — A sequence of sentences with a *neutral-focus* composite pattern of focus has no atomic patterns of focus, and thus it has no inconsistencies or consistencies in focus. This means that it shows neither unity nor disunity, and thus it is assigned a neutral position setting. Sequences of sentences with a *stepped* composite pattern of focus are also assigned a neutral position setting because the minor changes in focus that occur between each sentence in such a sequence do not create the feeling that something is missing. At the same time, they do not contribute to a sense of completeness and unity either. Paragraphs that have a concord followed by a discord and that end with a concord are called neutral because they do not fit into the definitions for resolution or dissolution.

• Dominance

- **Monoschematic** — A monoschematic sequence of sentences has a single, dominant shape. A sequence of sentences that has the same atomic pattern between each pair of consecutive sentences cannot have more than one unique composite pattern of focus in its composite pattern set. If all the sentences in a sequence have a *shift* atomic pattern between them, for instance, then the composite pattern set must contain a *stepped* composite pattern of focus. I call the resulting stylistic shape a *dominant* one because even without the composite set algorithm (described in section 4.1.3), there is only a single, unique composite pattern of focus that can describe the sequence. This means that sequences with a *static*, *stepped*, or *jagged* composite pattern of focus are monoschematic.
- **Diaschematic** — A diaschematic sequence of sentences is one that *can* be organized around a single stylistic shape. A sequence of sentences that can be described by a *initial-shift*, *initial-jump*, *final-shift*, *final-jump*, or *cycle* composite pattern of focus can be seen as a single stylistic shape. At the same time, a sequence with an *initial-shift* pattern of focus, for instance, can be seen as two sequences, the first with a *stepped* composite pattern of focus, and the second with

a *static* pattern. Thus, such a sequence *can* be seen as a single shape, but unlike a *monoschematic* pattern, it does not *need* to be interpreted in this way. For this reason, sequences with an *initial-shift*, *initial-jump*, *final-shift*, *final-jump*, or *cycle* composite pattern of focus are diaschematic.

- **Polyschematic** — A polyschematic sequence of sentences is one that is made up of more than one stylistic shape. Each member in the composite pattern set of a paragraph corresponds to a separate stylistic shape in the paragraph. This means that if a paragraph has more than one member in its composite pattern set, then it is made up of more than one stylistic shape. For this reason, paragraphs with more than one member in their composite pattern sets are polyschematic.
- **Neutral** — A sequence of sentences is defined to be neutral if it has no distinct effect with respect to dominance. A sequence of sentences with a *neutral-focus* composite pattern of focus is defined to have no stylistic value, and therefore is assigned a dominance setting of neutral.

5.3 The Grammar of Stylistic Goals

The grammar of stylistic goals (GSG) relates the abstract elements of style, which are produced by the GAES using the paragraph's composite pattern set, to a limited set of stylistic goals. For each triple of abstract elements produced by the GAES, the GSG determines the appropriate *setting* for the stylistic goals of emphasis (*emphatic*, *neutral*, or *flat*), clarity (*clear*, *neutral*, or *obscure*), and dynamism (*dynamic*, *neutral*, or *static*). Each stylistic goal has three settings: two extremes, such as *clear* and *obscure*, and one neutral setting in between. Thus, the system distinguishes 27 (3^3) different stylistic settings. However, not all of these settings are possible. It is not possible, for instance, to have a *flat* setting for emphasis and a *clear* setting for clarity at the same time (see tables 5.2 and 5.3). In fact, only nine of the settings are possible with the current configuration of the system, but more would be used if the system were expanded to deal with other characteristics in addition to *balance*, *position*, and *dominance*.

5.3.1 Defining the stylistic goals

Before I describe the rules that make up the GSG, it is important to have some sort of definition for the three stylistic goals. Since the stylistic effect of a piece of text is somewhat subjective (that is, it is impossible to say that every reader will agree that a particular text is *clear* or *dynamic*), it may not be possible to state definitively exactly what the stylistic goals mean. Nevertheless, I will appeal to definitions in the literature to clarify my intuitive definitions of emphasis, clarity, and dynamism. The following definitions will be used to determine whether or not the GSG assigns valid stylistic goals to a given paragraph:

- **Emphasis** — Kane (1983, p. 280) states that emphasis “means strength or force.” In written language, various devices are used to *emphasize* certain elements, that is to bring them to the fore or make them more prominent than the elements that surround them. Kane notes that this prominence must be relative to the surrounding elements. If everything is emphasized then nothing ends up being particularly prominent. I define a piece of text as *emphatic* if a specific idea or entity in the text is given some kind of special prominence relative to the rest of the text. A *flat* piece of text, on the other hand, does not place any single one of its ideas or entities to the fore. It is important to note that I define emphasis not in terms of prominence but rather in terms of *relative* prominence. In a paragraph that only deals with one entity, this entity will of course be prominent. It will not, however, be relatively prominent because it is no more prominent than any other item in the paragraph (since there are no others). Texts that show neither emphatic nor flat characteristics, or that have a mixture of emphatic and flat characteristics, are called *neutral*.
- **Clarity** — Anatole France said this when asked about the three most important aspects of French style: “d’abord la clarté, puis encore la clarté, et enfin la clarté”. Indeed, clarity is one of the most desirable aspects a piece of text can have. But what is clarity? Lucas (1958) characterizes it as “courtesy to readers”. He goes on to make the following statement about clarity in paragraphs (Lucas, 1958, p. 72):

At each paragraph-end the reader can draw breath for an instant, and rest. The essential is that he should feel it a rational place to rest — that the paragraph, in other words, should seem a unity.

This specific statement about clarity in paragraphs is simply an instance of being courteous to the reader. The reader has expectations about the way a piece of text will unfold, and if these expectations are not met then the reader will have more difficulty reading the text: the text will not be clear. A clear text is one that is easy to read. Thus, I define a piece of text as *clear* if it follows certain customs of exposition and rhetoric, such as maintaining balance and unity, that make it easy to read. An *obscure* piece of text does not follow these customs, and may, in fact, contradict more basic rules of text composition that serve to make a text comprehensible. A distinction is made here between conventions that simply make a text understandable (such as setting a limit on the number of topics introduced at any point in the text), and those that make it easy to read (such as returning at the end of a text to the ideas introduced at the beginning). Texts that neither contradict nor observe the conventions that make a text easy to read are called *neutral*.

- **Dynamism** — The literature on style does not deal directly with dynamism, but it is still possible to come up with a succinct definition. *Webster’s Third New International Dictionary* defines *dynamic* as “characterized by continuous movement”, while it states

that *dynamism* is "a quality in artistic representation that conveys an impression of dynamic movement". With these definitions in mind, I define a piece of text as *dynamic* if it deals with a large variety of entities and ideas. A *static* text, on the other hand, deals with a limited number of ideas and entities. Texts that deal with more than one entity but do not exhibit a wide range of topics are called *neutral*.

It is important to note that there is more than one way for a piece of text to be clear, dynamic, or emphatic. I am only dealing with the cases where these stylistic goals are met because of the patterns of focus found in the text. A piece of text can, for instance, be emphatic if certain lexical choices are made. In certain contexts, *death* and *end* are synonyms, but the former is more emphatic than the latter. Kane (1983, p. 280) provides the following example of emphasis at the sentence level:

(5.1) An old man sat in the corner.

(5.2) In the corner sat an old man.

The word order of (5.2) makes it more emphatic than (5.1). If a text contains emphatic lexical choices, or if it contains a sentence with an emphatic syntactic structure, then the text as a whole may be emphatic. In the same way, a text may be clear or dynamic simply because of the lexical choices and syntactic structures used. Because it only uses the way that focus changes or remains the same to establish the stylistic goals that a piece of text satisfies, the semantic stylistic system may not necessarily assign the appropriate stylistic goal to a piece of text when that piece of text has many stylistically significant lexical or syntactic features. In chapter 7 I discuss how lexical and syntactic information could be incorporated into an improved semantic stylistic system, but the system as it stands cannot take advantage of such information.

Another problem is caused by the current system's inability to make use of lexical and syntactic information. There are some combinations of stylistic goals that are not possible. For instance, the system cannot say that a paragraph is both emphatic and static at the same time. The reason for this is that a static paragraph has the same focus throughout, while a paragraph must have shifts in focus in order to be emphatic. Of course, it is not hard to think of examples of paragraphs that are both static and emphatic, but such paragraphs have these stylistic characteristics because of factors other than changes in focus. For instance, lexical choices can make the paragraph static, while the syntactic structures used in the individual sentences can make it emphatic. The fact that the semantic stylistic grammar does not recognize certain combinations of stylistic goals (including emphatic and static, flat and dynamic, and clear and flat) does not mean that such combinations cannot exist. Rather, it means that the stylistic contributions of patterns of focus cannot lead to such combinations. An improved system that could use syntactic and lexical information in addition to semantic information, such as the one described in chapter 7, would be able to recognize the combinations of stylistic goals that the current semantic stylistic system is unable to recognize.

As shown in the above definitions, each of the three stylistic goals only has three possible settings. Of course, it is not possible to express the full range of clarity, for instance, with only three settings. Ideally, I would like to have a complete range of gradations to describe different degrees of clarity. However, the problems that such a scheme would cause are similar to those that arise when semantic closeness is finely calibrated (see section 4.1.2). Suppose that I had a larger set of settings, say (*very clear, clear, fairly clear, neutral, fairly obscure, obscure, very obscure*), instead of only (*clear, neutral, obscure*), for the clarity stylistic goal. It is difficult enough to show that a paragraph that gets a *clear* setting from the semantic stylistic system does have that intuitive feeling for the "average reader". It would be much harder to demonstrate that two paragraphs that are given the *fairly clear* setting do, in fact, elicit exactly the same intuitive sense of clarity. In addition, the use of a larger, more finely graded set of settings would suggest a level of precision that is simply not present in my research.

