A COGNITIVE MODEL OF FICTION WRITING

ANTHONY JOHN BLOOR

A thesis submitted in partial fulfilment of the requirements of Middlesex University for the degree of Doctor of Philosophy

March 1997

ABSTRACT:

Models of the writing process are used to design software tools for writers who work with computers. This thesis is concerned with the construction of a model of fiction writing. The first stage in this construction is to review existing models of writing. Models of writing used in software design and writing research include behavioural, cognitive and linguistic varieties. The arguments of this thesis are, firstly, that current models do not provide an adequate basis for designing software tools for fiction writers. Secondly, research into writing is often based on questionable assumptions concerning language and linguistics, the interpretation of empirical research, and the development of cognitive models. It is argued that Saussure's linguistics provides an alternative basis for developing a model of fiction writing, and that Barthes' method of textual analysis provides insight into the ways in which readers and writers create meanings. The result of reviewing current models of writing is a basic model of writing, consisting of a cycle of three activities - thinking, writing, and reading. The next stage is to develop this basic model into a model of fiction writing by using narratology, textual analysis, and cognitive psychology to identify the kinds of thinking processes that create fictional texts. Remembering and imagining events and scenes are identified as basic processes in fiction writing; in cognitive terms, events are verbal representations, while scenes are visual representations. Syntax is identified as another distinct object of thought, to which the processes of remembering and imagining also apply. Genette's notion of focus in his analysis of text types is used to describe the role of characters in the writer's imagination: focusing the imagination is a process in which a writer imagines she is someone else, and it is shown how this process applies to events, scenes, and syntax. It is argued that a writer's story memory influences his remembering and imagining; Todorov's work on symbolism is used to argue that interpretation plays the role in fiction writing of binding together these two processes. The role of naming in reading and its relation to problem solving is compared with its role in writing, and names or signifiers are added to the objects of thought in fiction writing. It is argued that problem solving in fiction writing is sometimes concerned with creating problems or mysteries for the reader, and it is shown how this process applies to events, scenes, signifiers and syntax. All these findings are presented in the form of a cognitive model of fiction writing. The question of testing is discussed, and the use of the model in designing software tools is illustrated by the description of a hypertextual aid for fiction writers.

CONTENTS:

LIST OF FIGURES:

INTRODUCTION

Last Christmas, my sister gave me an orrery - orreries are models built to demonstrate the movements of bodies in the solar system. Mine was a plastic kit that had to be assembled with the aid of a knife and glue, and consisted of a miniature earth, sun and moon. The instructions point out that the model is not to scale: "the earth and the moon have been made too large compared with the sun, and their distances have been made smaller, but this is the only way to keep the model to a convenient size". Once assembled, this model can be set in motion with the aid of a clockwork motor, and demonstrates the orbit of the earth around the sun, and of the moon around the earth. It can be used to show why we have seasons, why we have day and night, and various other features.

With the aid of computers, the art of model building takes on a new dimension. Computer-based modelling aids have been used in schools to teach a variety of topics in mathematics and mechanics, as Sharples points out: "A good way to understand the laws, constraints, and possibilities of a complex rule-governed system is to build models of the system, subject to the same rules, and then perform experiments on them" (Sharples 1985, p.52). In this case, the purpose of a modelling aid is to enhance a child's understanding of mathematics by enabling her to build her own model of a complex system, or to alter the variables in a pre-determined system and see what effect this has. Computer-based modelling aids have been used to teach topics in linguistics; in this case, a modelling aid enhances a child's understanding of grammar and the English language by enabling him to manipulate models of syntactic structure (Sharples 1985, pp.54-55).

Compared with orreries, models of syntax, and models in mathematics, the development of models of writing is a more recent phenomenon. Models of writing are used in teaching, but the main motivation for their development is the growth of interactive computing and the design of computer software for writers. As Noel Williams points out, software tools for writers are always based on a model of writing, whether explicit or implicit (Williams 1991a, p.31). A model of writing is a rather different entity to the above examples of models. If we consider writing as

a dynamic process, then a model of writing should have more in common with an orrery than with a model of syntactic structure - a representation of process rather than structure, motion rather than stasis, diachrony rather than synchrony. However, we do not have any ready made plastic kits out of which we can assemble a writer with pen or keyboard, wind him up, and observe the process of writing; neither do we have the equivalent of mathematical modelling tools. So, a model of the process of writing is a conceptual model rather than a physical model - an implicit or explicit hypothesis about how writers write, or what writing involves, perhaps conceived as a number of stages such as "Plan, Draft and Revise", a set of operations that a writer performs in sequence to produce a finished text. According to Williams, this is the most common model found in teaching and computer software (Williams 1991a, p.31). Flower and Hayes describe a model as a metaphor:

> "A model is a metaphor for a process: it's a way of describing something, such as the composing process, which refuses to sit still for a portrait. People build models in order to understand how a dynamic system works, and to describe the functional relationships among its parts. In addition, if a model is really to help us to understand more, it should speak to some of the critical questions in the field of writing and rhetoric. It should help us to see things in a way we didn't see them before."
> (Hayes & Flower 1980b, p.390)

This thesis is concerned with the construction of a model of fiction writing. The purpose of the model is to design a hypertextual planning or thinking aid for fiction writers. The motivation for designing this software is discussed in chapter one, where we summarise the assumptions in our approach to modelling, and compare them with those that characterise much of the current research into writing. To construct a model of fiction writing, our first stage is to review existing models of writing. In chapter two, we introduce the variety of models in current use, and discuss the assumptions of cognitive science concerning the testing of models.

After discussing writing behaviour, cognitive models of writing, and models of planning in chapters three to five, we emerge with a basic model of writing - a general model of writing behaviour. This model is basically an interpretation of what has been called a "consensus model of writing" - the Hayes and Flower (1980a) model of writing. In this interpretation, we represent writing as a cycle of activities - thinking, writing, and reading - and distinguish between motivational, metacognitive, and cognitive processes in a writer's thinking. One problem with models of cognitive processes is a general failure to consider conscious thought, as Griffin (1984) points out. In representing writing in this fashion, and making these distinctions in a writer's thinking, our aim is to remedy this general failure by trying to identify the kinds of conscious processes that create fictional texts.

The basic model is only a general model, and makes no reference to the kind of text a writer is creating; the text is an absent feature in the models discussed so far. To develop this basic model into a model of fiction writing, our next stage is to consider linguistic approaches to modelling writing. However, we find that these approaches are dominated by the influence of Chomsky's (1965) transformational grammar. Their main concern is structure: linguists and cognitive scientists have developed grammars to represent not only syntactic but also semantic structures. Thus a linguistic model of writing tends to describe writing in terms of synchrony rather than diachrony, in terms of a hierarchy of semantic and syntactic structures rather than structuring activities. In this case, a hierarchical model of structures, in which semantic structures are transformed into syntactic structures, is assumed to be a model of writing.

This kind of model confirms the critique of Winograd and Flores concerning the influence of the rationalistic tradition in computer science: "In a complete rationalistic analysis of meaning, we would be able to explicate the meaning of each utterance by showing how it is built up systematically from smaller elements, each with its own determinate meaning" (Winograd & Flores 1986, p.64). Linguistic approaches to modelling writing generally

assume a rationalistic view of language, in which words are the names of things, and ideas are entities that have a separate existence from language; they also assume a rationalistic view of narration and description which is not always relevant to the context of fiction writing.

Our alternative approach in developing the basic model into a model of fiction writing is to follow a semiological view of language. In this approach, we adopt Saussure's notion of the linguistic sign, the assumption that we cannot separate ideas from language, and the view of language as a system of sequential and associative relations, in which syntax is an aspect of the former. In addition, we look at research in the area of narratology - the work of Jakobson, Genette, Todorov and Barthes in particular - to gain a perspective on how different types of texts might influence the process of writing. We use narratology and textual analysis to make inferences about thinking processes, and look to research in cognitive psychology for any confirmation or refutation of these inferences.

We pursue this approach in chapter seven to look at narration and description in the context of fiction writing, and we identify the remembering and imagining of events and scenes as basic processes in fiction writing. In cognitive terms, events are verbal representations, while scenes are visual representations. Syntax is another distinct object of thought, to which the processes of remembering and imagining also apply. In his discussion of perspective or "point-of-view", Genette (1980) uses the term "focus" to classify narrative texts. Using his analysis and the accounts of fiction writers on their characters, we identify the process of focusing the imagination in fiction writing. Focusing the imagination is a process in which a writer imagines she is someone else, and we show how this process applies to events, scenes, and syntax. In chapter eight, we look at the influence of a writer's story memory on their remembering and imagining, and we argue that interpretation plays a role in generating new stories. In fiction writing, interpretation fills a gap between remembering events (from a writer's story memory or from her

personal experience) and imagining the events of her fictional work, and we show how story schemata are used in this process.

In chapter nine, we look at Barthes' (1990) account of textual signifiers, pursuing the suggestion that avenues of meaning for readers can also be avenues of meaning for writers. Barthes describes reading as a process of hypothesis testing, in which naming is equivalent to problem solving. We explore the role of naming in reading and writing. Following Saussure, we argue that names are signifiers, rather than elements in an inventory of things, and we argue that naming in writing is not the continuous process given by rationalistic accounts of language, but refers to the specific process of imagining names or signifiers. We add signifiers to the objects of thought in fiction writing, and show how the processes we have already identified (remembering or reflecting, imagining, and focusing the imagination) apply to this object. We explore the role of problem solving in reading and writing, comparing rationalistic accounts of problem solving with Barthes' account of the hermeneutic code - a code of enigmas or mysteries - and we show how mysteries in fictional texts can be classified according to event, scene, signifier, and syntax. We argue that in the context of fiction writing, problem solving includes the creation of enigmas for the reader.

As the purpose of the model is to design a hypertextual aid for fiction writers, we look at hypertext in more detail before presenting the results of our investigations in the form of a cognitive model of fiction writing. The model is based on the basic model of writing discussed in chapter five. We identify the principal elements of cognitive planning in fiction writing as remembering and reflecting, imagining, focusing the imagination, and problem solving. Each of these processes can be applied to events, scenes, syntax, and names or signifiers. We show how the model can be used in design by using it to construct a hypertextual aid for student writers of fiction, and we describe the conceptual design of a prototype. In the conclusion, we outline some of the implications of our findings for future research, design, and teaching.

CHAPTER ONE:

AIMS AND ASSUMPTIONS

1.1 INTRODUCTION

In this chapter we describe the objectives of our research, discuss the motivation for it, and explain our methods of pursuing these objectives. We introduce the assumptions behind much of the current research into writing, and compare them with the alternative set of assumptions that informs our approach. We begin by considering research as a type of narrative.

1.2 BEGINNINGS

A story, according to Propp's *Morphology of the Folktale,* begins with a *lack* (Propp 1968), which is a feature that this type of narrative shares with *research.* In an attempt to characterise the latter activity, Roland Barthes asks:

> "What is a piece of 'research'? To find out, we would need to have some idea of what a 'result' is. What is it that one finds? What is it that one wants to find? *What is missing?* "
> (Barthes 1979b, p.197)

So, just as the lack motivates a *quest* in the folktale, we can say that research is a type of narrative, in which a quest is motivated by the question, *"What's missing?"* In Genette's view, "research is nothing but a series of questions, and the point is not to ask the wrong question" (Genette 1988, pp.75-76). In that case, we need to add to Barthes' questions, *"Are we asking the right questions?".*

Traditionally, empirical research begins with a statement that defines some kind of problem. A method of resolving the problem is then proposed, perhaps in the form of a hypothesis, and the method is tested by practical experiment. A description of the experiment, or series of experiments, leads to a discussion of the results, and possibly the confirmation, refutation, or qualification of the hypothesis. Some kind of conclusion is reached, and a programme of future work outlined. But what kind of assumptions do we start with, and how do those assumptions influence the definition of a problem, the construction of a hypothesis, the

design of practical experiments, and the interpretation of results? Or as Barthes asks, "In what axiomatic field will the fact be isolated, the meaning brought out, the statistical discovery be placed?" (Barthes 1979b, p.198).