5.3.2 How the GSG works

In order to make the GSG rules easier to understand, the relationships between the stylistic goals and balance, position, and dominance are described in tables 5.2, 5.3, and 5.4. In each of these tables, the top element of each column is a stylistic setting, such as *emphatic*, and the rest of the column consists of all the abstract elements that contribute to that setting. The left-most element in each row is a stylistic characteristic, such as *balance*, and the rest of the row consists of all the abstract elements that can be used to describe that characteristic. This means that the box in the *emphatic* column and the *position* row in table 5.2 contains the position abstract element that leads to an *emphatic* setting for the emphasis stylistic goal, namely *dissolution*. Similarly, *monoschematic* is the *dominance* abstract element that leads to a *flat* setting for emphasis.

Tables 5.5, 5.6, and 5.7 contain the rules for emphasis, clarity, and dynamism, respectively, that make up the GSG. These rules produce a triple that describes the emphasis, clarity, and dynamism of the input triple of abstract elements. In order to get a particular setting for a stylistic goal, only two of the three abstract elements in a triple need to lead to that setting. A triple of abstract elements is *emphatic*, for example, as long as at least two of the elements lead to an *emphatic* setting according to table 5.2. This means that (*polypoise, dissolution, neutral*) gives a setting of *emphatic* for the emphasis stylistic goal, since table 5.2 says that *polypoise* and *dissolution* lead to an *emphatic* setting for the emphasis goal. Similarly, the triple (*polypoise, dissolution, monoschematic*) gives an *obscure* setting for the clarity stylistic goal, even though table 5.3 shows that *monoschematic* is neutral with respect to clarity. As a final example, consider how the GSG deals with a paragraph that is assigned the triple (*monopoise, concord, monoschematic*) by the GAES. The emphasis rules in the GSG assign *flat* to the triple, the clarity rules assign *neutral*, and the dynamism rules assign *static*. Thus, given the triple (*monopoise, concord, monoschematic*), the GSG

Emphasis			
	emphatic	neutral	flat
balance	polypoise	neutral homopoise	monopoise
position	dissolution	neutral resolution	concord
dominance	diaschematic	neutral polyschematic	monoschematic

Table 5.2: The relationship between emphasis, balance, position, and dominance

Note: In tables 5.2, 5.3, and 5.4, the settings for the appropriate stylistic goal are listed on the top of the table and the three stylistic characteristics are listed on the left side. Each column contains all the abstract elements of style that contribute to the setting that appears at the top of the column. The abstract element of style for *balance*, for example, that contributes to an *emphatic* setting is *polypoise*.

Clarity			
	clear	neutral	obscure
balance	homopoise	neutral monopoise	polypoise
position	resolution	neutral concord	dissolution
dominance	diaschematic	neutral monoschematic	polyschematic

Table 5.3: The relationship between clarity, balance, position, and dominance

Dynamism			
	dynamic	neutral	static
balance	homopoise polypoise	neutral	monopoise
position	resolution dissolution	neutral	concord
dominance	polyschematic	neutral diaschematic	monoschematic

Table 5.4: The relationship between dynamism, balance, position, and dominance

Emphasis:

emphatic ← (polypoise, dissolution, ____)
emphatic ← (polypoise, ____ , diaschematic)
emphatic ← (____ , dissolution, diaschematic)
neutral ← (homopoise | neutral, resolution | neutral, ____)
neutral ← (homopoise | neutral, ____ , polyschematic | neutral)
neutral ← (____ , resolution | neutral, polyschematic | neutral)
flat ← (monopoise, concord, ____)
flat ← (monopoise, ____ , monoschematic)
flat ← (____ , concord, monoschematic)

Notation:

The right-hand side of each rule is a triple produced by the GAES, the first element of which describes the balance of the paragraph, the second of which describes the position, and the third of which describes the dominance. A “____” matches with any setting.

Table 5.5: The grammar of stylistic goals: emphasis

Clarity:

clear ← (homopoise, resolution, ____)
clear ← (homopoise, ____ , diaschematic)
clear ← (____ , resolution, diaschematic)
neutral ← (monopoise | neutral, concord | neutral, ____)
neutral ← (monopoise | neutral, ____ , monoschematic | neutral)
neutral ← (____ , concord | neutral, monoschematic | neutral)
obscure ← (polypoise, dissolution, ____)
obscure ← (polypoise, ____ , polyschematic)
obscure ← (____ , dissolution, polyschematic)

Table 5.6: The grammar of stylistic goals: clarity

Dynamism:

dynamic ← (homopoise | polypoise, resolution | dissolution, _____)
dynamic ← (homopoise | polypoise, _____ , polyschematic)
dynamic ← (_____ , resolution | dissolution, polyschematic)
neutral ← (neutral, neutral, _____)
neutral ← (neutral, _____ , diaschematic | neutral)
neutral ← (_____ , neutral , diaschematic | neutral)
static ← (monopoise, concord, _____)
static ← (monopoise, _____ , monoschematic)
static ← (_____ , concord, monoschematic)

Table 5.7: The grammar of stylistic goals: dynamism

produces as output the triple (*flat*, *neutral*, *static*).

5.3.3 The GSG rules: an explanation

Not all of the rules in the GSG are immediately obvious. Why, for instance, does the triple (*homopoise*, *resolution*, *neutral*) result in a *neutral* description for emphasis? In order to explain the rules in tables 5.5, 5.6, and 5.7, I will appeal to the definitions of emphasis, clarity, and dynamism given in section 5.3.1 above, and to the definitions of the abstract elements of style from section 5.1:

• Emphasis

- **Balance** — Polypoise is assigned to paragraphs that have inconsistencies in focus that disturb the stylistic balance. This disturbance will give relative prominence to the elements involved, and thus polypoise contributes to an *emphatic* setting for the emphasis stylistic goal. Monopoise is assigned to paragraphs that have no changes in focus. Consistency of focus means that nothing is given relative prominence. If only one thing is being mentioned, then its prominence cannot be compared with that of anything else (because there is nothing else with which to compare it). Thus, monopoise contributes to a *flat* setting for the emphasis stylistic goal. Paragraphs with homopoise have inconsistencies in focus that support the overall stylistic balance, and thus contribute to neither the *emphatic* nor the *flat* settings.
- **Position** — Dissolution is assigned to paragraphs that end with a sense that something is missing. This feeling of incompleteness gives relative prominence to the elements at the end of the paragraph, and thus dissolution contributes to an *emphatic* setting for the emphasis goal. A paragraph that is assigned concord, on the other hand, displays unity and agreement. This sense of agreement

does not give relative prominence to any of the elements in the paragraph, and thus concord leads to a *flat* setting for emphasis. A paragraph that is assigned resolution contains discord followed by concord. While the discord gives a certain amount of relative prominence to the elements around it, the concord that follows it reduces the effect. For this reason such a paragraph is given a *neutral* setting for emphasis.

- **Dominance** — Paragraphs that are diaschematic have a single, dominant shape around which the other shapes are organized. This shape will, therefore, have a certain degree of relative prominence, and thus a diaschematic dominance setting leads to an *emphatic* setting for the emphasis goal. In a monoschematic paragraph, however, there is only one shape, and this shape has no special prominence. Thus, a monoschematic setting for dominance contributes to a *flat* setting for emphasis. A *polyschematic* paragraph cannot be described by any single composite pattern of focus. This means that there may or may not be prominent elements, and thus a *polyschematic* dominance setting leads to a *neutral* emphasis setting.

• Clarity

- **Balance** — A paragraph with *homopoise* has an inconsistency of focus which reinforces the overall stylistic balance. Since such a sense of balance makes a text easier to read, *homopoise* contributes to a *clear* setting. A paragraph with *polypoise*, on the other hand, has an inconsistency of focus that disturbs the overall stylistic balance. Such disturbances in balance make a text harder to read, and thus *polypoise* leads to an *obscure* setting for clarity. A paragraph with *monopoise* has the same focus throughout, and thus neither does it contain the offsets that make a text easy to follow, nor does it break the rules that make a text comprehensible. I claim that a certain amount of variety is expected by the reader, and that keeping the same focus throughout a paragraph will not necessarily make the paragraph easy to read. Because of this, *monopoise* contributes to a *neutral* setting for clarity.
- **Position** — A *resolution* is a stylistic shape that moves from discord to concord. Such a movement is customarily used to make texts easier to read. When there is change from discord (that is, incongruity and incompleteness) to concord (that is, unity and completeness) at the end of a piece of text, the text is easier to read because its conclusion is strongly marked. Because of this, a *resolution* leads to a *clear* setting for clarity. A *dissolution*, on the other hand, ends with a discord. The discord creates the expectation of something more to follow, and thus a piece of text that ends with a discord is not as easy to read as one that ends with a concord. For this reason, *dissolution* contributes to an *obscure* setting for clarity. A paragraph that only has *concord* does not have the movement from incompleteness to completeness, and thus it receives a *neutral* clarity setting.
- **Dominance** — A *diaschematic* paragraph has all of its components organized around a single stylistic shape and can be described by a single composite pattern of focus. This means that there is some variance in focus, but this variance occurs in a recognized pattern. Such recognized patterns of focus variation are used to make a piece of text easier to read, and because of this a *diaschematic* setting for dominance contributes to a *clear* setting for clarity. A *polyschematic* paragraph, on the other hand, has a pattern of focus that cannot be described using one of my conventional, composite patterns of focus. Such paragraphs are likely to contain many sentences, and according to Lucas (1958, p. 72): "Short paragraphs make for ease and clarity ... Paragraphs, too, like sentences, can cause obscurity by being overloaded or overlong." A paragraph that cannot be described by any of the composite patterns may, therefore, not be following the rules for making text easy to read. Because of this, a *polyschematic* setting for dominance contributes to an *obscure* setting for clarity. A *monoschematic* paragraph has the same atomic pattern between each of its constituent sentences, and such a pattern of

focus variation has a *neutral* effect on clarity.