The objective of the research activity that has resulted in this thesis is the design of writing software. To be more specific, the objective is to design a hypertextual aid for student writers of fiction. Why? What is the motivation for this particular objective? What are the initial assumptions?

1.3 OBJECTIVES

The aim of this research is motivated by four sets of considerations. The first set of assumptions come from accounts of student writing. For the majority of students on writing courses, the environment in which most writing takes place is the writing laboratory or resource centre. Investigations into the effects of computers on composing suggest that the use of word processors does not encourage planning (Haas 1989). Research has also found that expert and novice writers when composing with a computer have difficulties achieving a global view of the text (Eklundh 1991). From a developmental perspective, psychologists have argued that students often have difficulties with "high-level structures" in writing, and tend to get immersed in the "low-level" concerns of grammar and sentence construction (Collins & Gentner 1980, Bereiter 1980). Flower and Hayes argue that planning is the most effective method of reducing constraints in writing, and that experts adopt this method more often than novices (Flower & Hayes 1980a).

The collation of these findings results in the argument that while there is a need for planning or structuring in writing, the use of computers to compose does not encourage such activity. We can conclude, therefore, that there is a *need* for on-line planning tools for students on writing courses who perform most of their writing in a writing laboratory or resource centre. We do not

assume that the process of writing essays or argumentative texts is the same as writing fiction. However, we do assume that the conditions that Flower and Hayes call the task environment (Hayes & Flower 1980a) - the conditions in which writing occurs and cognition is situated - are similar for students on writing courses, whatever the task, in that most writing takes place in the writing laboratory. The differences between planning in fiction writing and planning in writing argumentative texts will therefore be one of the topics of our investigation.

The second reason for this objective comes from a review of the various types of writing software available in the market, which indicates a lack of tools aimed specifically at fiction writers (Dorner 1992, Williams 1991a, 1992b, Kellogg 1989). Many word processors now include a spelling checker, a grammar checker, and a thesaurus, while a range of reference material exists on CD and CD-ROM, including multimedia encyclopaedias and the complete works of Shakespeare, for example. There is also a range of software tools intended to support planning in writing, such as idea generators and idea processors (Kellogg 1989). However, this range of tools is generally intended to assist the planning of argumentative texts. Moreover, as we shall see, most writing software assumes a *model of writing* that describes how writers compose in a medium of pen and paper, so that the software tools based on such models may not be adaptable to the ways in which writers compose with computers (Williams 1991a). There is some software support for plot development (Sawyer & Weingarten 1991), but does plot development constitute planning in fiction writing? The conclusion of these observations, therefore, is that there is a *lack* of writing software aimed specifically at fiction writers, while we still need to investigate the question of what constitutes planning in fiction writing.

The third reason for this objective concerns hypertext. A hypertext or hyperdocument is an electronic document that consists of *nodes*, or chunks of information (text or pictures); nodes are connected to other nodes by *links* that enable a reader or user to pursue various paths through the document. Hypertext

has been used for various purposes (Conklin 1987), including the design of an "open learning system" for writers (Williams 1991b). Conklin claims that it "opens some very exciting possibilities, particularly for new uses of the computer as a communication and thinking tool" (Conklin 1987, p.17). One of its uses is the design of "problem exploration tools" - "tools to support early unstructured thinking on a problem when many disconnected ideas come to mind" (Conklin 1987, p.20). Hypertext has been used to design some of the planning tools mentioned above, such as idea processors - tools for planning and developing arguments in which "ideas" are represented by nodes, and the relationships between ideas are represented by various kinds of links (Kellogg 1989, p.75). Hypertext has also been used to create "interactive fiction", a hypertextual fiction that presents the reader with a different text on each reading (Bolter & Joyce 1989). It seems, therefore, that hypertext would be a suitable device to design a thinking, planning or structuring tool for writing fiction.

The fourth set of assumptions are concerned with the decision to design a tool, rather than a piece of instructional software or "courseware". The first consideration here is the question of learning in the context of writing. Different domains need different strategies of teaching and learning - "learning is not unitary", as Hammond points out (Hammond 1993, p.53). Psychologists studying learning have made a distinction between declarative and procedural knowledge (Anderson 1981, 1983; Kahney 1986, pp.123-124). Hammond refers to this distinction in his discussion of the use of hypertext in education. Declarative knowledge is "essentially knowledge of facts", while procedural knowledge is the knowledge of how to do things (Hammond 1993, p.62). In the former case, Hammond argues that "on the whole, learning of conceptual material occurs as a by-product of understanding it" (Hammond 1993, p.57). In the latter case, he argues that "since learning occurs as a by-product of performing the actions, rote practice (perhaps appropriately varied and contextualised) is often effective" (Hammond 1993, p.57).

The process of writing is an activity rather than a body of declarative knowledge, and teaching it would seem to require a different set of strategies compared with the teaching of history, for example. However, declarative knowledge is often tested by writing, and writing is one strategy for acquiring it. A writer calls on declarative knowledge to write an essay on a historical topic, or a fiction using historical data. At the same time, the process of writing requires various kinds of procedural knowledge, such as using computer software to underline text, copy files, print, and so forth. In short, writing argumentative texts is an activity that requires both types of knowledge, while declarative knowledge is less of a prerequisite in writing fiction, traditionally an activity in which the imagination rather than reason is the dominant faculty. However, whatever the type of text, the process of writing is like other activities, in the sense that skills in writing are acquired by practice.

What Hammond calls "rote practice" may be effective in enabling what psychologists call the automation of skills, such as learning how to spell in the context of writing development (Bereiter 1980, pp.80-82). For certain types of mechanical or motor task, such as riding a bicycle, driving a car, or handling a mouse, an automation of skills is an advantage because it allows for "parallel processing"; that is, it allows humans to engage in more than one task at the same time (Sutcliffe 1988, p.41). For example, a proficiency in keyboard skills allows a writer to think about what she is writing, rather than where certain letters are placed on the keyboard. However, in the case of more complex activities, automation can be counter productive; an automatic response may be triggered in situations where it is inappropriate, a phenomenon known as "set" (Hayes & Flower 1980a, p.9), and may result in human error (Sutcliffe 1988, p.41).

From a developmental perspective, Bereiter argues that "mature writing involves a large number of skills at different processing levels" (Bereiter 1980, p.81). An "adequate mature functioning", he continues, "can be possible only when many of the skills are highly automated, and when they are well enough

coordinated to permit efficient time-sharing" (Bereiter 1980, p.81). In the case of the novice writer, who has yet to master grammatical and stylistic conventions, "low-order" skills have to become automated before "high-order" skills can develop (Bereiter 1980, p.82). However, Bereiter assumes a *model of writing* in which many processes occur simultaneously - this is an assumption about writing which needs further investigation. A second assumption here is that a mastery of grammar is a "low-order" skill that has to become automated for writing expertise to develop - an assumption that reflects Chomsky's notion that implicit knowledge of a grammar, or "competence", is a requirement for language comprehension, or "performance" (Chomsky 1965). Beyond spelling, and a procedural knowledge of technological tools, an automation of skills is not necessarily an advantage in writing, because of the possibility of "set". The place of syntax in the process of writing is therefore another topic that needs investigation.

Traditional grammar is concerned with a lexical taxonomy, or "parts of speech", and the structure of the sentence (Phythian 1980). In the context of teaching writing, traditional grammar is inadequate for two reasons. The first is that traditional grammar does not investigate the role of sentences as elements in a larger discourse (Cooper & Matsuhashi 1983). A knowledge of sentence structure represents a declarative rather than procedural knowledge, and from the latter perspective, it is grammarians and linguists, rather than writers, who produce the isolated sentence. In the writing of prose, writers produce sentences that are adapted "to the framing of the text" (Nash 1980, p.89), and connected by a range of cohesive devices (Halliday & Hasan 1976).

The second reason for its inadequacy follows from the first, which is that traditional grammar does not address the problem that Collins and Gentner describe as "downsliding" - "the phenomenon of getting pulled into lower and more local levels of task processing", in which writers, particularly children, "lose sight of the high-level relationships they originally wanted to express" (Collins & Gentner 1980, p.67). They argue that "if a teacher

emphasizes accuracy in spelling and grammar, it will reinforce the natural tendency toward downsliding" (Collins & Gentner 1980, p.67). So although traditional grammar has a place in teaching, it needs to be placed in a framework of procedural rather than declarative knowledge for it to be relevant to the process of writing.

For students on writing courses, practice consists mostly in performing the assignments given out on the course. But practice can also be a feature of instructional software. For example, the hypertext described by Williams is an "open learning system" for writers which offers the learner three views - writing concepts, writing exercises or practice, and illustrations or examples (Williams 1991b, p.71). The learner selects a topic from the menu, such as *audience analysis* or *types of audience*, and can read about the topic in the concepts view, study the examples, or do the exercises. However, like the problem with traditional grammar, one problem with the exercises offered by instructional software is their relationship to a student's regular writing tasks.

For example, in a paper delivered to the *Sixth UK Conference on Computers and Writing*, Thea van der Geest described a six-year project to design a writing environment for students (van der Geest 1993). The environment combines word processing software with writing instruction in an attempt to encourage students to plan. However, evaluation of the project identified a basic problem in trying to integrate instruction on the one hand, and on the other, the word processing software that students use to perform their regular writing assignments; van der Geest argues for the separation of tools and courseware.

Winterbauer reports a similar problem in his evaluation of a "pre-writing" aid; the aid uses a question and answer dialogue, and is intended to encourage students to develop ideas before they start writing (Winterbauer 1992). According to Winterbauer, "the core of the problem seemed to be that students were unwilling to devote 'extra time' to using an innovation that did not seem to have a direct relationship with the rest of the course

requirement" (Winterbauer 1992, p.176). In both cases then, instruction or exercises had an interference effect on a student's regular writing tasks, giving rise to the question: why bother with tools or exercises that appear to be irrelevant to the task at hand?

These observations lead to the second consideration in designing a tool - the view that actions and effective learning are both "situated". On the first, Hammond explains:

> "Recent years have seen something of a change of emphasis in the modelling of plans and their execution: there has been a swing from the somewhat formal view that people largely plan their goals and actions in advance (and that these can in principle be modelled) to the view that much action is 'situated', and is determined by a mix of high-level goals and of the specifics of the immediate situation."
> (Hammond 1993, p.58)

Situating learning makes use of the observation that learners make sense of concepts by engaging in the activity that circumscribes those concepts (Brown, Collins & Duguid 1989a, 1989b). So, for example, students will understand concepts in writing by writing. According to Hammond:

> "Information is learned for a number of purposes... The situation in which the information will be used is an important determinant of how it should best be learned: other things being equal, the greater the similarity between the conditions of learning and the conditions of use, the better the demonstrable learning."
> (Hammond 1993, pp.60-61)

Hammond argues that "if computer based learning material is to support some specific task, then as far as feasible the materials should reflect the intended task and its situation" (Hammond 1993, p.61). In the case of hypertext, he argues that the inability to match the goals of a task to the structure of information and activities offered by the system is the cause of navigational difficulties (Hammond 1993, p.54).