- **Dynamism**

- **Balance** — Paragraphs with *homopoise* or *polypoise* do not have the same focus throughout. Such paragraphs deal with a variety of ideas and entities, and thus they have a *dynamic* setting for dynamism. Paragraphs with *monopoise*, on the other hand, have the same focus throughout, and thus they have a *static* setting for dynamism.
- **Position** — Paragraphs with *resolution* or *dissolution* have offsets in their consistency of focus that either reinforce or disturb the stylistic balance. Such paragraphs deal with a variety of ideas and entities, and thus they have a *dynamic* setting for dynamism. Paragraphs with *concord*, on the other hand, do not display the same kinds of offsets in focus, and thus they have a *static* setting for *dynamism*.
- **Dominance** — A *polyschematic* paragraph cannot be described with any single composite pattern of focus, and this means that it must deal with a variety of topics. Because of this, such a paragraph has a *dynamic* setting for dynamism. A *monoschematic* paragraph can be described by a single composite pattern of focus and has the same atomic pattern of focus between each sentence, which suggests that it is not dealing with a large variety of topics. This means that such a paragraph is given a *static* setting for dynamism. A *diaschematic* paragraph is given a *neutral* setting for dynamism because it has different atomic patterns but can be described by a single composite pattern.

It is important to note that *neutral* settings for any of the stylistic characteristics (balance, position, or dominance) contribute to a *neutral* setting for all three of the stylistic goals.

5.4 Some Complete Examples

The preceding discussions of the GAES and GSG complete the description of the semantic stylistic system. In order to show how the sentence-level processing, the paragraph-level processing, the GAES, and the GSG work together, I will now present a couple of complete examples of how the semantic stylistic system determines the stylistic goals for a paragraph. Example (5.3) shows how the system deals with a relatively complex paragraph:

(5.3) (1) Anyway, before I got to the hotel, I started to go in this dumpy looking bar, (2) but two guys came out, drunk as hell, (3) and [they] wanted to know where the subway was. (4) One of them was this very Cuban-looking guy, (5) and he kept breathing his stinking breath in my face while I gave him

directions. (6) I ended up not even going in the damn bar. (7) I just went back to the hotel.¹

Let us begin by applying the sentence-level processing to each sentence individually.

5.4.1 Sentence-level processing for example (5.3)

Sentence 1

(1) Anyway, before I got to the hotel, I started to go in this dumpy looking bar

This sentence has the following noun phrases:

- **Subject** — *I*
- **Direct object** — *the hotel, this dumpy looking bar*
- **Indirect object** — [none]
- **Object of preposition** — [none]

These noun phrases fall into the following categories:

- **Focal-assured** — *this dumpy looking bar*
- **Focal-prevented** — [none]
- **Focal-allowed** — *I, the hotel*

An application of the FPO focal-allowed rules from table 3.1 gives the following relationship:

the hotel \succ *I*

Since *this dumpy looking bar* is focal-assured, and since *the hotel* is not subordinate to any other NPs according to the FPO focal-allowed rules, the focus set for this sentence contains these two NPs. We are now ready to look at the sentence-level processing for sentence (2):

Sentence 2

(2) but two guys came out, drunk as hell

This sentence has the following noun phrases:

- **Subject** — *two guys*
- **Direct object** — [none]
- **Indirect object** — [none]

¹Salinger, J. D. *The Catcher in the Rye*. Little, Brown and Company (1951): p. 118.

- **Object of preposition** — *hell*²

These noun phrases fall into the following categories:

- **Focal-assured** — [none]
- **Focal-prevented** — [none]
- **Focal-allowed** — *two guys, hell*

An application of the FPO focal-allowed rules from table 3.1 gives the following relationship:

two guys > *hell*

Since *two guys* is not subordinate to any other NP, the focus set for (2) contains only this NP.

Sentence 3

(3) and [they] wanted to know where the subway was.

This sentence has the following noun phrases:

- **Subject** — *they, the subway*
- **Direct object** — [none]
- **Indirect object** — [none]
- **Object of preposition** — [none]

These noun phrases fall into the following categories:

- **Focal-assured** — [none]
- **Focal-prevented** — [none]
- **Focal-allowed** — *they, the subway*

Since both of the NPs are subjects, neither one is subordinate to the other. Thus, the focus set for this sentence contains *they* and *the subway*.

Sentence 4

(4) One of them was this very Cuban-looking guy

This sentence has the following noun phrases:

- **Subject** — *one of them*

²Although it is part of an idiom, I claim that *hell* can still be analysed as a noun phrase. If this sentence were followed by *Hell is where the heart is*, for instance, then there would be a lexical connection between the two occurrences of *hell*, even though one of them was part of an idiom.

- **Direct object** — *this very Cuban-looking guy*

- **Indirect object** — [none]

- **Object of preposition** — [none]

These noun phrases fall into the following categories:

- **Focal-assured** — *this very Cuban-looking guy*
- **Focal-prevented** — [none]
- **Focal-allowed** — *one of them*

Since there is only one focal-allowed NP, it cannot be subordinate to any other focal-allowed NPs, and thus it joins the focal-assured NP *this very Cuban-looking guy* in the focus set for sentence (4).

Sentence 5

(5) and he kept breathing his stinking breath in my face while I gave him directions.

This sentence has the following noun phrases:

- **Subject** — *I, he*
- **Direct object** — *his stinking breath, directions*
- **Indirect object** — *him*
- **Object of preposition** — *my face*

These noun phrases fall into the following categories:

- **Focal-assured** — [none]
- **Focal-prevented** — [none]
- **Focal-allowed** — *I, his stinking breath, directions, him, my face*

An application of the FPO focal-allowed rules from table 3.1 gives the following relationships:

his stinking breath > *I, he, him, my face*
directions > *I, he, him, my face*
I > *him, my face*
he > *him, my face*

Since *his stinking breath* and *directions* are not subordinate to any other NPs, these two NPs form the focus set of sentence (5).

Sentence 6

(6) I ended up not even going in the damn bar.

This sentence has the following noun phrases:

- Subject — *I*
- Direct object — *the damn bar*
- Indirect object — [none]
- Object of preposition — [none]

These noun phrases fall into the following categories:

- Focal-assured — [none]
- Focal-prevented — [none]
- Focal-allowed — *I, the damn bar*

An application of the FPO focal-allowed rules from table 3.1 gives the following relationship:

the damn bar \succ *I*

This means that the focus set consists of *the damn bar*.

Sentence 7

(7) I just went back to the hotel.

This sentence has the following noun phrases:

- Subject — *I*
- Direct object — *the hotel*
- Indirect object — [none]
- Object of preposition — [none]

These noun phrases fall into the following categories:

- Focal-assured — [none]
- Focal-prevented — [none]
- Focal-allowed — *I, the hotel*

An application of the FPO focal-allowed rules from table 3.1 gives the following relationship:

the hotel \succ *I*

This means that the focus set consists of *the hotel*.

5.4.2 Paragraph-level processing for example (5.3)

Now that the focus sets have been defined for each sentence, we can continue with the paragraph-level processing. There is a *jump* atomic pattern of focus between (1) and (2) because none of the NPs in (1) is co-specificational or specificationally related to any of the NPs in (2). A *static* pattern of focus exists between (2) and (3) because *two guys* and the elided *them* are co-specificational by pronominal reference. There is a *shift* pattern of focus between (3) and (4) since *them* and *one of them*, are specificationally related. Sentences (4) and (5) have a *shift* pattern of focus between them because the focus set NP *one of them* from (4) is co-specificational with the non-focus set NP *he* from (5). There is also a *shift* pattern of focus between (5) and (6) since *I* is a non-focus set NP in both sentences. Sentences (6) and (7) have a *shift* pattern of focus between them as well for the same reason. From sentence to sentence, the focus transitions in this paragraph look like this:

(1) $\xrightarrow{\text{jump}}$ (2) $\xrightarrow{\text{static}}$ (3) $\xrightarrow{\text{shift}}$ (4) $\xrightarrow{\text{shift}}$ (5) $\xrightarrow{\text{shift}}$ (6) $\xrightarrow{\text{shift}}$ (7)

Normally, this paragraph would be assigned the composite pattern set (*initial-jump, stepped*), but this is a special case since the focus set for sentence (1):

(*this dumpy looking bar, the hotel*)

and the focus set for sentence (7):

(*the hotel*)

have co-specificational NPs, namely *the hotel*. Because of this, and because *the hotel* is not co-specificational with any of the elements of the focus sets of any of the intervening sentences, this paragraph is assigned a composite pattern set containing the single pattern *cycle*.

Now that the composite pattern set has been defined for the paragraph, the GAES can be applied to it to establish the abstract elements of style. An application of the rules in table 5.1 to the composite pattern set gives the balance setting of *homopoise*, the position setting of *resolution*, and the dominance setting of *diaschematic*. The output of the GAES for this paragraph is the triple (*homopoise, resolution, diaschematic*).

This triple is the input to the GSG. The rules in table 5.5 assign a *neutral* setting for emphasis. The rules in table 5.6 assign a *clear* setting for the clarity stylistic goal, while the rules in table 5.7 assign a *dynamic* dynamism setting. The output triple produced by the GSG to describe the input paragraph is (*neutral, clear, dynamic*). In other words, the semantic stylistic system found that example (5.3) was neither especially emphatic nor especially flat, but that it was both clear and dynamic.

5.4.3 Analysis of the results for example (5.3)

The critical question now is whether or not the stylistic analysis produced by the semantic stylistic system is valid. I claim that it is, and that example (5.3) does not, in fact, have

any strong flavour with respect to emphasis, while it is both clear and dynamic. In order to substantiate this claim, I will appeal to the definitions for emphasis, clarity, and dynamism that I introduced in section 5.3. It is important to note that the lexical and syntactic content of the sample paragraph also has an effect on its stylistic value. Despite the fact that the semantic stylistic system does not capture this, I believe that the system does provide a valid picture of the stylistic content of example (5.3).

According to the definition for emphasis, a piece of text is emphatic if it gives markedly greater prominence to one of its elements than it does to others, while a text is flat if it does not do so. A text that is neutral with respect to emphasis neither gives the same prominence to all the entities and ideas that it deals with, nor does it put any one element to the fore. In example (5.3), *the subway* is less prominent than *I* simply because *I* occurs four times while *the subway* only occurs once. This means that not all the elements are given the same prominence. At the same time, *I* is not really any more prominent than *the hotel* or *this dumpy looking bar*. Thus, it can be argued that the paragraph is, in fact, neutral with respect to emphasis.