The third consideration is an ergonomic one. Traditional computer based learning, or "programmed instruction", "presents information to the learner in a fixed sequence interspersed with tests, with branching back to earlier, or remedial, information if the tests indicate inadequate learning" (Hammond 1993, p.56). Hypertext, on the other hand, is particularly suited to learning situations where flexibility is required, and, as we saw in the case of Williams' "open learning system", allows the learner to explore, rather than follow a pre-determined sequence of instruction:

> "The use of hypertext tools in education and training is growing. In some cases, hypertext serves as the sole mechanism for delivering information to the student: I shall term this basic hypertext. Basic hypertext systems present information to the learner in the form of a linked network of displays (whether frame-based or window-based), allowing exploration through browsing."
> (Hammond 1993, p.53)

McAleese argues that hypertext not only allows exploration by browsing, but also allows learning by exploration:

> "One of the aims of hypertext is to enhance existing learning strategies. Learning by exploration is one of the most powerful strategies for certain types of information and certain learning goals. Exploring in this way is occasioned by known concepts triggering off new ideas or by the learner attempting to make a link between two previously known ideas. In hypertext this has its parallel with a node triggering another node and a learner or designer making a link or association between existing nodes. A discovery approach is a situation where what is to be learned is determined independently by the learner. Guided discovery places the locus of control in the hands of the teacher or teaching materials."
> (McAleese 1993, p.19)

Research does indeed show that browsing is the favoured reading strategy when hypertext is used for study purposes (McAleese 1993, Whalley 1993, Wright 1993). However, Whalley argues that browsing is not necessarily conducive to learning (Whalley 1993). Moreover, he argues that "because of its fragmented nature",

hypertext "is not a suitable medium to form the core of teaching materials" (Whalley 1993, p.17). In Hammond's view, "hypertext presentation systems, on their own, are a poor vehicle for many learning situations" (Hammond 1993, p.51). As a means of linking together a multitude of documents to form an electronic reference library (Yankelovich 1991), hypertext may facilitate information retrieval - but, as Hammond points out, "learning is not the same as retrieving information" (Hammond 1993, p.66). The ergonomic constraints in reading on-line text have been identified as one reason why writers find it difficult to achieve a global view of their text (Haas & Hayes 1986). Ergonomic constraints could also be a factor, therefore, in the choice of browsing as a strategy for reading hypertext.

Hypertext, however, does not have to be seen in terms of a "New Alexandria" (Landow & Delany 1991, pp.42-44; Crane & Mylonas 1991, p.206); it could equally be viewed as a means of designing "minimal manuals" (Ramsay & Oatley 1991). Minimal manuals are based on the notion of activity based and goal centred learning, and research has found them effective for learning various computer skills (Draper & Oatley 1992; Hammond 1993, p.52). The reason for their success is a debatable subject - some argue this is due to a minimalist approach to instruction, while others argue that activity based learning is the explanation (Draper & Oatley 1992). Hammond emphasises the second. Referring to psychological research into memory, he notes two phenomena with consequences for the design of educational materials. The first, known as the enactment effect, is that the remembering of descriptions of actions is more effective when those actions are performed, and the second, known as the generation effect, is "that people tend to be better at remembering material that they have generated for themselves than equivalent material provided by someone else" (Hammond 1993, p.60). The implication for design is that "learning is enhanced by doing":

> "Learning-by-doing, whether through the performance of task-relevant actions or through the generation of materials, tends to lead to good retention of information. Learning-by-doing, together with minimising the baggage of verbal

> instructions and descriptions, has been a central theme of the highly effective minimalist approach to the training of computer skills pioneered by Carroll and his associates..." (Hammond 1993, p.60)

Thus the ergonomic consideration of reading on-line text takes us back to the first consideration - that of learning in the context of writing.

We assume a situation where students are already involved in writing fiction - students, for example, on writing courses which feature creative writing as a minor or major component. In this context, we assume that the bulk of the teaching is carried out through lectures, seminars, and tutorials, and that this teaching includes instruction in the use of computers and word processing software. Given the above comments on the psychology of learning, and given that writing is an activity rather than a body of declarative knowledge; given the empirical research already undertaken into the use of hypertext in education, the use of instructional software for student writers, and the ergonomics of on-line reading - given all these considerations, we conclude that learning in the context of writing will be more enhanced by a range of tools rather than by instructional software; tools, that is, that provide on-line assistance to students when they are writing. Our aim, then, is to design a hypertext that will assist a student's thinking about their writing, and is designed for the environmental conditions in which most of their writing takes place.

In summary, our aim is to design a hypertextual aid for student writers of fiction. This objective is motivated by four sets of considerations. Firstly, reports of student writing have identified a *need* for on-line assistance in planning. Secondly, there is a *lack* of software that supports the planning of fiction writing. Thirdly, hypertext has been used to design different kinds of planning or thinking aids, including tools to support the planning of argumentative texts. Fourthly, an analysis of reports on computer based learning materials suggests that learning in the context of writing will be more enhanced by a range of tools

rather than by instructional software. The next question is how should we proceed?

1.4 METHODS AND ASSUMPTIONS

What is the procedure for designing a tool for student writers? The initial obstacle to achieving our objective seems to be that we lack sufficient information to define what a planning, structuring, or thinking tool for fiction writers might contain. A further question is whether we should distinguish between tools for professional writers and tools for students. In the context of writing development, Sharples argues that "if we want children to become adult writers, we should equip them with adult writing tools" (Sharples 1985, p.10). Following Sharples, we could argue that if we want students to become professional writers, we should equip them with professional writing tools; that is, tools designed for professional writers. However, psychologists argue that there are many differences between the ways in which students write and the ways in which professionals write (Bereiter 1980, Flower & Hayes 1980a, Steinberg 1980). Surely then, a tool designed for professionals is not going to be appropriate for students? Moreover, professionals have already achieved their status without using such tools, and many have done so without using computers at all - indeed, some professionals not only persist with methods of writing to which they have become accustomed, but also reject the idea that a computer can be useful to writers (Williams 1992a, pp.4-7). Is there not a paradox, therefore, in advocating that we should equip students with professional writing tools, when many professionals do not see the need for such tools?

However, the alternative would seem to be that we design a tool that reflects the ways in which students write. In that case, is there not also a paradox in that, while the notion of teaching generally assumes some change or transformation on the part of the student (through the acquisition of knowledge and understanding), the notion of a software tool for student writers should

assume that tools should merely reflect the ways in which students write? Why should writing be an exception to the general assumption? The answer lies in the notion of *writing behaviour* - that is, that writers have acquired or adopted certain patterns of behaviour in their procedures for composing, and that software tools for writers should reflect that behaviour.

In the design of writing software, writing behaviour serves, therefore, as a *model of writing* - that is, as a model that can be used as the basis for design. Noel Williams points out that while writing software is always based on a model of writing, such models are often implicit, and may be incoherent, unorganised or arbitrary (Williams 1991a, p.31). He argues that we need to model writing in order to design more effective software:

> "Different writers act in different ways. Writers think in different ways, organise their time in different ways, behave in different ways. Few people can sit down with pen and paper, or a computer keyboard, and write a document from beginning to end without pause, review or reworking. Yet we all have different approaches to these complex processes.
>
> If we are to teach people how to write, or how to improve their writing; if we are to use computers to support real writers in real situations, in the practices they normally use, we need to understand those processes, behaviours, ways of thinking and ways of organising. In other words, we need to be able to model the writing process, and to model it in a way which makes sense of what people actually do, want to do and ought to do."
> (Williams 1991a, p.29)

Returning to the question of *"What's missing?"*, the initial obstacle to our objective is now twofold. As well as a lack of sufficient information to define what a planning, structuring, or thinking tool for fiction writers might contain, we also lack a model of writing. As we shall see however, the two lacks are closely related, and in making provision for the one, we shall also provide for the other.

Matsuhashi claims that "the search for a model of the writing process is part and parcel of a search for a methodology to verify that model" (Matsuhashi 1982, p.271). However, to claim that a model can be *verified* is to assume that a model is some kind of proposition to which we can attribute a truth value; thus some models may be *true,* while others may be *false.* Sharples and Pemberton, on the other hand, argue that a model of writing can be *refined,* rather than verified, and that this process is performed by using the model to design a computational writing tool, and by testing the tool:

> "A writing tool designed on the basis of an explicit model of writing is an embodiment of the assumptions, possibilities and limitations of that model. By testing the tool with a variety of writers the model can be evaluated and refined... As well as offering new facilities for writers, a cognitive-based writing environment can also act as a powerful research tool with which to explore and develop further models of the writing process."
> (Sharples & Pemberton 1992, p.335)

So, according to Sharples and Pemberton the relation between model and tool is a complementary one, in which an explicit model of writing serves as the basis for designing a tool, the implementation and testing of a prototype serve to refine the model, and the refined model in turn serves as the basis for making enhancements to the tool. Elsewhere, Sharples and colleagues refer to a design cycle of implementation and evaluation (Sharples, Goodlet & Pemberton 1989, pp.34-35), while Winograd and Flores argue that "the development of any computer-based system will have to proceed in a cycle from design to experience and back again" (Winograd & Flores 1986, p.171). This cycle is often referred to as *iterative design,* and is discussed in more detail in chapter eleven.

The first stage of our quest for a model of writing is to consider the models that are used in current writing research. These models give us an insight into various aspects of the writing process, such as writing strategies and writing behaviour (Torrance & Thomas 1993), writing operations such as "planning"

and "reviewing" (Hayes & Flower 1980a), and the external representations that writers create and manipulate (Sharples & Pemberton 1992). After discussing writing behaviour, cognitive models of writing, and the operation of planning in chapters three to five, we emerge with a basic model of writing. However, the basic model does not supply sufficient information to design a planning, structuring, or thinking tool for fiction writers. Moreover, these discussions show that much of the current research into writing is based on a set of questionable assumptions, which can be summarised as follows.

The first concerns the claim that "we can find out more about *how* people write by observing writers in action than by analysing finished texts" (Sharples & Pemberton 1992, p.320). Empirical research into writing, however, not only observes what writers do, but often uses the technique of protocol analysis in these observations. This requires writers to articulate their thoughts in an attempt to obtain reports about the writer's activity directly from the writer, while they are in the process of writing. These "think aloud" protocols are then assumed to have some kind of objective validity. Yet to perform an activity that often requires a process of verbal rehearsal (Cohen, Eysenck & LeVoi 1986, p.67), while simultaneously providing a commentary on that activity (a process that also requires verbal rehearsal) makes a demand on working memory that is difficult, if not impossible, to satisfy.

Such demands must turn a writer's usual activity into one that is only performed under these peculiar experimental conditions, so that the picture of writing which emerges is a distorted one. Yet the assumption about empirical research is that such intrusive methods can tell us more about writing than the non-intrusive method of textual analysis. It appears that, while empirical research is viewed as somehow objective or scientific, textual analysis is seen as subjective and the results a question of interpretation. However, this is to deny the ubiquity of interpretation, as Winograd and Flores (1986), following Heidegger, point out. The results of empirical research are also interpreted, and the

second assumption in writing research is that the Hayes and Flower (1980a) model of writing represents some kind of norm, according to which empirical research into writing should be conducted. The model is used in writing research to define problems, construct hypotheses, design experiments, and interpret results; according to Smith and Lansman, the Hayes and Flower model has become "the standard model accepted by composition theorists as well as cognitive psychologists who study writing" (Smith & Lansman 1989, p.17).

Thirdly, much of the current research into writing is based on linguistic assumptions inherited from Chomsky, such as the separation of semantics and syntax, the distinction between cognitive and linguistic planning, and the notion of "translating", an operation defined by Hayes and Flower (1980a), and fundamental to their model of writing. Fourthly, the assumption of cognitive science is that cognition is basically a process of manipulating mental representations, and that a theory about cognitive processes should be tested in the form of an intelligent knowledge-based system, in which representations form the input and output to various processes; thus Chomsky's (1957) linguistic theories, which have formed the basis for designing machine systems of language understanding (Bornat 1979), are held to be cognitive theories (Mandler 1985). Because of this concern with representations, models of cognitive processes generally fail to consider conscious thought, as Griffin (1984) points out, and much cognitive research into writing assumes that a writer's thinking processes are generally inaccessible.

The second stage of our quest is concerned with developing the basic model into a model of fiction writing. To do this, we start with an alternative set of assumptions. The basic model lacks detail concerning types of writing; to fill in this detail and to find out how textual structures are created, we turn to linguistics for assistance. However, instead of following Chomsky's rationalistic view of language as a system of rules and grammars, we follow Saussure's view of language as a system of sequential and associative relations. Saussure viewed linguistics as a branch of

what he called *semiology* or the science of signs, a science that was yet to be developed; semiology was in turn seen as a branch of social psychology. Barthes claims that all research in the area of structural analysis of narrative has a common scientific origin in semiology, "the science of signification" (Barthes 1981, p.135). In chapter six however, we criticise Culler's (1975) discussion of structuralist approaches to literature for the failure to distinguish between a rationalistic linguistics and a semiological one. When applied to literary theory, the former seeks to establish the rules and grammars for constructing semantic structures, while the latter seeks to explain the ways in which meanings are created by readers.