The definition for clarity says that a clear piece of text follows certain customs that make a text easy to read, while an obscure text does not follow these conventions. Example (5.3) exhibits the established clarity tactic of recapping an idea from the beginning of the text at the end of the text. Since *the hotel* is introduced in the first sentence of the paragraph, and does not appear again until the last sentence, it can be argued that the paragraph is clear.

A dynamic piece of text, according to the definition for dynamism, is one that deals with a variety of topics. In four sentences, example (5.3) introduces six separate elements, *I*, *the hotel*, *the bar*, *the two guys*, *the subway*, and *directions*. Furthermore, the elements of the focus sets change from sentence to sentence. Thus, it can be argued that the paragraph is, in fact, dynamic.

We are now ready to look at example (5.4), a short, simple paragraph:

(5.4) (1) "Yes, she's really feeling fine." (2) I'm tempted, for a moment, to tell him about the Ferrari parked in the driveway.³

Let us begin by applying the sentence-level processing to each sentence individually.

³Ellis, B. E. *Less Than Zero*. Penguin Books (1985): p. 42.

5.4.4 Sentence-level processing for example (5.4)

Sentence 1

(1) "Yes, she's really feeling fine."

This sentence has the following noun phrases:

- **Subject** — *she*
- **Direct object** — [none]
- **Indirect object** — [none]
- **Object of preposition** — [none]

These noun phrases fall into the following categories:

- **Focal-assured** — [none]
- **Focal-prevented** — [none]
- **Focal-allowed** — *she*

Since *she* is the only noun phrase in the sentence, it must constitute the focus set of the sentence. We are now ready to look at the sentence-level processing for sentence (2):

Sentence 2

(2) I'm tempted, for a moment, to tell him about the Ferrari parked in the driveway.

This sentence has the following noun phrases:

- **Subject** — *I*
- **Direct object** — *the Ferrari parked in the driveway*
- **Indirect object** — *him*
- **Object of preposition** — *a moment, the driveway*

These noun phrases fall into the following categories:

- **Focal-assured** — [none]
- **Focal-prevented** — [none]
- **Focal-allowed** — *I, a moment, him, the Ferrari parked in the driveway, the driveway*

An application of the FPO focal-allowed rules from table 3.1 gives the following relationship:

the Ferrari parked in the driveway > *I, a moment, the driveway*
I > *a moment, the driveway*

Since *the Ferrari parked in the driveway* is not subordinate to any other NP, it constitutes the focus set for sentence (2).

5.4.5 Paragraph-level processing for example (5.4)

Now that the sentence-level processing for example (5.4) has been completed, we can continue with the paragraph-level processing. There is a *jump* atomic pattern of focus between sentences (1) and (2) because none of the NPs in (1) is co-specificational with any of the NPs in (2). This means that the paragraph is assigned the composite pattern set (*jagged*).

Now that we have the composite pattern set, the GAES can be applied to it to get the abstract elements of style. An application of the rules in table 5.1 yields a balance setting of *polypoise*, a position setting of *dissolution*, and a dominance setting of *monoschematic*. The GAES therefore produces the triple (*polypoise, dissolution, monoschematic*) as its output.

The abstract element triple for example (5.4) acts as input to the GSG. An application of the rules in table 5.5 assigns an *emphatic* setting for the emphasis stylistic goal. The rules in table 5.6 assign an *obscure* setting for the clarity goal, while the rules in table 5.7 assign a *dynamic* setting for the dynamism goal. The GSG produces the triple (*emphatic, obscure, dynamic*) for example (5.4).

5.4.6 Analysis of the results for example (5.4)

The definition of emphasis in section 5.3 states that a piece of text is emphatic if it gives greater prominence to one of its elements than it does to another. I claim that example (5.4) is indeed emphatic, and that the NP *the Ferrari parked in the driveway* has greater prominence than the other NPs in the paragraph because of its length and because it is the only direct object in the paragraph.

The definition for clarity says that a piece of text is obscure if it is difficult to read. Since the first and second sentences in the paragraph do not have any direct connections between their NPs, it can be argued that example (5.4) is difficult to read. Of course, the reader can try to make a connection between the *Ferrari* and the female person referred to in the first sentence, but it is still not easy to tell what the paragraph is about.

A piece of text is dynamic, according to the definition in section 5.3, if it deals with a variety of topics. In just two sentences, four separate elements, *she, I, him* and *the Ferrari parked in the driveway*, are introduced. In addition, the focus set changes completely between the two sentences. Thus, it can be argued that the paragraph is, in fact, dynamic.

The problem with the justifications I have made for the semantic stylistic system's analyses of examples (5.3) and (5.4) is that there are no universally recognized definitions for emphasis, clarity, and dynamism. My definitions may provide some kind of common ground, but they still are, by their nature, inexact. Would it not have been more effective to bypass the definitions altogether and compare the semantic stylistic system's analysis with the analysis of a large body of readers? The problem with such an approach is that it is impossible to get an honest, informed stylistic analysis of a paragraph from the average reader without priming the reader for the "desired" response. Most people have a fuzzy idea of what emphasis, for example, means, but they would require a more exact definition in

order to be able to say whether a paragraph that they had just read was emphatic, neutral, or flat. This definition would tend to steer them towards one particular choice, and thus the value of using readers, that is to get their unbiased "gut feelings", would be lost. In addition, this definition would have the same shortcomings as the existing definitions, and thus we are back to the original problem. Thus, while it is not ideal to depend on such definitions to validate the output of the semantic stylistic system, it is certainly no worse than attempting to use the impressions of a large body of readers.

In this chapter I have discussed the parts of the semantic stylistic system that link the output of the paragraph-level processing described in the last chapter with specific stylistic goals. The GAES associates the composite pattern set with abstract elements of style that describe the paragraph with respect to the stylistic characteristics *balance*, *position*, and *dominance*. The GSG associates these abstract elements with specific stylistic goals, such as *clarity*. This completes the description of the semantic stylistic system. In the next chapter, we shall examine the computational application that is based on this system.

Chapter 6

A Computational Application: BOGUE

In order to demonstrate the computational tractability of the semantic stylistic system, I have written a limited implementation of the theoretical work described in the previous three chapters. This system, called **BOGUE** after the noted nineteenth-century prose poet Dr. Q. S. Bogue, is not intended to be a practical tool for stylistic analysis. Rather, it is meant to show that the semantic stylistic system can be adapted to a computational application. A complete, fully functional implementation would require elements, such as a thorough anaphor resolution scheme, that are simply beyond the scope of this research. In this chapter, I discuss the organization of **BOGUE**, its limitations, and its potential for further development.

An annotated example of how **BOGUE** processes an input paragraph is provided in appendix C.

6.1 The Organization of **BOGUE**

BOGUE consists of over 3,000 lines of C-Prolog under Unix. The code is divided into two parts, a simple parser based on work by Kem Luther and Rick MacLean at the University of Toronto, and the implementation of the semantic stylistic system itself. The parser consists of three sections:

- **Syntactic analysis** — This section contains the code that produces a parse tree for an input sentence. The code implements a DCG that covers some of the most-common English sentence constructions.
- **Lexicon** — This section contains rules that describe the common nouns, proper nouns, pronouns, verbs, adjectives, adverbs, determiners, and conjunctions that the parser recognizes.
- **Enriched lexicon** — This section contains an entry for each common noun, proper noun, and pronoun contained in the parser's lexicon. Each entry contains a list of

all the common nouns, proper nouns, and pronouns¹ that are co-specificational or specificationally related to the word in question. The entries in the enriched lexicon are used to determine the semantic relationships that exist between noun phrases.

The implementation of the semantic stylistic system includes the following sections:

- **Paragraph processor** — This is the main module of BOGUE. It prompts the user for an input paragraph, calls the sentence processor to get the focus set for each sentence, and determines the atomic patterns of focus that exist between each pair of consecutive sentences in the paragraph. It calls the composite pattern set processor, which uses the set of atomic patterns to create the composite pattern set. The paragraph processor then calls an implementation of the grammar of stylistic goals to get the abstract elements of style that describe the paragraph. Finally, these abstract elements of style are passed to an implementation of the grammar of stylistic goals, which produces as its output the stylistic goal settings that describe the paragraph.
- **Sentence processor** — The paragraph processor passes a sentence to the sentence processor. The sentence processor then calls the parser to get a parse tree for the sentence, and uses an implementation of the FPO to determine the focus set of the sentence.
- **Composite pattern set processor** — This section takes as input the set of atomic patterns that describe the paragraph, and produces as output the composite pattern set.
- **Implementation of the grammar of abstract elements of style** — This section takes in the composite pattern set and produces the triple of abstract elements of style that describes the paragraph.
- **Implementation of the grammar of stylistic goals** — This section takes as input the triple of abstract elements of style and produces as output the stylistic goal settings that describe the paragraph.

The following is a detailed description of how these parts of BOGUE work together. The processing begins with the parser producing a parse tree for each sentence in the input paragraph. Each parse tree is put through the following steps by the sentence processor:

- All of the noun phrases in the parse tree are collected.
- The noun phrases are put into focal-assured, focal-prevented, and focal-allowed groupings.

¹Valid pronoun references are listed in the enriched lexicon, rather than derived from the number and gender of the antecedent, in order to keep the amount of information that needs to be extracted from the parse tree to a minimum.

- The focal-allowed noun phrases are ranked according to the FPO focal-allowed rules in table 3.1.

The result of this processing is a focus set for each sentence. The paragraph processor uses the focus sets and focal-allowed noun phrases of consecutive sentences to define the atomic patterns of focus that exist between these sentences according to the definitions in section 4.1.2. These atomic patterns of focus are then combined by the composite pattern set processor using the rules in table 4.1 and the algorithm in section 4.1.3 to form the composite pattern set for the paragraph.

An implementation of the grammar of abstract elements of style (described in section 5.2) takes as its input the composite pattern set for the paragraph and produces as its output a triple describing the paragraph in terms of balance, position, and dominance according to the rules in table 5.1. This triple acts as input to an implementation of the grammar of stylistic goals (described in section 5.3), which produces as output a triple describing the paragraph according to the stylistic goals of emphasis, clarity, and dynamism. BOGUE, therefore, takes a paragraph of text as input and produces as output a triple that describes the stylistic goals achieved by the paragraph according to the semantic stylistic system.