The difference between these two approaches is reflected in Barthes' distinction between structural analysis and textual analysis. According to Barthes, structural analysis seeks to establish a structure, grammar, or model of narrative. Once this model has been discovered, "faced with all the narratives in the world... each particular narrative will be analysed in terms of divergencies" (Barthes 1981, p.135). Textual analysis, on the other hand, "does not try to describe the structure of a work; it is not a matter of recording a structure, but rather of producing a mobile structuration of the text" (Barthes 1981, p.135). Thus the purpose of textual analysis is to show how texts signify, and "to locate and classify... the forms and codes according to which meanings are possible" (Barthes 1981, p.135).

The alternative assumptions which inform the second stage of our quest are as follows. The first concerns linguistics and notions of language. Culler advocates the use of linguistics as a tool for "semiological investigation" (Culler 1975, p.257). While we follow Culler's suggestion, we argue that to carry out such an investigation we need to follow Saussure's semiological view of language, rather than Chomsky's rationalistic one. Secondly, in contrast with Hayes and Flower's decision to model individual writers (Hayes & Flower 1980b, pp.390-391), the discussions of writing behaviour in chapter three suggest that our aim should be to model *writing* rather than *writers*. Thirdly, given the absence of

the text in current models of writing, we conclude that in order to model fiction writing, we need to look at fictional texts. The fourth assumption is that Saussure's linguistics and Barthes' method of textual analysis can provide us with insight into textual signifiers.

Moving beyond this insight however, the fifth assumption concerns Genette's suggestion that "what would theory be worth if it were not also good for *inventing practice* ?" (Genette 1988, p.157). We assume that if we can locate what Barthes (1981, p.135) calls "the avenues of meaning" in fictional texts, then we can model the ways in which writers create meanings; that is, we assume that avenues of meaning are avenues not only for readers but also for writers. In chapter five, we use the term textual structuring to describe a writer's mental activities in creating meanings. The sixth assumption is that such activities are not inaccessible, and that the possible ways in which writers perform textual structuring can be identified.

Finally, we return to the paradox concerning tools for students and tools for professional writers. We assume that the purpose of providing software tools for students is to improve their writing, and that one way of improving their writing is to learn from professionals. We assume that this can be achieved by looking not only at how they write but also at the texts that they produce. If we can establish a model of fiction writing by analysing the texts created by professional fiction writers, then we can use the model to identify where students need assistance and design the software accordingly - the two lacks, of model and tool, are therefore complementary.

Returning to the notion that research is a type of narrative in which a quest is motivated by a lack, we can now identify this dual purpose of designing model and tool as one way in which the quests of fiction and the quests of research part company. Genette describes Proust's *A la recherche du temps perdu* as a novel, not about the novelist, but about the *future* novelist, and adds that "what is novelistic is the quest, the search *[recherche]* , which ends at the discovery (the revelation), not at the use to which that

discovery will be put" (Genette 1980, p.227). While the novelistic quest might end with a discovery, this quest is concerned with a model that is constructed rather than discovered, and ends with an explanation of the consequences for design.

1.5 CONCLUSION

In this chapter we described the objectives of our research, discussed the motivation for it, and explained our methods of pursuing these objectives. We introduced the assumptions behind much of the current research into writing, and compared them with the alternative set of assumptions that informs our approach. In the next chapter we classify models of writing according to their derivation and purpose. We also discuss the assumptions of cognitive science concerning the testing of models; this involves a discussion of the relations between cognitive psychology, computer science, and artificial intelligence.

CHAPTER TWO :

MODELLING WRITING

2.1 INTRODUCTION

In this chapter we introduce models of writing, and classify a range of models by considering their derivation and purpose. The different types of models may undergo different types of tests. However, cognitive scientists argue that models of cognitive processes should be tested by designing and testing a computational system that simulates the appropriate process. We discuss the assumptions of cognitive science and consider the implications of this kind of test for modelling writing. We conclude that it may not be feasible to test a model of writing by designing computer programs that simulate human writers.

2.2 MODELS OF WRITING

What is a model of writing, and how do we begin to construct one? There are two methods of answering these questions. The first is to describe the ingredients that a model ought to contain, and to suggest procedures for obtaining them; we might then go on to review existing models and see how they measure up to our requirements. We can describe this method as moving from prescription to description. Alternatively, we might review existing models, examine their inadequacies, and suggest improvements. We can describe this method as moving in a counter direction, from description to prescription.

Each method is not without its problems. The problem with the first is that prescribing a list of ingredients will not be uncontroversial - we return to this point at the end of chapter four. The problem with the second is that, in describing and reviewing existing models, we already entertain some notion of what constitutes writing, and this notion constitutes an implicit model of writing that needs to be made explicit. In teaching and writing technology a model of writing is frequently implicit, but as Noel Williams points out, a model is always present:

> "You may ask: why bother with a model of writing? Why not just design the software or do the teaching? The answer is

that writing software and writing teaching always use a model of writing, but that model may be an unclear or variable one. It will probably be a model implicit in the method of teaching or the software design, rather than an explicit one that has been stated and researched as the best foundation for those students or those users. Such a model may well be incoherent or unorganised, simply an arbitrary or accidental model that makes some kind of sense to the people concerned, derived from a multiplicity of experiences. Nevertheless, a model of writing will be there."
(Williams 1991a, p.31)

How do we identify an implicit model of writing? Williams claims that the most common implicit model found in software and teaching is "Plan, Draft and Revise", a set of operations that a writer performs in a linear sequence to produce a finished text (Williams 1991a, p.31). On the other hand, Flower and Hayes describe a common assumption that writers simply write when possessed by the muse; they claim that students often subscribe to this implicit model of writing (Flower & Hayes 1980a, p.32). However, both "Plan, Draft and Revise" and "Draft and Revise" are two "strategies of writing" acknowledged by research into the process of writing (Sharples & Pemberton 1992, p.324). To identify an implicit model of writing then, we must have some notion of a minimal model as a writing strategy, such as "Plan, Draft and Revise", or simply, "Write".

Bearing this in mind, we can now return to the question of what might constitute a model of writing. Our approach to this question is the second method outlined above. We defer discussion of a list of ingredients until we have reviewed existing models of writing. The question we ask of these models is whether they provide a suitable basis for designing software to assist fiction writing. Besides the minimal models frequently implied in teaching and writing software, explicit models of writing generally fall into two categories: psychological or linguistic. Psychological models of writing can be behavioural, cognitive or developmental. Behavioural models are discussed in the next chapter, and cognitive models in chapter four. We refer to developmental models in chapter five, and linguistic models in chapter six.

Behavioural models of writing aim to model the usual ways in which writers approach the task of writing. In this context, the aim of behavioural psychology is to identify different kinds of writing behaviour and to develop a taxonomy for classifying writers. The methods employed for this purpose are statistical and experimental; questionnaires may be used to collect information (Hartley & Branthwaite 1989, Torrance, Thomas & Robinson 1993), or writers may be observed directly at work (Matsuhashi 1982, Torrance & Thomas 1993). In either case, the subjects tend to be writers within higher education (students and lecturers).

Whereas the aim of behavioural psychologists is to model behaviour, the aim of cognitive psychologists is "to understand human mental processes" (Sutcliffe 1988, p.57). Sutcliffe describes cognition as "the mental activity we describe in everyday terms as reasoning, problem solving, thinking and learning" (Sutcliffe 1988, p.11). Thus a cognitive model of writing aims to model writing primarily as a mental process (Hayes & Flower 1980a). A cognitive model may be used as the basis for software design (Smith & Lansman 1989). Cognitive psychologists studying writing often use the technique of protocol analysis (Hayes & Flower 1980a). This involves the direct observation of a writer at work, but working in a situation where she has been asked to comment simultaneously on her activity. The comments are recorded, and the recordings are later analysed and interpreted by referring to the text that the writer was producing at the time.

While a behavioural model is purely descriptive, a cognitive model may be constructed by using a writer's descriptions as the basis for informed speculation or generalisations about the writing process. The resulting model might have a prescriptive purpose (for example, in software design). However, implicit models of writing such as "Plan, Draft and Revise", which also has a prescriptive purpose in teaching and writing software, are often based on assumptions concerning writing behaviour, as Williams points out (Williams 1991a, p.31). For example, the model of "Plan, Draft and Revise" is based on observations of writing behaviour in

a medium of pen and paper, but software designers have used the model as an indicator of behaviour in an electronic medium - the assumption is that the medium of writing will not have a significant effect on writing behaviour (Williams 1991a, p.43). As we shall see in the next chapter however, writing technology can alter the ways in which writers approach the task of writing.

Developmental models of writing are derived from studying the development of writing in children (Bereiter 1980, Martlew 1983, Kroll & Wells 1983, Bereiter & Scardamalia 1987). The purpose of these models is to identify what might be called a normal sequence of events in the development of writing; thus a developmental model aims to model writing primarily as a chronological process. Consequently, it can be applied in the classroom to develop a curriculum for the teaching of writing, and to identify children with learning difficulties or special needs who may need extra tuition. A developmental model of writing might also serve as the basis for designing educational software targeted at a specific age-group (Sharples 1985).

A linguistic model of writing aims to model writing as a process that is primarily concerned with the manipulation of written language (Nystrand 1982, Cooper & Matsuhashi 1983, Cooper & Greenbaum 1986). Linguistic models of writing are derived in the first instance by applying linguistics to analyse written texts and to identify textual structures (Frederiksen 1986, Witte & Cherry 1986). As, traditionally, linguists have identified the sentence as the largest structure open to linguistic analysis (Crystal 1971, Halliday & Hasan 1976), the identification of textual structures larger than the sentence is a polemical affair, as are the ways in which the individual sentences of a text can be mapped onto more global structures (van Dijk 1980). Having identified layers of textual structures, the next stage is to formulate the ways in which these structures are manipulated in the process of writing; experiments are then designed in which this hypothetical formulation is tested (Frederiksen 1986, Witte & Cherry 1986). There are a number of ways in which linguistics can be applied to the modelling of writing; these are discussed in chapter six.

The purpose of a linguistic model is to develop our understanding of writing as a linguistic process. Consequently, a linguistic model might have implications for the teaching of writing. Another reason for designing this kind of model is the possibility of implementing it on a machine. A linguistic model of writing or comprehending could serve as the basis for designing a computational system of story understanding or story writing, for example.

Having constructed a model of writing by following one of the above methods, how do we test it? Different kinds of models need different kinds of tests, and the kind of test that a model may undergo tends to reflect its derivation and purpose. In the case of behavioural or developmental models, a model of writing is based on observation, experience and empirical evidence. The model might serve to summarise or collate the findings of many researchers in the field or, as Williams (1991a, p.31) comments, it may be an accidental model that is "derived from a multiplicity of experiences". Therefore, these models may need to be modified in the light of new discoveries in the fields of writing behaviour or writing development; new observations may result, for example, from experiments on the effects of writing technology. As we argue in the next chapter however, studies of the effects of writing technology frequently adopt a model of writing in order to design experiments and to interpret results. In that case, the model serves as a kind of norm and is used to measure the effects.

In the case of linguistic models, a model of writing is more of a hypothetical model based on the results of textual analysis, a hypothesis which suggests that the structures derived from an analysis of written texts are structures that writers manipulate in the process of writing. As we argue in chapter six, the claim that such hypotheses can be confirmed by practical experiment (for example, Frederiksen 1986) is a questionable one, and a linguistic model may also be open to refutation by alternative applications of linguistics to the analysis of written texts.

In the case of cognitive models, we face a problem in that models which claim to be cognitive, or which tend to be called cognitive in the literature, can be quite different in their derivation, so that in this case we also face different kinds of tests. For example, Hayes and Flower (1980a) use the technique of protocol analysis to study a number of writers in order to construct their model of writing. A test of the model also uses protocol analysis. The designers point out that "although the model was derived through informal analysis of many protocols, it has been tested formally with only one protocol", and they plan to conduct more extensive testing using the same method (Hayes & Flower 1980a, pp.27-28).

On the other hand, Sharples and Pemberton (1992) note that writing involves the manipulation of external representations; a taxonomy of these representations and their organisation forms the basis of their model of writing. Testing the model is not a subject of discussion, so that a refutation of the model would presumably rest on a disagreement with their method of classification, on the observation that there are other types of representations not accounted for in the model, or on the claim that external representations are not fundamental to writing. Elsewhere however, Sharples and colleagues test their external representation model by carrying out a protocol analysis and task analysis of two writers at work (Sharples, Goodlet & Pemberton 1989, p.28).

As we discuss below, some cognitive psychologists argue that linguistics is a cognitive science (Mandler 1985), so that a *linguistic* model of writing can also claim to be a *cognitive* model of writing (Frederiksen 1986). In this case, testing consists of mapping the texts produced by an experimental group of writers on the one hand onto the models of textual structures designed by researchers on the other. This method of testing may form the preamble to a more rigorous test of a linguistic model, in which the model is used to design a computational system that can simulate these transformations of textual structures. From the perspective of a cognitive science, some would argue that the only

scientific test of a cognitive model is this kind of computational test. Before we discuss models of writing in more detail, we need to discuss this argument about the testing of cognitive models.

2.3 COMPUTERS, COGNITION, AND COMPUTER MODELLING

In the last chapter we outlined a set of questionable assumptions in writing research. One of those assumptions is found in the field of cognitive science, which is that cognition is basically a process of manipulating mental representations, and that a theory about cognitive processes should be computationally tested in the form of an intelligent knowledge-based system, in which representations form the input and output to various processes. This relation between computers, cognitive psychology, and models of cognition is an issue that we need to discuss in more detail.

The assumption about cognition is an example of what Winograd and Flores (1986) call the rationalistic tradition in computer science. According to Winograd and Flores (1986, p.14), the rationalistic tradition has greatly influenced not only "current thinking about computers and their impact on society" but also "the development of linguistics and cognitive psychology":

> "In examining how people have thought about and talked about computers, we become aware of the pervasive effect of a powerful tradition that emphasizes 'information', 'representation', and 'decision making'...
>
> We have labelled this tradition the 'rationalistic tradition' because of its emphasis on particular styles of consciously rationalized thought and action. In calling it 'rationalistic' we are not equating it with 'rational'. We are not interested in a defense of irrationality or a mystic appeal to non-rational intuition. The rationalistic tradition is distinguished by its narrow focus on certain aspects of rationality, which ... often leads to attitudes and activities that are not rational when viewed in a broader perspective. Our commitment is to developing a new ground for rationality - one that is as rigorous as the rationalistic tradition in its aspirations but that does not share the presuppositions behind it." (Winograd & Flores 1986, p.8).

Winograd and Flores begin their disclosure of this tradition by considering the question, "What do people do when faced with a problem whose solution they care about?". In their view, a rationalistic orientation to this question can be represented as "a series of steps" (Winograd & Flores 1986, pp.14-15). The first step is to "characterize the situation in terms of identifiable objects with well-defined properties". The second is to "find general rules that apply to situations in terms of those objects and properties". The third is to "apply the rules logically to the situation of concern, drawing conclusions about what should be done". Winograd and Flores point out that "there are obvious questions about how we set situations into correspondence with systematic 'representations' of objects and properties"; however, in much of the rationalistic tradition, these questions are "deferred in favor of emphasizing the formulation of systematic rules that can be used to draw logical conclusions" (Winograd & Flores 1986, p.15). They argue that much of Western philosophy "can be seen as a drive to come up with more systematic and precise formulations of just what constitutes valid reasoning" (Winograd & Flores 1986, p.15). The use of symbolic logic to formalise thought is a feature of artificial intelligence or AI (Kowalski 1979). However, Winograd and Flores argue that the designation of certain computer systems as "intelligent" is based on a rationalistic notion of intelligence:

> "The rationalistic orientation not only underlies both pure and applied science but is also regarded, perhaps because of the prestige and success that modern science enjoys, as the very paradigm of what it means to think and be intelligent. In studies of thought, emphasis is placed on the form of the rules and on the nature of the processes by which they are logically applied. Areas of mathematics, such as symbolic logic and automata theory, are taken as the basis for formalizing what goes on when a person perceives, thinks, and acts."
> (Winograd & Flores 1986, p.16)

Winograd and Flores claim that "the rationalistic orientation pervades not only artificial intelligence and the rest of computer science, but also much of linguistics, management theory, and

cognitive science - three areas with which artificial intelligence has been closely associated" (Winograd & Flores 1986, p.16). A rationalistic orientation is particularly apparent in the relatively new discipline of cognitive science, which in their view represents an attempt "to unify theories of human thought and language from within the rationalistic tradition" (Winograd & Flores 1986, p.23):

> "The research programme of cognitive science encompasses work that has been done under different disciplinary labels, but is all closely related through its roots in the rationalistic tradition. Cognitive science needs to be distinguished from 'cognitive psychology', which is the branch of traditional (experimental) psychology dealing with cognition. Although cognitive psychology constitutes a substantial part of what is seen as cognitive science, it follows specific methodological principles that limit its scope. In particular, it is based on an experimental approach in which progress is made by performing experiments that can directly judge between competing scientific hypotheses about the nature of cognitive mechanisms."
> (Winograd & Flores 1986, pp.24-25)

Cognitive psychology deals with psychological processes such as perception, attention, learning and memory (Greene & Hicks 1984). According to Greene and Hicks:

> "Cognition is often defined as higher level mental processes going on inside our heads, such as conscious thoughts and feelings, making plans, having opinions and deciding what to say. But basic cognitive processes usually refer to the mechanisms underlying such activities as perceiving and recognizing objects, attending to sounds, learning simple responses and memorizing lists of items. These basic mechanisms are considered to be universal to all members of the human species, if not to the whole animal kingdom."
> (Greene & Hicks 1984, p.xi)

What, then, is the relation between cognitive psychology and cognitive science? Winograd and Flores describe the boundaries of cognitive science as "vague", but in their view, "much of linguistics, psychology, artificial intelligence, and the philosophy of

mind fall within its scope" (Winograd & Flores 1986, p.24). For others, however, the boundaries are not as vague as Winograd and Flores make out. Beaugrande and Dressler describe cognitive science as "a comparatively new field integrating the concerns of cognitive psychology and computer science" (Beaugrande & Dressler 1981, p.210), and the area of computer science most often associated with cognitive science is AI. Elsewhere, Beaugrande and Dressler add linguistics to the concerns that cognitive science attempts to integrate (Beaugrande & Dressler 1981, p.12). For George Mandler however, the "cognitive sciences", as opposed to cognitive science, is simply the collective noun that likewise includes cognitive psychology, linguistics, and AI, so that cognitive psychology *is* a cognitive science (Mandler 1985).

AI, however, is hailed by Mandler as "keeper of the computational grail", and the means of testing cognitive theories by their implementation on a machine (Mandler 1985, pp.13-14), and it is this point which is crucial in distinguishing between cognitive psychology and cognitive science. The relation is not simply one of inclusion, but of integration - cognitive science, as opposed to "the cognitive sciences", is a term that applies to the *integration* or *merging* of cognitive psychology with AI. Van Dijk points out that "although the methods of inquiry in these two branches of cognitive science are rather different" (carrying out psychological experiments on the one hand, building and running computer programs on the other), "they share an important common attention for the processes of *understanding* " (van Dijk 1980, p.3). In a similar fashion, Beaugrande and Dressler argue that through research in the area of cognitive science, "computers can lead us from *understanding data* toward the broader domain of *understanding understanding*" (Beaugrande & Dressler 1981, p.220). However, the merging of cognitive psychology with AI into a cognitive science leads to a sharing of interests that is not confined to a common concern for understanding. For example, van Dijk uses the case of language understanding to illustrate the different interests of the psychologist and the AI researcher:

> "The psychologist in that case will often be more interested in the precise cognitive processes, memory constraints,

decoding strategies, storage capacity, retrieval conditions and contextual factors of understanding. The researcher in artificial intelligence, on the contrary, will try to satisfy the demands of a running, and hence algorithmically explicit, program which at the same time should preferably have some psychological plausibility. Thus, the precise forms of representation of semantic information, and hence of discourse, will be crucial in such programs, as well as the knowledge which is necessary to make understanding by the computer possible."

(van Dijk 1980, p.3)

Decoding, storage capacity, retrieval - all these are terms that are associated with computer science and the description of machines; but here, the same terms are used to describe the psychology of humans. On the other hand, as Griffin points out, "words that used to be reserved for conscious human beings are now commonly used to describe the impressive accomplishments of computers" (Griffin 1984, p.456).

As Mandler points out, the original term for cognitive psychology was "human information processing" (Mandler 1985, pp.90-91). It is this characterisation of cognitive psychology which he seeks to defend by pointing to "the rather naive models used within the information processing community during its early days":

> "There were boxes and arrows and the arrows dutifully went from box to box; the model was simple and serial - the serial box model. However, serial processes have given way to parallel processes and boxes to distributed representations and complex processing activities. To be interested in human information processing is to be concerned with the flow of information/knowledge within the organism and between it and its environment. It seems peculiar, therefore to hear claims that some research project has shown the information processing approach to be incorrect. Such an approach cannot be "correct" or "incorrect". Information processing is a way of looking at the world, a framework for thinking, NOT a theory. For most of its practitioners it is a synonym for cognitive psychology."
> (Mandler 1985, p.19)

Mandler also claims that the information processing approach in the 1950s and 60s "was the first step from the stimulus-response psychology of the preceding era to contemporary cognitive psychology" (Mandler 1985, p.90). Thus for Mandler, the replacement of the stimuli and responses of behavioural psychology by the inputs and outputs of information processing is "a change in terminology that probably did no more than define a break with the past" (Mandler 1985, p.90). Subsequently, he claims, "with the development of cognitive psychology, the concern with simple input-output relations dimmed and the major interest began to center on the nature of the internal inferred mechanisms - the representations and processes" (Mandler 1985, p.90). Responding to criticisms that cognitive theory is "tightly wedded to computer language and computer processes", he remarks that "the computer metaphor was unavoidable; it was forced by the culture of the 1950s and 1960s" (Mandler 1985, pp.20-21).

However, according to Winograd and Flores, the advocates of 'information-processing psychology' claim that "cognitive systems can be best understood by analogy to programmed computers" (Winograd & Flores 1986, p.25). Moreover, although Mandler claims that "we have moved away from the computer metaphor" (Mandler 1985, p.21), his own account of the development of cognitive psychology shows that, far from being left behind, the metaphor has evolved with the changing concerns of computer science, particularly developments in computer architecture (Stallings 1990). The large mainframes of the 50s and 60s were characterised by a type of architecture that restricts the processing of data to sequential or serial processing. Subsequent research has investigated possible architectures that will enable parallel processing, while the development of the much smaller personal computer in the 70s and 80s brought about a new era of interactive computing, distributed or networked systems, and the application of computers to a diverse range of functions and users.

Certain developments in cognitive psychology - that is, the evolution of models of basic cognitive processes - parallel these developments in computer science. For example, Mandler claims

that a serial view of mental processing was replaced by the notion that mental processes "may occur in parallel and provide interactive products during such parallel processing" (Mandler 1985, p.91). Mandler's discussion of the future directions of cognitive psychology is a debate that is intimately associated with future developments in computer science:

> "The development of parallel processing notions occurred hand in hand with the promotion of distributed processes... Once one considers representation to be distributed rather than locally organized, the idea of parallel processes operating over these representations follows naturally.
>
> The general adoption of a model of parallel information processing did, however, create a new problem. Action and thought are obviously serially organized; how does a parallel system produce a serial output?"
> (Mandler 1985, p.91)

Yet while cognitive scientists look to the computer for appropriate models of human behaviour, recent research on animal behaviour suggests that intentions, thoughts, feelings and consciousness are characteristics not only of humans but also of animals - a view that challenges the traditional belief that animals are motivated solely by instinct (Griffin 1984).