The atomic patterns of focus are defined according to the specificationally related and co-specificational relationships between noun phrases. BOGUE uses an *enriched lexicon* to identify these relationships. The enriched lexicon has an entry for every common noun, proper noun, and pronoun in the parser's lexicon. Each entry contains a list of all those common nouns, proper nouns, and pronouns that the noun in question is specificationally related to, as well as a list of all those that are co-specificational to the noun. The enriched lexicon entry for the noun *man* looks like this:

```
nlex(man, [he,him,man] , [men,boy,boys])
```

The first list contains the lexical items that are co-specificational to *man*, namely *he*, *him* and *man*. The second list contains the lexical items that are specificationally related to *man*, namely *men*, *boy* and *boys*.

BOGUE's parser recognizes three kinds of noun phrases: pronouns, proper nouns, and those built around a particular common noun. In order to establish the relationship between two noun phrases, BOGUE simply determines whether the primary part of the second noun phrase (the pronoun, the proper noun, or the common noun) appears in either of the lists in the enriched lexicon entry for the first noun phrase. It is important to note that BOGUE only deals with anaphora and does not deal with cataphora. This means that the relationship between a pronoun and the referent that follows it will not be detected.

6.2 Limitations

Certain features of the semantic stylistic system have not been implemented in BOGUE. These features include:

- The *substitution* and *ellipsis* cohesion relationships.
- The *cycle* composite pattern of focus.

The missing cohesion relationships could be incorporated into BOGUE, but a more sophisticated anaphor resolution scheme would be needed. The *cycle* composite pattern of focus presents a problem because it requires that all of the noun phrases from the first sentence in a sequence be compared with all of the noun phrases in every other sentence in the sequence. In addition to all of these extra comparisons, it would be necessary to store all of the noun phrases from the first sentence in a sequence until the end of the sequence. This would make BOGUE considerably less efficient, and it would not add considerably to the system's functionality.

BOGUE also has some limitations that are not related to the semantic stylistic system. The largest single limitation is the primitive nature of the anaphor resolution scheme. It is obvious that the enriched lexicon, on which the anaphor resolution scheme is based, is not entirely satisfactory. Simply listing the lexical units that are co-specificational or specificationally related to a given lexical unit will not permit one to establish all of the semantic relationships that exist between noun phrases. It may be impractical, for instance, to list all of the possible lexical items that are specificationally related with a very general noun such as *human*. As the vocabulary gets larger, the entries in the enriched lexicon get bigger. Furthermore, the enriched lexicon would have to be modified for some pieces of text since two nouns that are synonyms in one context are not necessarily synonyms in another context. Finally, ambiguous pronoun references are not resolved. No effort is made to determine the correct referent for a pronoun if there is more than one possible referent. Nevertheless, a complete anaphor resolution scheme is beyond the scope of this thesis, and the one used by BOGUE is sufficient to make the connections between the noun phrases in a paragraph.

Another limitation of BOGUE is its parser. The parser only covers a small subset of English syntax. It is unable to handle, for instance, sentences with more than two main clauses. It is also unable to deal with composite noun phrases and verb phrases with more than one main verb. The parser is, nevertheless, adequate for showing that the semantic stylistic system can be implemented. A practical implementation of the semantic stylistic system would need both an improved parser and a better anaphor resolution scheme, but the existing implementation still shows that the theoretical work in this thesis can be used in a computational application.

6.3 Potential for Further Development

As I stated in the previous section, a practical implementation of the semantic stylistic system would have to have a more expressive parser and a more sophisticated anaphor resolution scheme than BOGUE does. In this section I will discuss some of the specific

improvements that could be made to both of these areas. I will also discuss other ways in which BOGUE could be developed.

A practical implementation of the semantic stylistic system would need a much more complete parser than the one used in BOGUE. This improved parser would be able to handle conjunction in noun phrases and verb phrases. It would have some kind of "pre-parse" that would identify the sentence type (simple or complex, question or assertion, inverted or standard order) before the detailed parsing began. The "pre-parse" could use clues like conjunctions and punctuation in order to determine the sentence type. If the sentence type could be determined immediately by a simple, shallow "pre-parse", then the most expensive kind of backtracking would be eliminated. This means that the system would operate more efficiently, and that it would be able to handle a greater variety of sentence types.

An improved anaphor resolution scheme would have to be able to resolve certain kinds of anaphor ambiguity. It would also have to deal with pronouns that are *followed* by their referent. While this phenomenon is not, strictly speaking, anaphor, it can be dealt with using the same techniques that are used to resolve anaphors.

BOGUE does not really have a knowledge representation scheme. In a test system such as BOGUE, the lack of a knowledge representation scheme is not critical, but this is not the case for a practical system that is supposed to work for a wide variety of input. In a practical application of the semantic stylistic system, BOGUE's lexicon could be replaced with a proper knowledge representation scheme. This would make the system easier to expand, and it would do away with the need for an enriched lexicon "patched onto" the parser's lexicon.

A practical system would also benefit from the use of stylistic information provided by DiMarco's syntactic stylistic grammar. While BOGUE was designed to be compatible with DiMarco's work, it does not actually make any use of her implementation of the syntactic stylistic grammar. In a practical system, the stylistic goals achieved by the syntactic content of each individual sentence could be compared to the stylistic goals found for the paragraph as a whole. If the goals selected by the syntactic stylistic grammar and those found by the semantic stylistic system matched, then the output of both systems would be reinforced. If, on the other hand, the goals contradicted each other (for instance, the syntactic stylistic grammar found that each sentence in a paragraph was *clear*, whereas the semantic stylistic system found that the paragraph as a whole was *obscure*), then the system could recognize some kind of stylistic ambiguity. The lexical stylistic grammar has not been written yet, much less implemented, but an implementation of this grammar could also be used to validate or refute the stylistic goals found by an implementation of the semantic stylistic system. The proposed lexical stylistic grammar would be created using the common methodology and vocabulary that was used for the syntactic stylistic grammar and the semantic stylistic system. The fact that all three would share a development methodology and vocabulary would help to ensure that they could, in fact, be used together in a comprehensive stylistic analysis system.

The areas that need to be developed in order to make BOGUE a useful, practical tool include, therefore, the parser, the anaphor resolution scheme, the knowledge representation scheme, and the use of information from the other stylistic grammars. While BOGUE does demonstrate that the semantic stylistic system can, in fact, be implemented, it is not ready to be used in a practical, working application. The improvements suggested in this section would help make it suitable for such an application.

Chapter 7

Conclusions

7.1 Goals

At the beginning of this thesis, I set out to codify some of the connections between the semantic content of a piece of text and its stylistic effect. In chapter 1, I stated that the codification of the semantic aspects of style would have to satisfy the following goals:

1. It should be able to use the semantic content of a piece of text to identify the stylistic goals that the text achieves.
2. It should be compatible with DiMarco's (1989) work on the codification of style for machine translation.
3. It should be flexible enough to accommodate new stylistic goals.
4. It should be adaptable to a computational application.

In this chapter, I will look at each of these goals to see if they were met. I will also discuss some shortcomings of the semantic stylistic system, and some areas for future work.

The first goal in the above list is the most important one, and I claim that the semantic stylistic system does in fact use the semantic content of a piece of text to identify its stylistic value. The semantic stylistic system uses the way that focus changes from sentence to sentence to determine the stylistic goals that a piece of text achieves. In section 2.2.1, I argue that focus is an essentially semantic concept, and in chapters 4 and 5, I argue that the way that focus changes does in fact have a stylistic effect. This means that the semantic stylistic system does indeed use the semantic content of a piece of text to identify its stylistic value.

The second goal is met because the semantic stylistic system makes use of DiMarco's methodology, as well as her vocabulary for discussing style. DiMarco's methodology, which is discussed in section 2.2.2, is based on associating patterns of *stylistic shapes* with terms in her *stylistic metalanguage*. In section 4.2, I show how DiMarco's concept of stylistic shapes is adapted to the semantic stylistic system, and in section 5.1, I show how her stylistic

metalanguage is used to connect semantics with style. Throughout my research, terms from DiMarco's vocabulary are used, and the result is a semantic stylistic system which is compatible with her own work on the codification of style.

Since the stylistic goals (see section 5.3) are only introduced at the top level of the semantic stylistic system, it is easy to introduce new ones. If the stylistic goal of *formality*, for instance, needed to be introduced, then I would simply have to add a set of rules to the GSG to associate the triple of abstract elements of style produced by the GAES with the settings of the *formality* goal. The GSG would then produce a set of *four* settings, one for each of *emphasis*, *clarity*, *dynamism*, and *formality*, instead of the triple of settings currently produced. Nothing else in the semantic stylistic system would have to be changed, and this demonstrates that the system is flexible enough to accommodate new stylistic goals.

The semantic stylistic system meets its fourth goal because of the existence of BOGUE, the computational application of the system. While BOGUE does not implement all of the system's features, it does demonstrate that the codification is, in fact, adaptable to a computational implementation.

7.2 Shortcomings

The most obvious limitation of the semantic stylistic system is that it is based on the the way focus changes or remains the same between *consecutive* sentences. Apart from the *cycle* composite pattern of focus, no effort is made to look at consistencies in focus between sentences that are not adjacent. Consider the following paragraph:

(7.1) (1) Kirsten said she would meet me this afternoon. (2) The weather is getting colder. (3) I think that her new leather jacket is really quite attractive.

Since the only NP in sentence (2), *the weather*, is neither co-specificational nor specificationally related to any other NPs in the paragraph, the paragraph has the following atomic patterns of focus:

(1) \xrightarrow{jump} (2) \xrightarrow{jump} (3)

The rules in table 4.1 create a composite pattern set containing only *jagged* for this paragraph. This means that the GAES and GSG assign the same stylistic goals to this paragraph that they would to any collection of semantically unconnected sentences, despite the fact that *Kirsten* from (1) and *her new leather jacket* from (3) are specificationally related by possessive reference. The semantic stylistic system does not detect the semantic relationship between (1) and (3) because the two sentences are separated by a third which is not semantically connected to either of them. I chose to deal only with the semantic connections between consecutive sentences because I wanted to keep the system as simple as possible. Nevertheless, the resulting system does not capture all of the semantic connections between sentences in a paragraph.