Griffin argues that information processing psychology is no different from behavioural psychology in that "historically, the science of psychology has been reacting for fifty years or more against earlier attempts to understand the workings of the human mind by introspective self-examination - trying to learn how we think by thinking about our thoughts" (Griffin 1984, p.456). The result, he argues, is that "psychologists largely abandoned the effort to understand human consciousness, replacing introspection with objective experiments" (Griffin 1984, p.456). According to Griffin however, "the rejection of any concern with consciousness and subjective feelings has gone so far that many psychologists virtually deny their existence or at least their accessibility to scientific analysis" (Griffin 1984, p.456). He argues that "analyzing people as though they were computers may be useful as an initial, limited approach", but the result of this emphasis on information

processing is the absence of conscious thinking from models of cognitive processes:

> "Conspicuously absent from most of contemporary cognitive psychology is any serious attention to conscious thoughts or subjective feelings. . . Information-processing is doubtless a necessary condition for mental experience, but is it sufficient? Human minds do more than process information; they think and feel."
> (Griffin 1984, p.457)

While models of cognitive processes have developed in tandem with computer science, the merging of cognitive psychology with AI into a cognitive science has two consequences. The first is that both share a common concern for representation and process, as Mandler points out (Mandler 1985, pp.10-13). The second is that theories about cognition are only acceptable as theories if they can be implemented on a machine - that is, if a computational system can be constructed such that a machine will produce the required representation or behaviour. For example, a theory of human vision is an acceptable cognitive theory (within cognitive science) if it provides a basis for designing a computational system that can simulate the perception of objects; given a photograph of a tree as an input, the system should be able to produce the name of the object - "tree" - as the final output. Winograd and Flores summarise these assumptions as follows:

> "1. All cognitive systems are symbol systems. They achieve their intelligence by symbolizing external and internal situations and events, and by manipulating those symbols.
> 2. All cognitive systems share a basic underlying set of symbol manipulating processes.
> 3. A theory of cognition can be couched as a program in an appropriate symbolic formalism such that the program when run in the appropriate environment will produce the observed behavior."
> (Winograd & Flores 1986, p.25)

According to Winograd and Flores, the programs designed and tested by AI researchers or cognitive scientists are "then taken as

theories of the corresponding human behavior" (Winograd & Flores 1986, pp.25-26).

In their critique of the rationalistic tradition and its influence on computer science, Winograd and Flores refer to Heidegger, who rejects the notion that representations are basic to human cognition (Winograd & Flores 1986, pp.27-37). They also refer to work in the area of hermeneutics, to argue not only that cognition involves interpretation as well as understanding, but also that interpretation is a regular feature of human interaction. On that basis, claims that AI systems somehow embody human intelligence can not be supported. In the case of natural language understanding for instance, AI systems assume a rationalistic notion of semantics, in which lexical items and sentences have some kind of absolute meaning - a meaning that is independent of the context in which they occur. Winograd and Flores characterise such an approach as follows:

> "In a complete rationalistic analysis of meaning, we would be able to explicate the meaning of each utterance by showing how it is built up systematically from smaller elements, each with its own determinate meaning. At the bottom, the smallest elements would denote objects, properties, and relations of interest in the external world. Although there is a deep fallacy in this orientation, there is also a power in its emphasis on regular formal structures. To the extent that they are adequate for a particular purpose (such as the implementation of language-like facilities on computers) they provide a systematic approach for generating rules and operations dealing with symbolic representations."
> (Winograd & Flores 1986, p.64)

A rationalistic analysis of meaning is exemplified by Chomsky's notion of a transformational grammar (Chomsky 1965), which, as we shall see, has had a major influence on cognitive psychologists. Indeed, Mandler acknowledges claims that "cognitive psychology was fathered by the emergence of transformational grammar in linguistics" (Mandler 1985, p.10). In his view, "the development of transformational grammars in *linguistics* and the notion of deep structure... can be seen as the discovery of underlying represent-

ations and the processes that operate on them" (Mandler 1985, pp.12-13). This discovery of representation and process in transformational grammar enables him to claim that Chomsky's linguistics is a cognitive science: "If one accepts the commonality between deep structure and underlying representations, *linguists* have been cognitive since the 1950s" (Mandler 1985, p.16). As we shall see, this is a claim that does not bear close scrutiny.

Winograd and Flores characterise the future directions for AI research by describing a "forking of paths":

> "Until the mid-1970s artificial intelligence researchers generally believed they could work simultaneously towards two goals: extending the capabilities of computers, and moving towards an understanding of human intelligence...
>
> In the last few years, this view has been questioned. There is a tacit acceptance of the point we have made in this book - that the techniques of current AI are not adequate for an understanding of human thought and language. As a result, there is a clear split between the 'knowledge engineers', who apply the well-developed technologies of AI to practical problems, and the 'mind-modelers', who speculate about the more complex structures that might underlie human thought."
> (Winograd & Flores 1986, p.126)

Those that follow the first path include the designers of "expert systems", which Winograd and Flores characterise as "programs for problem solving in some scientific or technical domain" (Winograd & Flores 1986, p.127). A knowledge-base for a specific domain such as medical science can be used by "non-experts" for consultation or advice in decision making or analysis. The application of AI techniques to robotics has also been successful for limited tasks in specific domains, such as car manufacturing. However, according to Winograd and Flores, those that follow the second path have not been so successful. In the area which they characterise as "cognitive modelling", such as designing a system that simulates human vision, traditional AI techniques have taken a back seat to the connectionist techniques of neural science (Winograd & Flores 1986, pp.130-131). In the case of natural

language processing or speech recognition, attempts to develop a system for general use have also not met with much success.

A similar pair of paths are identified by Beaugrande and Dressler in their discussion of future directions for a science of texts. They claim that on the one hand, AI is "intended to improve the interactions of humans with machines, particularly where the abilities of the two groups complement each other" (Beaugrande & Dressler 1981, p.219). On the other hand, AI can also be used as a source of models for human processes: "In the new field of cognitive science, theories about the mental activities of humans are frequently tested by building computer models" (Beaugrande & Dressler 1981, p.220).

However, Beaugrande and Dressler describe a divergence of paths by looking at AI from a *functional* perspective (enhanced interaction versus a source of models). On the other hand, Winograd and Flores describe a divergence from an *applicational* perspective (limited domains versus general systems). Yet if we view AI from a *modelling* perspective, these diverging paths converge, in that whatever the function or the application, AI is primarily concerned with the modelling of *knowledge*. One problem with using AI to enhance interaction is that this purpose can come into conflict with the way that knowledge is traditionally represented in AI - that is, by the predicate calculus and a programming language such as PROLOG - so that further research is required to create a suitable "front-end" for non-programmers (Nicolson 1990). On the other hand, the "theories about the mental activities of humans" that are tested by building models are, traditionally, general theories about object perception or language understanding, in which cognition is assumed to be the manipulation of different kinds of representations (the input and output to various computational processes). As Griffin points out, such models are marked by the absence of conscious thought, with the result that current psychological research may tell us more about the consciousness of animals than of humans (Griffin 1984).

Two reasons for this have been mentioned - the influence of the rationalistic tradition, and the reaction to introspection - and a third is AI's prime concern for the modelling of knowledge, rather than mental activities or conscious thought. A fourth reason is that a cognitive theory not only has to be implemented as a computational system in order to be a viable theory, but given that cognitive science merges cognitive psychology with AI, it has to be implemented as an *intelligent knowledge-based system*. Such a theory is bound to be based on some kind of computer architecture - otherwise, it would not be an implementable theory - and theories that are based on computer architectures are, traditionally, theories of basic cognitive processes. In the case of a general system of natural language processing or computer vision, the designer's aim is to simulate understanding or recognition, and the modelling of knowledge is basic to this purpose.

A fifth reason is the traditional role of computers in the research programmes of the humanities and sciences. On the one hand, information technology is viewed by some universities as a *human* science, so that psychology, ergonomics, and anthropometry are integrated components of courses. On the other hand, the computer is traditionally viewed by the *humanities* as a tool for studying texts, numbers, or pictures, and is particularly associated with stylometry (Kenny 1992, p.1). From this perspective, the study of the kinds of activities that humans perform with texts, numbers, or pictures - and particularly, the use of computers to develop theories about those activities - are seen as the province of psychologists and cognitive scientists.

However, Winograd and Flores argue that "computers, like every technology, are a vehicle for the transformation of tradition":

> "We cannot choose whether to effect a transformation: as designers and users of technology we are always already engaged in that transformation, independent of our will. We cannot choose what the transformation will be: individuals cannot determine the course of a tradition. Our actions are the perturbations that trigger the changes, but the nature of those changes is not open to our prediction or control...

> However, we can work towards unconcealment, and we can let our awareness of the potentials for transformation guide our actions in creating and applying technology." (Winograd & Flores 1986, p.179)

In a short time, computers have transformed the nature of work, working practices, and organisational behaviour. Two decades ago, the main purpose of computers was data processing. In a batch processing environment, systems analysts would discuss the data needs of their clients, design a suite of programs by using flow charts, and pass the program specifications onto the programmer. The programmer would design a program by using another set of flow charts, write the program code on sheets of paper, and pass the sheets of paper onto the punch card operator. The punched cards were delivered to the programmer, who passed them onto the data processing clerk, who passed them onto the computer. The programmer would collect the output, and initiate further passes of cards while testing and debugging the program.

The history of AI goes back to those days of non-interactive computing. The function of the computer as a data processing machine has therefore had a major influence on notions about the purpose of AI and the ways in which it might be implemented, as well as the notion of machine understanding as the manipulation of representations. Far from being envisaged as an enhancement to interaction, AI systems were seen as stand-alone systems, to be implemented in the form of robots that would perform routine tasks, or, ideally, intelligent machines that would perform more complex tasks. As mentioned, the subsequent development of AI continues to be influenced by those aspirations, some advocates claiming that "AI researchers are trying to create a computer which thinks" (Charniak & McDermott 1985, p.1). So just as systems analysts modelled data, AI researchers modelled the knowledge that was thought to be fundamental to understanding.

However, as Winograd and Flores point out, "design includes the generation of new possibilities" (Winograd & Flores 1986, p.170). In the last twenty years, transformations in technology have occurred at a rapid pace, and since playing a limited role as a

data processor, the computer now plays an integrated role in communications of all kinds. In particular, the innovation of the microcomputer generated the possibility of interactive computing. Subsequently, designers have considered the potential use of technology for a variety of purposes, and have developed different kinds of software to assist a variety of activities. To do this, they have had to consider the needs of different kinds of users. Interactive computing therefore gives rise to another kind of modelling: the modelling not only of data but also of the activities that humans perform on it.

This kind of modelling involves the modelling of activities that require the manipulation of external representations. Such representations must be translatable into machine code, a binary symbolism of ones and zeros. Numbers, letters and still or moving pictures can all be represented in this way, so that any activity involving numerical, textual or graphic manipulation might be amenable to some form of computational assistance.

On the one hand then, Heidegger's observation that representations are not basic to human cognition - an observation that may be relevant in the context of basic cognitive processes - is not appropriate in this context, because human activities such as drawing or writing fundamentally involve the manipulation of representations. On the other hand, the process of writing involves not only the basic cognitive processes such as attention and perception but also conscious thought and the manipulation of written language. It would appear, therefore, that creating a text is a more complicated process than merely attending to stimuli.

However, as we noted above, cognitive psychologists have traditionally modelled cognition as information processing, in which an input or stimulus produces an appropriate output or response. These models have tended to follow developments in computer architecture, evolving from bottom-up serial processing models, to serial models that acknowledge the role of top-down processing, to parallel processing models. Within the framework of cognitive science, where the aims of cognitive psychology are

integrated with the aims of AI, a cognitive model is only acceptable if it can be implemented in the form of an intelligent knowledge-based system that can produce the required output from a specified input. In this context, the purpose of cognitive modelling is to construct a computational system that simulates a basic cognitive process such as perception or understanding. In the case of Marr's (1982) computational theory of human vision for example, the "computational problem" is to describe, for each level of the system, a method that will obtain a specified output representation from a specified input representation (Roth & Frisby 1986, p.138).