7.3 Future Work

The research described in this thesis opens up several areas of investigation. The most obvious open question is whether or not there are other ways in which semantics and style are connected. The codification could be extended at a very fundamental level by the inclusion of elements other than noun phrases in the search for sentence focus (see section 3.1). At a higher level, the concept of *global focus* (defined in section 2.3.3) could be used to capture the semantic aspects of style in text. In the same vein, the stylistic goals achieved by individual paragraphs could be combined in some way to determine the stylistic value of sequences of paragraphs.

A second important area for future work is the integration of DiMarco's syntactic stylistic grammar and her proposed lexical stylistic grammar with the semantic stylistic system. The resulting system would draw on syntactic, semantic, and lexical information to determine the stylistic value of a given piece of text. The stylistic analysis provided by the syntactic and lexical stylistic grammars at the sentence level could be used by a revised semantic stylistic system to validate the paragraph-level stylistic analysis.

A third challenging question is whether or not the semantic stylistic system could be improved by using context information as well as the semantic content of the paragraphs themselves. Certain paragraphs that appear to be semantically disconnected when taken in isolation have considerable cohesion in context. Consider the following example:

(7.2) We stand there for a while longer. A wind comes through the alley. Sounds of traffic can be heard coming from Melrose.¹

The semantic stylistic system found that there were no semantic connections between the noun phrases in this paragraph, and that it had a jagged composite pattern of focus (see appendix A). This paragraph, however, is part of a description of the scene of a murder, and in the context of the description that surrounds it, the paragraph does not seem semantically disconnected at all. If some way could be found to represent the context of a piece of text, then the semantic stylistic system could use this context to find semantic connections between sentences.

It can be seen that the computational investigation of the connection between semantics and style is by no means complete. Much work also remains to be done in the wider study of style in a computational context. Nevertheless, my research makes a contribution to what DiMarco (1989) calls "computational stylistics", and together with DiMarco's research it constitutes a step towards the codification of style for computational applications.

¹Ellis, B. E. *Less Than Zero*. Penguin Books (1985): p. 187.

Appendix A

Examples of the Composite Patterns of Focus

The following is a list of sample paragraphs that show all of the composite patterns of focus defined in table 4.1. There are eight composite patterns of focus: *static*, *stepped*, *jagged*, *initial-shift*, *initial-jump*, *final-shift*, *final-jump*, and *cycle*. Each sentence in the following paragraphs is numbered. It is important to remember that every main clause is considered to be a sentence in this thesis. The noun phrases that are in the focus sets of each sentence are underlined, and elided elements are shown in square brackets.

Static

This first paragraph has a static composite pattern of focus:

- (1) The whole lobby was empty. (2) It smelled like fifty million dead cigars. (3) It really did.¹

The noun phrase *it* in sentences (2) and (3) is a pronominal reference to *the whole lobby* in (1). Since all three noun phrases are in the focus sets of their respective sentences, there is a static atomic pattern of focus between (1) and (2), and between (2) and (3):

- (1) $\xrightarrow{\text{static}}$ (2) $\xrightarrow{\text{static}}$ (3)

The rules in table 4.1 tell us that this paragraph just has the composite pattern *static* in its composite pattern set.

Stepped

The following paragraph has a stepped composite pattern of focus:

- (1) Bonn still takes a cautious view of these events. (2) For Chancellor Helmut Kohl and his government, the main thing is to implement the decisions taken

¹Salinger, J. D. *The Catcher in the Rye*. Little, Brown and Company (1951): p. 118.

when Honecker visited the country last September in order to increase cooperation in all areas, and (3) [the main thing is] to make sure that the East German authorities do not go back on the liberalisation noted in recent months in granting permission to travel. (4) While an indignant protest did indeed come from the Minister for Inter-German Relations, no concrete threat has been made. (5) This is also true for the Social Democratic Party, where only former Chancellor Willy Brandt has raised his voice in vigorous protest against the arrests.²

The first thing to note about this paragraph is that none of the focus set elements are co-referential. This means that a static atomic pattern of focus does not appear between any of the consecutive sentences. There will at most be shift patterns of focus between sentences. *Bonn* from (1) and *Chancellor Helmut Kohl* from (2) are specificationally related, so there is a shift pattern between (1) and (2). There is also a shift atomic pattern of focus between (2) and (3) because *Chancellor Helmut Kohl* and *the East German authorities* are specificationally related by collocation. Sentences (3) and (4) have a shift pattern of focus between them because *the East German authorities* and *the Minister for Inter-German Relations* are specificationally related by collocation. Finally, (4) and (5) have a shift pattern of focus between them because *the Minister for Inter-German Relations* and *former Chancellor Willy Brandt* are specificationally related.

The paragraph, therefore, has the following atomic patterns of focus between its sentences:

(1) $\xrightarrow{\text{shift}}$ (2) $\xrightarrow{\text{shift}}$ (3) $\xrightarrow{\text{shift}}$ (4) $\xrightarrow{\text{shift}}$ (5)

The rules in table 4.1 tell us that this paragraph has a composite pattern set consisting of the single composite pattern of focus *stepped*.

Jagged

This paragraph has a jagged composite pattern of focus:

(1) We stand there for a while longer. (2) A wind comes through the alley. (3) Sounds of traffic can be heard coming from Melrose.

In this paragraph, no noun phrase is co-specificational or specificationally related to any noun phrase in any other sentence. Because of this, there is a jump atomic pattern of focus between (1) and (2), and between (2) and (3):

(1) $\xrightarrow{\text{jump}}$ (2) $\xrightarrow{\text{jump}}$ (3)

The rules in table 4.1 tell us that this paragraph just has the composite pattern *jagged* in its composite pattern set.

²Dhombres, D. and Tréan, C. "Slim pickings from Anglo-French summit", *Manchester Guardian Weekly* 138 (6), (1988): p. 13.

Initial-shift

The following paragraph has an initial-shift pattern of focus:

(1) Anyway, the corridor was all linoleum and all, and (2) you could hear his goddam footsteps coming right towards the room. (3) I don't even remember where I was sitting when he came in — at the window, or in my chair or his. (4) I swear I can't remember.³

Sentences (1) and (2) have a shift pattern between them because *the corridor* and *the room* are specificationally related by collocation. There is also a shift atomic pattern of focus between (2) and (3) because two focus set elements, *his goddam footsteps* and *he* are specificationally related by possessive reference. Sentences (3) and (4) have a static pattern between them because *I* is an element of the focus set of both sentences.

The paragraph has the following atomic patterns of focus between its sentences:

(1) $\xrightarrow{\text{shift}}$ (2) $\xrightarrow{\text{shift}}$ (3) $\xrightarrow{\text{static}}$ (4)

The rules in table 4.1 tell us that the composite pattern set for this paragraph consists of the single composite pattern of focus *initial-shift*.

Initial-jump

This paragraph has an initial-jump composite pattern of focus:

(1) He read it anyway, though. (2) You can't stop a teacher when they want to do something. (3) They just do it.⁴

Since the only noun phrase in (1), *he*, is not co-specificational or specificationally related to any noun phrase in (2), there is a jump atomic pattern of focus between (1) and (2).⁵ Between (2) and (3), however, there is a static pattern since *something* and *it* are co-specificational by pronominal reference.

This paragraph has the following atomic patterns of focus between its consecutive sentences:

(1) $\xrightarrow{\text{jump}}$ (2) $\xrightarrow{\text{static}}$ (3)

The resulting composite pattern set contains only the *initial-jump* composite pattern of focus.

³Salinger, J. D. *The Catcher in the Rye*. Little, Brown and Company (1951): p. 52.

⁴Salinger, J. D. *The Catcher in the Rye*. Little, Brown and Company (1951): p. 16.

⁵It can be argued that, in context, the reader can tell that *he* and *a teacher* are co-referential, but I claim that there is no way for the reader to determine this when the paragraph appears by itself.

Final-shift

This paragraph has a final-shift composite pattern of focus:

- (1) She looked nice smoking. (2) She inhaled and all, (3) but she didn't wolf the smoke down, the way most women her age do. (4) She had a lot of charm.
(5) She had quite a lot of sex appeal, too, if you really want to know.⁶

There is a static pattern of focus between (1) and (2) because *she* is in the focus sets of both sentences. Between (2) and (3) there is a shift pattern of focus because *she* is in the focus set of (2) while *she* is a non-focus set NP in (3). The NP *she* is also a non-focus set NP in (4) and (5) as well, and this results in the following atomic patterns of focus between the sentences in the paragraph:

- (1) $\xrightarrow{\text{static}}$ (2) $\xrightarrow{\text{shift}}$ (3) $\xrightarrow{\text{shift}}$ (4) $\xrightarrow{\text{shift}}$ (5)

The rules in table 4.1 tell us that this paragraph has a composite pattern set consisting of the single composite pattern of focus *final-shift*.

Final-jump

The following paragraph has a final-jump composite pattern of focus:

- (1) The goddam movies. (2) They can ruin you. (3) I'm not kidding.⁷

There are two interesting things to note about this paragraph:

- Sentence (1) is a fragment sentence consisting only of a noun phrase. This means that the sentence is its own focus set.
- The direct object in sentence (2) is not in the focus set of the sentence because it is focal-prevented. In section 3.2.2 it was noted that personal pronouns with no specific referent are never included in the focus set of a sentence, and *you* in sentence (2) is just such a personal pronoun.

There is a static pattern of focus between (1) and (2) because *the goddam movies* and *they* are co-specificational by pronominal reference. Sentences (2) and (3) have a jump pattern between them because the only noun phrase in (2), *they*, is neither co-specificational nor specificationally related to *I*, the only noun phrase in (3).

This paragraph has the following atomic patterns of focus between its consecutive sentences:

- (1) $\xrightarrow{\text{static}}$ (2) $\xrightarrow{\text{jump}}$ (3)

The resulting composite pattern set contains only the *final-jump* composite pattern of focus.