So, although cognitive psychologists have developed more sophisticated models of cognitive processes, a cognitive model that would be acceptable to cognitive scientists is one that specifies an input or stimulus, an output or response, and a method of transforming input into output - that is, a model that follows the traditional data processing models developed by AI researchers. From this perspective, it follows that a cognitive model of writing would be a model that represents writing as data processing.

To model writing in this fashion, we would have to specify the initial input to the system, the final output, and a method of producing the output from the given input. Would the input be a written instruction to write an essay on a given topic, for example, or to write a novel on a specified theme? In that case, how would such an input be transformed into the desirable output of the system, such as a cohesive text in the form of an essay, a novel or a short story? If we need to give the system instructions to write in the first instance, does this not suggest that the system lacks motivation or can only simulate writers who work to a given brief? How do we model motivation? Should the system be given financial incentives to produce several best-sellers a year, or should it be programmed to produce a Finnegans Wake once every twenty years?

Despite the difficulties of answering this range of questions, a cognitive model of writing would only be acceptable to cognitive

scientists if it could be used to design computer software that simulates the process of writing. It is from this perspective that Sharples comments:

> "Although Flower and Hayes used a computational metaphor to describe the act of writing, there have been few attempts to verify the model by building computer programs that mimic a human writer. . . And by attempting to design programs that mimic human writers we can see, in failure, inadequacies of our existing models of the writing process and, in success, some confirmation of their worth."
> (Sharples 1992, pp.2-3)

So according to Sharples, the test of a model of writing is its use in designing computer programs that mimic human writers. There are two problems with this formulation, however. The first is that the only models that can be tested in this way are data processing models. Therefore, if we demand that models be tested in this fashion, are we not imposing constraints on the modelling of writing that may not be appropriate to our purpose? The second problem is that even if we accept these constraints and emerge with a data processing model of writing, it may not be feasible to use the model to design the software that Sharples requires. There must be a reason why there have been few attempts to design software that imitates human writers, so let's seek an explanation.

Traditionally, AI researchers have been primarily concerned with modelling the knowledge held to be necessary for understanding and perceiving - "input processes" that involve attending or responding to incoming information, rather than "output processes" that involve creating or generating new kinds of information. Such knowledge is assumed to be universal to all humans, in the same way that a basic cognitive process is "considered to be universal to all members of the human species, if not to the whole animal kingdom" (Greene & Hicks 1984, p.xi). The kind of knowledge which is held to be universal is a knowledge about causality and temporal ordering, for example, and is often referred to as semantic knowledge (Quillian 1968). However, in studying the operations of human memory cognitive psychologists have made a distinction between semantic memory

on the one hand and episodic or autobiographical memory on the other (Tulving 1972). Cohen and colleagues explain:

> "Episodic knowledge is an autobiographical record of your own experiences - the events, people, and objects you have personally encountered. Semantic knowledge consists of facts about the world in general. So you might have stored in your episodic memory personal knowledge about, for example, a particular clock in your living room at home, its appearance, habits, history, etc. You also have semantic knowledge about clocks in general, their function, mechanism, defining characteristics, and so on."
> (Cohen, Eysenck & LeVoi 1986, p.46)

It is semantic rather than episodic knowledge that is thought to be necessary to understanding and perceiving, and it is this kind of knowledge that is traditionally modelled by AI researchers.

Given that AI researchers have primarily been concerned with "input processes", we face two major problems in attempting to design computer programs that imitate human writers. The first is whether a model of semantic knowledge is adequate to design a system that will create rather than comprehend. The second takes us back to the question of testing - how do we measure the success or failure of such a system? On the one hand, the demand of a model of writing that it should be tested in this way appears to be a call for rigorous testing; but on the other hand, this apparent rigor collapses if we have no way of knowing whether such a system succeeds or fails.

Let's consider the example of another creative process; that of painting. As we mentioned above, the test of a cognitive theory of human vision, for a cognitive scientist, is whether it provides a basis for designing a computational system that can simulate the perception of objects. Given a photograph of a tree as an input, the system should be able to produce the name of the object - "tree" - as the final output. The same stimuli should provoke the same response, and the response should be the same if we implemented the system on another machine. How could we apply the "tree test" to evaluate a system that simulates human artists? Given the

instructions to paint a tree, the system should be able to produce a representation that is recognisable as a tree. To be consistent with the perceptual test, repeated instructions should produce the same results, and different machines should also produce identical results if they are given the same instructions. But if our system is intended to simulate human artists, should it not produce a unique work of art each time it receives a request to paint?

In some situations however, identical results from a team of artists may be desirable. In the Hollywood film production studios of the 1930's, for example, the artists who painted the cels of a Walt Disney animated cartoon would have been expected to draw Mickey Mouse in the same fashion, for obvious reasons, and their working conditions would have resembled the mass production and assembly line techniques of a car factory, rather than the traditional view of an artist's garret (Balio 1976). So, the criteria used to assess a computational system of perceiving (sameness and repeatability) may also be used to assess a system of creating, depending on the sort of work in production.

This observation also applies to a computational system designed to simulate human writers. In some areas of writing, it may be desirable that, given the same instructions, different writers should produce the same text, or, at least, texts that deliberately disguise the individual author. For example, Hoard and colleagues discuss an automated grammar and style checker for writers of "Simplified English" (Hoard, Wojcik & Holzhauser 1992). They explain:

> "Boeing Commercial Airplanes has made a commitment to write its aircraft maintenance manuals in Simplified English, the new international standard for aerospace technical documents. The standard places a heavy burden on the technical writers who produce the documentation, since Simplified English prescribes severe restrictions on grammar and style, forcing the writers to memorise an enormous body of detailed information about word usage."
> (Hoard, Wojcik & Holzhauser 1992, p.278)

According to Hoard and colleagues, "Simplified English" places severe restrictions on vocabulary; only 1500 words of general English are permitted, "fewer than 200 of which are verbs" (Hoard et al 1992, p.279). A supplementary vocabulary consists of a number of technical terms chosen by the manufacturer (Hoard et al 1992, p.281). The grammar and style restrictions imposed by "Simplified English" include limits on sentence length, paragraph length, paragraph content, verb forms and punctuation (Hoard et al 1992, pp.282-283).

The "Simplified English" used by the aerospace companies is an example of what Schreurs and Adriaens (1992) call "Controlled English", limited forms of English that impose these kinds of restrictions on vocabulary and grammar. According to Schreurs and Adriaens (1992, p.207), "Controlled English" was first developed by the Caterpillar Tractor Company in the mid-1960's, when "Caterpillar Fundamental English" led other companies producing technical manuals to develop similar grammars. Schreurs and Adriaens compare the grammars of three companies, and discuss the problems of introducing a standard form of "Controlled English":

> "The continuous expansion of international industries has inevitably led to the need of standardisation and conformity in the field of written communication...
>
> To ensure that the language of technical documents is unambiguous, well-structured, economical and easily translatable, 'controlled' language has been thought to be the solution. However approachable this phenomenon seems to be at first sight, it has been marked with some kind of mysterious isolation: controlled grammars appear not to exceed the confines of industry. International companies protect their own controlled grammar to enhance the internal functionality of personal business matters without attempting to co-operate with other multinationals, or even universities."
> (Schreurs & Adriaens 1992, p.206)

From Schreurs and Adriaens' account, it seems that multinational companies protect their own form of "Controlled English" as an essential part of their corporate identity. Under these conditions,

the author of a technical document is the company rather than the individual, and a technical manual produced by one team of writers would be indistinguishable, other than by its content, from one produced by another team employed by the same company. In the production of business reports, technical manuals and other kinds of writing that involve a standardisation of vocabulary, grammar and presentation, AI techniques have been used to design software tools that help writers to follow the recommended procedures (Beeken, Geerts & van Belle 1992).

However, if we consider the types of texts that Cooper and Matsuhashi (1983, p.14) call "poetic" (a category that includes fiction) or "expressive" (diaries and personal letters) rather than "transactional" (in which a writer is informing, persuading or instructing), then the restrictions imposed by the various forms of "Controlled English" no longer apply. In courses on creative writing, students are encouraged to seek out new forms of expression and explore a range of linguistic possibilities:

> "... the student is awakened to the real life of language, with all that implies of the physiology of words, their ancestry and history and dynamic behaviour in varying circumstances... At the same time he is introduced to literature as a living organism, part of the human organism, something which embodies the psychological record of this drama of being alive, something which articulates and illuminates the depth and range and subtlety of being human."
> (Hughes 1981, p.xvi)

In the case of "Controlled English", software tools assist writers in producing texts with a uniformity of style and grammatical construction. In the area of literary studies on the other hand, stylometry has been used in textual analysis to find out whether a text of unknown authorship is the product of a particular author (Kenny 1992). In the latter case, an author's texts are analysed to identify favoured words or grammatical constructions that are generally uncommon in other texts of the period. The text of unknown authorship is then analysed for occurrences of these favoured constructions. At some time in the future, perhaps

stylometry will be applied in the area of corporate communications to detect whether a technical manual is the product of IBM, BT or Caterpillar Tractors.

If we return to the problem of designing computer programs that simulate human writers, it would seem, therefore, that we are more likely to succeed if we restrict our system to simulate certain kinds of writing. We are more likely to succeed if we try to simulate the writers who are employed to write in the various forms of "Controlled English", where the traces of individual authorship are deliberately suppressed in favour of a corporate identity, where a uniformity of product is desirable, where we can measure our results against some kind of standard, and where AI techniques have been successfully applied. The body of linguistic knowledge required to produce "Simplified English" is the sort of knowledge that is stored in a writer's semantic memory, and as we mentioned above, it is this kind of knowledge that is traditionally modelled by AI researchers.

We can represent this kind of writing in the form of a data processing model by designating the input to the system as the brief to write a certain kind of manual, and the output as the final product. The body of linguistic knowledge concerning "Controlled English", and the body of semantic knowledge concerning aerospace manufacture or whatever, all of which would be stored in the technical writer's semantic memory, could be represented by AI techniques, and could be invoked as required. We would still need to model the processes that will turn the initial brief into the final product, and the difficulties of doing this are discussed in chapter six.

However, if we try to represent fiction writing in the form of a data processing model, we encounter a further set of problems. Professional writers of fiction often work to no given brief and are motivated simply by the urge to write (Boylan 1993). In that case, the input to the system would have to be designated as the writer's personal experiences which are translated into the fictional work. A writer's personal experiences are an example of

the episodic knowledge or autobiographical record stored in episodic memory, in contrast to the semantic knowledge traditionally modelled by AI researchers. Therefore, in addition to modelling the general kind of linguistic knowledge stored in semantic memory, we would need to model what is unique to a particular writer: the autobiographical record of a writer's episodic memory.

We can designate the output of the system as a cohesive text in the form of a novel, but in this case we lack the measure of a uniform product, unless we limit the range of fiction to a particular genre such as romance, and we cannot apply the criteria of sameness and repeatability to the results. And, as a final problem, we still face the difficulties of modelling the processes that will transform the input of episodic knowledge into the final product.

In short, we may be able to represent fiction writing in the form of a data processing model, but it may not be feasible to use the model to design computer software that simulates human writers. As AI has traditionally been concerned with input processes, the question is whether a model of semantic memory is sufficient to explain the output processes involved in writing. For some types of writing, a model of semantic knowledge may be adequate, but the processes of transforming input into output are not easy to identify. Compared with other types of writing however, the writing of fiction is a process that seems to make more demands on a writer's episodic memory, and this provides one explanation why there have been so few attempts to design programs that mimic human writers.