⁶Salinger, J. D. *The Catcher in the Rye*. Little, Brown and Company (1951): p. 17.

⁷Salinger, J. D. *The Catcher in the Rye*. Little, Brown and Company (1951): p. 136.

Cycle

The following paragraph (which is analysed in detail in section 5.4) displays a cycle composite pattern of focus:

(1) Anyway, before I got to the hotel, I started to go in this dumpy looking bar, (2) but two guys came out, drunk as hell, (3) and [they] wanted to know where the subway was. (4) One of them was this very Cuban-looking guy, (5) and he kept breathing his stinking breath in my face while I gave him directions. (6) I ended up not even going in the damn bar. (7) I just went back to the hotel.⁸

The important thing to note about this paragraph is that *the hotel* is in the focus set of both the first sentence and the last sentence. Since *the hotel* is not co-referential with any of the elements of the focus sets of the intervening sentences, the rules in table 4.1 tell us that this paragraph has a composite pattern set consisting of the composite pattern of focus cycle.

Multiple composite patterns of focus

In this section I will present some paragraphs that cannot be described with any single composite pattern of focus. The composite pattern sets for these paragraphs will, therefore, contain more than one composite pattern of focus.

The following paragraph has three patterns in its composite pattern set:

(1) I hand him the joint and then a book of matches from The Ginger Man. (2) He lights it and (3) then [he] resumes playing "Megamania". (4) He hands me the joint and (5) I relight it. (6) Yellow things are falling toward Daniel's man. (7) Daniel starts to tell me about a girl he knows. (8) He doesn't tell me her name.⁹

There is a static pattern of focus between (1) and (2) since *the joint* and *it* are co-referential by pronominal reference. Sentences (2) and (3) have a shift pattern of focus between them because the non-focus set NP *he* is repeated. There is a shift pattern of focus between (3) and (4) for the same reason. Between (4) and (5) there is a static pattern because *the joint* and *it* are co-specificational by pronominal reference. Sentences (5) and (6) have a jump pattern between them because none of their NPs are co-specificational or specificationally related. There is a shift pattern between (6) and (7) because two non-focus set NPs, *Daniel* and *Daniel's man*, are specificationally related by possessive reference. Finally, there is a shift pattern between (7) and (8) because two focus set NPs, *a girl* and *her name*, are specificationally related.

⁸Salinger, J. D. *The Catcher in the Rye*. Little, Brown and Company (1951):p. 118.

⁹Ellis, B. E. *Less Than Zero*. Penguin Books (1985): p. 159.

The paragraph, therefore, has the following atomic patterns of focus between its sentences:

(1) $\xrightarrow{\text{static}}$ (2) $\xrightarrow{\text{shift}}$ (3) $\xrightarrow{\text{shift}}$ (4) $\xrightarrow{\text{static}}$ (5) $\xrightarrow{\text{jump}}$ (6) $\xrightarrow{\text{shift}}$ (7) $\xrightarrow{\text{shift}}$ (8)

When we apply the rules in table 4.1 and the algorithm described in section 4.1.3, then we get the following composite pattern set for this paragraph: (*final-shift, final-jump, stepped*).

The following paragraph has another pattern again:

(1) I meet Julian that same day in an old rundown arcade on Westwood Boulevard. (2) He's playing "Space Invaders" (3) and I come up and stand next to him. (4) Julian looks tired and talks slowly and (5) I ask him where he's been (6) and he says around (7) and I ask him for the money (8) [I] and tell him that I'm leaving soon. (9) Julian says that there are some problems, (10) but if I come with him to this guy's place, he can give me the money.¹⁰

There is a shift pattern of focus between (1) and (2) because the focus set NP *Julian* from (1) is co-specificational with the non-focus set NP *he* from (2). Sentences (2) and (3) also have a shift pattern between them because two non-focus set NPs, *he* from (2) and *him* from (3), are co-specificational. A shift pattern exists between (3) and (4) because a non-focus set NP from (3), *him*, is co-specificational with a focus set NP from (4), *Julian*. There is a static pattern between (4) and (5) because two focus set NPs, *Julian* and *he*, are co-specificational by pronominal reference. Sentences (5) and (6) have a static pattern between them because *he* is an element of the focus set of both sentences. There is a shift pattern between (6) and (7) because a focus set NP from (6), *he*, is co-specificational with a non-focus set NP from (7), *him*. Sentences (7) and (8) have a shift pattern between them because *I* is in the focus set of (8), while it is a non-focus set NP in (7). There is a shift pattern between (8) and (9) because two non-focus set NPs, *him* from (8) and *Julian* from (9), are co-specificational. Finally, (9) and (10) have a shift pattern between them because two non-focus set NPs, *Julian* from (9) and *him* from (10), are co-specificational.

This paragraph has the following atomic patterns of focus between its consecutive sentences:

(1) $\xrightarrow{\text{shift}}$ (2) $\xrightarrow{\text{shift}}$ (3) $\xrightarrow{\text{shift}}$ (4) $\xrightarrow{\text{static}}$ (5) $\xrightarrow{\text{static}}$
 (6) $\xrightarrow{\text{shift}}$ (7) $\xrightarrow{\text{shift}}$ (8) $\xrightarrow{\text{shift}}$ (9) $\xrightarrow{\text{shift}}$ (10)

When we apply the rules in table 4.1 and the algorithm described in section 4.1.3, we get the following composite pattern set for this paragraph: (*initial-shift, stepped*).

¹⁰Ellis, B. E. *Less Than Zero*. Penguin Books (1985): p. 165.

Appendix B

A Test of the Relationship Between Focus and Grammatical Role

The format of the test

The following is a description of a limited test designed to support the focal-allowed rules listed in table 3.1. The test consisted of 175 sentences (all taken from existing texts) divided into six groups. Each sentence had two or more words underlined, and the test respondents were instructed to rank the underlined words in each sentence according to how focal they were. The idea of focus was explained in the instructions at the beginning of the test:

If a word, or group of words, seems to sum up what the sentence is about or seems to be central to the meaning of the sentence, this word or group of words is called the *focus* of the sentence.

The ten respondents were further instructed to find the word that best summarized the sentence in order to discover which underlined words were more focal. If the respondents could not determine whether any word was more focal, they were instructed to leave the words unranked. The following are two examples of sentences used in the test. The respondents were asked to rank the underlined words.

(B.1) I mean he really knows how to adapt himself.¹

(B.2) Then I thought of calling up this guy that went to Whooton School when I was there, Carl Luce, but I didn't like him much.²

¹Salinger, J. D. *The Catcher in the Rye*. Little, Brown and Company (1951): p. 71.

²Salinger, J. D. *The Catcher in the Rye*. Little, Brown and Company (1951): p. 78.

First Grammatical Role	Second Grammatical Role
subject — 15	indirect object — 3
subject — 147	object of preposition — 56
subject — 78	direct object — 112
indirect object — 40	direct object — 50
indirect object — 82	object of proposition — 78
main clause subject — 27	subordinate clause subject — 28
main clause object — 42	sub. clause object — 27
main clause object of prep. — 48	sub. clause object of prep. — 19
“this” NP — 94	subject — 30
“this” NP — 16	direct object — 26
“this” NP — 2	indirect object — 0
“this” NP — 16	object of preposition — 6
NP with reflexive pronoun — 10	subject — 9
NP with reflexive pronoun — 6	direct object — 7
NP with reflexive pronoun — 42	object of preposition — 3

Table B.1: The results of the test

The results

The results of the test are shown in table B.1. Each line in the table shows a pair of grammatical roles and the number of times each was chosen as the focus when they both appeared in a sentence together. In sentences where the first grammatical role was subject and the second grammatical role was indirect object, for instance, the subject was chosen as the focus 15 times, while the indirect object was chosen 3 times.

Conclusions

This test was not designed to ascertain the absolute correctness of the focal-allowed rules, but rather to provide some support for them. A larger test, with a greater variety of sentences and a larger number of respondents would be needed to fully validate the focal-allowed rules. Nevertheless, the test did uncover some shortcomings in an earlier version of the FPO, and this means that the current FPO is more valid. The test demonstrated the following points:

Main clause versus subordinate clause

An earlier version of the FPO stated that elements in the main clause of a sentence were more likely to be focal than elements with the same grammatical role in a subordinate clause of the sentence. The results of the test suggest this is not the case. Subordinate

clause subjects were chosen as the focus as often as main clause subjects. Main clause objects were chosen over subordinate clause objects in about 63% of the sentences. Main clause objects of prepositions were chosen over subordinate clause objects of prepositions in about 72% of the sentences.

Existential “there”

In all of the existential “there” sentences and cleft sentences, the complement of “to be” was chosen as the focus.³ Because of this, the FPO was modified, and now it classifies these complements as focal-assured.

Reflexive pronouns

An earlier version of the FPO stated that pronouns with a corresponding reflexive pronoun are focal-assured. In 60% of the sentences, the pronoun with a reflexive pronoun was chosen over the subject. In 54% of the sentences, the pronoun with a reflexive pronoun was chosen over the object. In 93% of the sentences the pronoun with a reflexive pronoun was chosen over the object of a preposition. Since the object of a proposition is subordinate to all other grammatical roles in the FPO, this last result does not say that pronouns with corresponding reflexive pronouns are focal-assured. Given this, and the inconclusive results for subjects and objects, pronouns with reflexive pronouns are not be considered focal-assured in the final version of the FPO.

Indirect objects and objects of prepositions

In an earlier version of the FPO, objects of propositions were subordinate to indirect objects. The test results contradict this. While the indirect object was ranked below the direct object in 74% of the sentences, it was ranked above the object of a preposition only in 51% of the sentences. In addition, the indirect object ranked below the subject in 83% of the sentences. With this in mind, objects of prepositions are no longer subordinate to indirect objects in the final version of the FPO.

This test was far too limited to provide any conclusive, positive results. Nevertheless, I claim that it provided direction on how the FPO could be improved. The focal-allowed rules were modified according to the results of this test, and the references in them to main and subordinate clauses were deleted. In addition, the old rules said that indirect objects were more likely to be focal than objects of prepositions. The test data did not agree with this rule so it has been removed. These changes make the focus partial ordering rules more valid in that they now agree with the results of a test conducted using sentences taken from existing texts.

³For example “There is a light over at the Frankenstein place” is an existential “there” sentence, and “It is a pleasure to meet you” is a cleft sentence.

Appendix C

An Example of BOGUE's Processing

The following is an example of how BOGUE processes an input paragraph. In this annotated trace, BOGUE's output is in typewriter font, while the explanatory comments are in normal font. The trace shows how BOGUE gets input from the user and how it displays the output.

The processing begins with a prompt that asks the user to enter the sentences in the paragraph one at a time. The user indicates that the paragraph is complete by entering the single letter *p* on a separate line.

```
=====
Please enter paragraph one sentence
at a time.  At the end of the paragraph,
enter p.  on a new line to start paragraph
processing.  When you are finished, enter
quit.
```

```
=====
```

```
|: I was in bed, and I could not pray.
|: I got started, but I kept picturing Sunny.
|: I sat up in bed, and I smoked another cigarette.
|: I must have smoked two packs since I left Pencey.
|: p.
```

```
=====
```

The input paragraph is echoed back to the user in its internal, C-Prolog form. Each sentence is now a C-Prolog list, commas have been changed to an internal representation, and capital letters have been changed to lower case.

```
===== here is the input paragraph =====
```

```
(i,was,in,bed,comma,and,i,could,not,pray)
(i,got,started,comma,but,i,kept,picturing,sunny)
```

(i, sat, up, in, bed, comma, and, i, smoked, another, cigarette)
(i, must, have, smoked, two, packs, since, i, left, pencey)

Now each sentence is displayed individually, along with the parse tree produced by BOGUE's parser. Note that if the original sentence has two main clauses, then the parse tree shows that the sentence is composite by giving it a root node of *comp* and a subtree rooted in *assertion* for each main clause. From this point on, BOGUE treats each main clause as a sentence.

i was in bed comma and i could not pray

```
comp
  assertion
    np(subj,pron(i))
    vp(copula(was),npprep(pp(prepare(in),np(pobj,n(bed))))))
  assertion
    np(subj,pron(i))
    vp(auxP(aux(could)),vp((advP(adv(not)),verb(pray))))
```

i got started comma but i kept picturing sunny

```
comp
  assertion
    np(subj,pron(i))
    vp(auxP(aux(got)),vp((passive,verb(started))))
  assertion
    np(subj,pron(i))
    vp(auxP(aux(kept)),vp(verb(picturing),np(obj,pn(sunny))))
```

i sat up in bed comma and i smoked another cigarette

```
comp
  assertion
    np(subj,pron(i))
    vp(verb(sat),verbmods(vpprep(pp(prepare(in),np(pobj,n(bed))))))
  assertion
    np(subj,pron(i))
    vp(verb(smoked),np(obj,det(indefinite,another),n(cigarette)))
```

i must have smoked two packs since i left pencey

```
assertion
  np(subj,pron(i))
```

```

vp
  auxP(aux(must),auxP(aux(have)))
  vp((passive,verb(smoked)),
    np(obj,adjP(adj(two)),n(packs),
      rel(relPro(since),assertion
        np(subj,pron(i))
          vp(verb(left),np(obj,pn(pencey)))))))

```

BOGUE now displays the atomic patterns of focus that occur between consecutive sentences in the paragraph. The input paragraph has a static atomic pattern of focus between its first and second sentences, and between its second and third sentences. The subsequent sentences all have a shift atomic pattern of focus between them.

```

===== the atomic pattern set =====
  static
  static
  shift
  shift
  shift
  shift

```

The composite pattern set that results from these atomic patterns is then displayed. Since the atomic patterns of focus for the input paragraph could be organized into a single composite pattern of focus, there is only one element in the composite pattern set.

```

=== the composite pattern set ===
  final_shift

```

BOGUE then shows the abstract elements of style that the implementation of the GAES produces for this composite pattern set. This paragraph has a *polypoise* setting for balance, a *dissolution* setting for position, and a *diaschematic* setting for dominance.

```

=== the abstract elements produced by gaes ===
  polypoise
  dissolution
  diaschematic

```

Finally, BOGUE displays the triple of stylistic goals that the implementation of the GSG produces for these abstract elements. This paragraph has an *emphatic* setting for emphasis, a *obscure* setting for clarity, and a *dynamic* setting for dynamism.

```

=== Goals for this paragraph =====
  emphatic
  obscure
  dynamic

```

The above trace shows how BOGUE interacts with the user. It also shows how the system displays its output. BOGUE takes in a paragraph a sentence at a time and produces as output

the stylistic goals that the paragraph satisfies. It also displays intermediate information (the parse trees for each sentence, the atomic patterns of focus, the composite pattern set, and the abstract elements of style) that can be used to verify the output.

References

- Bertinetto, P. M. (1979). Reflections on the status of text linguistics. In Petöfi, Janos S., editor, *Text vs. Sentence: basic questions of text linguistics*, Papiere zur Textlinguistik. Helmut Buske Verlag, Hamburg, pages 143-159.
- Bureau, Conrad (1976). *Linguistique fonctionnelle et stylistique objective*. Presses Universitaires de France, Paris.
- Carter, David M. (1987). *Interpreting Anaphors in Natural Language Texts*. Ellis Horwood Series in Artificial Intelligence. Ellis Horwood Limited, Chichester.
- Cha, Jin Soon (1985). *Linguistic Cohesion in Texts: Theory and Description*. Daehan Textbook Printing Company, Seoul.
- Crystal, David and Davy, Derek (1969). *Investigating English Style*. Longman Group Limited, London.
- Derr, Marcia A. and McKeown, Kathleen Rose (1984). Using focus to generate complex and simple sentences. In *Proceedings of the International Conference on Computational Linguistics (COLING-84)*, Stanford. pages 319-326.
- DiMarco, Chrysanne (1989). *Computational Stylistics for Natural Language Translation*. PhD thesis, Department of Computer Science, University of Toronto. [to appear].
- DiMarco, Chrysanne and Hirst, Graeme (1988). Stylistic grammars in language translation. In *Proceedings of the International Conference on Computational Linguistics (COLING-88)*, Budapest. pages 148-153.
- Ellis, J. M. (1970). Linguistics, literature and the concept of style. *Word*, 26(1):65-78.
- Enkvist, Nils Eric (1973). *Linguistic Stylistics*. Janua linguarum. Mouton Publishers, The Hague.
- Enkvist, Nils Eric (1985). Stylistics, text linguistics, and composition. *Text*, 4:251-267.
- Fibras, J. (1974). Some aspects of the Czechoslovak approach to problems of functional sentence perspective. In Daneš, F., editor, *Papers on Functional Sentence Perspective*. Academia, Mariánske Lázně, pages 11-37.
- Granger, Richard H. (1977). Foul-up: A program that figures out meanings of words from context. In *IJCAI-77 proceedings*. pages 172-178.
- Grosz, Barbara Jean (1977). The representation and use of focus in dialogue understanding. Technical note 151. AI Center, Stanford Research Institute.

- Grosz, Barbara Jean (1981). Focusing and description in natural language dialogues. In ~~Joshi, Aravind K., Webber, Bonnie Lynn, and Sag, Ivan A., editors, *Elements of Discourse Understanding*. Cambridge University Press, Cambridge, England, pages 84-105.~~
- Grosz, Barbara Jean and Sidner, Candace Lee (1986). Attention, intentions, and the structure of discourse. *Computational Linguistics*, 12:175-204.
- Halliday, Michael Alexander Kirkwood (1967). Notes on transitivity and theme in English. *Journal of Linguistics*, 3.
- Halliday, Michael Alexander Kirkwood and Hasan, Ruqaiya (1976). *Cohesion in English*. Longman Group Limited, New York.
- Kane, Thomas S. (1983). *The Oxford Guide to Writing*. Oxford University Press, New York.
- Lucas, Frank Laurence (1958). *Style*. Cassell & Company Ltd., London.
- Lyons, John (1968). *Introduction to Theoretical Linguistics*. Cambridge University Press, Cambridge, England.
- McKeown, Kathleen Rose (1982). *Generating Natural Language Text in Response to Questions about Database Structure*. PhD thesis, Department of Computer Science, University of Pennsylvania.
- McKeown, Kathleen Rose (1985). *Text Generation: Using discourse strategies and focus constraints to generate natural language text*. Studies in natural language processing. Cambridge University Press, Cambridge, England.
- Mitterand, Henri (1985). Le paragraphe est-il une unité linguistique? In Laufer, R., editor, *La notion de paragraphe*. Éditions du Centre National de la Recherche Scientifique, Paris, pages 85-96.
- Morris, Jane (1988). *Lexical cohesion, the thesaurus, and the structure of text*. Master's thesis, Department of Computer Science, University of Toronto. Published as technical report CSRI-219.
- Muller, Charles (1977). *Principes et methodes de statistique lexicale*. Langue, linguistique, communication. Hachette, Paris.
- Quirk, Randolph and Greenbaum, Sidney (1979). *A University Grammar of English*. Longman Group Limited, London.
- Sidner, Candace Lee (1979). *Towards a computational theory of definite anaphora comprehension in English discourse*. PhD thesis, Department of Electrical Engineering, Massachusetts Institute of Technology.

- Sidner, Candace Lee (1983). Focusing in the comprehension of definite anaphora. In Brady, Michael and Berwick, Robert C., editors, *Computational Models of Discourse*. The MIT Press, Cambridge, Massachusetts, pages 267-330.
- Taglicht, Josef (1984). *Message and Emphasis: on focus and scope in English*. English language series. Longman Group Limited, New York.
- van Dijk, Teun Adrianus (1980). *Macrostructures: an interdisciplinary study of global structures in discourse*. Lawrence Erlbaum Associates, Hillsdale.
- van Dijk, Teun Adrianus (1981). *Studies in the pragmatics of discourse*. Mouton Publishers, New York.
- Watt, Murray Edgar (1988). *The realization of natural language with pragmatic effects*. Master's thesis, Department of Computer Science, University of Toronto. Published as technical report CSRI-215.