As we mentioned above, the other problem with Sharples formulation is the implications for modelling. If we demand of a cognitive model that it be tested in this fashion, and the only test of a cognitive model is the simulation test, then the only models of writing that can be called "cognitive models" are models that represent writing as data processing. This constraint on testing therefore enforces a constraint on modelling, a constraint that

may not be appropriate to our purpose. As we mentioned above, AI researchers describe their aim as "trying to create a computer which thinks" (Charniak & McDermott 1985, p.1), and modelling knowledge is seen as essential to that purpose. In the context of interactive computing however, we are more concerned with modelling human activities, and our aim is to design software tools that assist humans in those activities. This does not preclude the use of AI techniques in situations where they may be appropriate, as we mentioned above (eg Beeken, Geerts & van Belle 1992).

2.4 CONCLUSION

In this chapter we introduced models of writing, and classified a range of models by considering their derivation and purpose. We also considered the different types of tests that models may undergo. Cognitive scientists argue that models of cognitive processes should be tested by designing and testing a computational system that simulates the appropriate process. We discussed the assumptions of cognitive science and the influence of the rationalistic tradition in linguistics and computer science. We also considered the implications of the simulation test for modelling writing, and concluded that it may not be feasible to test a model of writing by designing computer programs that mimic human writers. We now turn to discuss models of writing in more detail.

CHAPTER THREE:

WRITING BEHAVIOUR

3.1 INTRODUCTION

In this chapter we begin our review of current models of writing by discussing the notion of writing behaviour. Firstly we ask, why is creative writing traditionally viewed as a mysterious process that does not lend itself readily to detailed investigation? Secondly, we consider the reports of writing behaviour given by professional fiction writers. We compare these accounts with the findings of behavioural psychologists, who are trying to classify writers according to their behaviour, and conclude that a taxonomy of writers is not an appropriate basis for software design. We then discuss an alternative notion of writing behaviour, in which writing is viewed as a cyclical process of engagement and reflection. Thirdly, we discuss research into the effects of writing technology on the behaviour of student writers, and find further evidence of writing as a cyclical process. We also find that research into technological effects often adopts a model of writing in order to measure effects, and conclude by summarising the features of the computer as a medium of writing.

3.2 THE MYSTERY OF WRITING

In the *Phaedrus*, Plato distinguishes between the inspired and the uninspired poet:

> "The third type of possession and madness is possession by the Muses. When this seizes upon a gentle and virgin soul it rouses it to inspired expression in lyric and other sorts of poetry, and glorifies countless deeds of the heroes of old for the instruction of posterity. But if a man comes to the door of poetry untouched by the madness of the Muses, believing that technique alone will make him a good poet, he and his sane compositions never reach perfection, but are utterly eclipsed by the performances of the inspired madman."[1]

In ancient Greece, the oracles at Delphi and elsewhere were thought to be mediums who were possessed by a god or a goddess

---

[1] p.48 in Walter Hamilton's translation for Penguin (1973).

and whose words needed interpretation by the appropriate authority. Similarly, the poet sought inspiration by appealing to one of the nine muses to take control of his speech. In Plato's account, poets, prophets, lovers and madmen are all possessed and not in control of their reason.

In more recent times, Flower and Hayes argue that the teaching of writing has traditionally emphasised the product while neglecting the process of writing (Flower & Hayes 1980a, p.32). The consequence of this neglect is that many students have ideas about processes that reflect the Platonic tradition of possession:

> "There is, of course, a well-established mythology about the nature of writing as a creative process. Some of this mythology is insightful; some of it is pure bunk. Students often seem to subscribe to the inspiration paradigm in which a writer sits patiently waiting for delivery and the descent of the muse."
> (Flower & Hayes 1980a, p.32)

The notion of creative genius (a Roman equivalent to Plato's divine possession) and the distinction between creative and prosaic writing both help to perpetuate the idea that some writing is the product of thought processes which are irrational and defy analysis.

Professional writers themselves tend to reinforce the view that their activity is a mystery. This is Clare Boylan, introducing a collection of essays by fiction writers on their art:

> "Over and over the writers in this volume refer to 'the mystery' - that element in their work which is outside themselves but to which they aspire or submit.....Most writers of fiction claim that the mystery cannot be explained (and should not be too closely investigated)..."
> (Boylan 1993, p.xi)

Many writers in this collection allude to the role of the unconscious in the writing of fiction. For example, Hilary Mantel writes:

> "It seems to me that a good part of the business of fiction is performed half-consciously, even subconsciously."
> (Mantel 1993, p.38)

Some writers point to childhood as a source of inspiration (Gardam 1993, Paretsky 1993, McGahern 1993, Hill 1993, Jolley 1993, Moore 1993), while some refer to character as their main concern (Swift 1993, Mantel 1993, Moggach 1993, Fitzgerald 1993, Highsmith 1993, Hart 1993, Mortimer 1993). Swift's advice to young writers is to "write about what you don't know - for how else will you bring your imagination into play?" (Swift 1993, p.24). He makes the point that "one of the fundamental aims of fiction is to enable us to enter, imaginatively, experiences other than our own" (Swift 1993, p.24). This is Deborah Moggach, describing her imagination at work:

> "More recently I was planning a novel about a man who had a lot of ex-wives. He sprang into life once I had pinpointed where he lived: one of those sooty blocks of mansion flats on the Edgware Road. For days I sat in my car, opposite the building, and pictured him shuffling out - big, bearded, wearing espadrilles with the backs squashed down and pulling along one of those matted little dogs that looks as if it has been run over. By this time his name had come to me - Russell Buffery."
> (Moggach 1993, p.134)

In his essay on creative writers and daydreaming, Freud (1985c) argues that there is a relationship between the unconscious, childhood memories and imaginative activity. Arguing that "the creative writer does the same as the child at play", Freud continues:

> "He creates a world of phantasy which he takes very seriously - that is, which he invests with large amounts of emotion - while separating it sharply from reality."
> (Freud 1985c, p.132)

According to Freud, child play, creative writing and daydreams are activities which all involve the imagination, although each serves a different function. Through play, the child comes to terms

with the world of the adult. When the child grows up and the imagination can no longer express itself publicly through play, it finds a private outlet in fantasy and daydreams. These are usually associated with ambition, eroticism, or both. The creative writer gives concrete expression to imaginative activity. Freud singles out the romance as the prime example of an "egocentric story", in which a sharply differentiated hero and heroine are invested with the writer's ego (Freud 1985c, p.138). He makes the connection between memories of childhood and the writer's imagination in this way:

> "A strong experience in the present awakens in the creative writer a memory of an earlier experience (usually belonging to his childhood) from which there now proceeds a wish which finds its fulfilment in the creative work."
> (Freud 1985c, p.139)

This stringing together of past, present and future occurs in a similar fashion in fantasy; in this case, the creative work is the daydream. In Freud's "wish fulfilment" hypothesis, the activity of the imagination is tied to the writer's ego, even when the writer's ego is not directly bound to a central character's point of view:

> "The psychological novel in general no doubt owes its special nature to the inclination of the modern writer to split up his ego, by self-observation, into many part-egos, and, in consequence, to personify the conflicting currents of his own mental life in several heroes."
> (Freud 1985c, p.138)

Given that, some years prior to writing this essay, Freud had frequently used the technique of self-observation in his work on dream analysis (Freud 1976a), one could argue that here he assumes that the creative writer works in a similar way. However, a view of the imagination that restricts its field of operation to "wish fulfilment" or "self-observation" is not likely to find many adherents among the writers whose essays are referred to above. Even so, Freud's departure for his enquiry is essentially the same question raised by Clare Boylan in her introduction: from what sources does the creative writer draw

inspiration, and why is creative writing such a mysterious process? Whatever one thinks about Freud's "wish fulfilment" hypothesis, these essays provide fresh evidence for the idea that past memories and present incidents are tied up in the creative work. In particular, the anecdotes of fiction writers reinforce Freud's suggestion - that it is the involvement of the writer's unconscious which makes the process of writing fiction difficult to articulate and shrouds attempts to do so in the rhetorical cloak of mystery.

It therefore appears that our aim of establishing a model of fiction writing faces two immediate problems. Firstly, how can one model a process which is traditionally seen as mysterious and tied to the unconscious? Secondly, how can one generalise from the particular, when the latter - the imagination - is traditionally held to be the unique property of individuals? We shall return to these questions when we explore linguistic approaches to writing.

3.3 FICTION WRITERS AND WRITING BEHAVIOUR

Fiction writers are no exception to the observation that "different writers act in different ways" (Williams 1991a, p.29). For example, several writers in Boylan's collection describe writing as a compulsive activity:

> "...as the essays included here reveal, the compulsion to write, coupled with cunning, intelligence, endurance and a willingness to lay open oneself and pretty well lay down one's life, is all that is needed to engage with the mystery (if you are a story-teller, if you have a story to tell)."
> (Boylan 1993, p.xi)

Lorrie Moore believes that "the compulsion to read and write - and it seems to me it should be, even must be, a compulsion - is a bit of mental wiring the species has selected, over time, in order, as the life span increases, to keep us interested in ourselves" (Moore 1993, p.199). However, Jane Gardam denies any compulsion to write. After her initial spark of inspiration, she claims that:

> "There is no immediate compulsion as a rule to do anything about it. Like love, if it is the real thing there is often no sense of urgency."
> (Gardam 1993, p.12)

Hilary Mantel's strategies reveal a similar cautious approach to the early stages of writing. This involves the use of index cards or small notebooks in which she gathers material before attempting to piece it together - a method she describes as "growing a book, rather than writing one" (Mantel 1993, p.41).

Following Plato, we might say that one way in which writers differ is their relation to the muse. To invoke compulsion as a means of engaging with the mystery of writing is like summoning the muse, with the possessed poet disguised as the compulsive writer. However, sometimes the muse can be resisted. Josephine Hart confesses that "for most of my adult life I resisted writing", but her first novel had been completed in her head, "long before I

sat down to write it" (Hart 1993, p.209). When the urge to write could no longer be restrained, Hart sat down and finished her novel in six weeks, while still refusing to be taken over:

> "I always stopped at 12.30 irrespective of how I felt the writing was progressing. Whenever a wave of intense creativity threatened to break over me, I got up and walked away. I refused to 'go with it'."
> (Hart 1993, p.210)

As a further complexity, there are some writers who never receive a visit from the muse - Hilary Mantel attributes her method of working to her lack of imagination, rather than a resistance to compulsion (Mantel 1993, p.37).

Is it possible to make generalisations about differences between fiction writers? One method is to construct various poles along which differences can be scaled. For example, another way of expressing the above relation to the muse is that writers vary along a Platonic pole of possession and detachment. At one extreme, the compulsive writer is absorbed in her work, thinks or writes until exhausted, and never allows any disruptions to her train of thought. At the other extreme, the completely detached writer imposes a timetable on her work, always works at a set time, and never allows an outburst of inspiration to disrupt her regularity. Writers also vary in the amount of time thinking through ideas before writing anything, in the scope of this thinking (a sentence, a chapter, an entire book), and productively in terms of how much writing results. Whereas Josephine Hart thinks about an entire novel over a long period before writing a word, Hilary Mantel writes a few sentences at a time, as they occur to her, while having no idea how these sentences will be incorporated into her story. Developing Hilary Mantel's metaphor of "growing a book", we might describe a pole of horticulture here, with tree planters at one end and seed sowers at the other. However, bearing in mind incubation periods, the size of the plant, the number of fruits, and differential rates of growth, developing a metaphor of complex processes can itself become a complicated affair.

Differences in the ways that academics approach writing have been found by psychologists researching writing behaviour. This research has led to a polar taxonomy of writers. The two breeds are the "planner" (Torrance, Thomas & Robinson 1993), who is also known as the "serialist" (Wason 1980) or the "Mozartian" (Sharples & Pemberton 1992) - and the "discoverer" (Galbraith 1991), who is also known as the "reviser" (Torrance et al 1993), the "wholist" (Wason 1980), or the "Beethovian" (Sharples & Pemberton 1992). Describing research into the writing of PhD students, Wason gives two examples of "opposite 'cognitive styles' in writing" (Wason 1980, p.134). The "serialist writer" (the planner) starts with a plan of the whole before writing a draft, whereas the "wholist writer" (the discoverer) writes without a plan and with much subsequent revision.

However, establishing a taxonomy of writing behaviour is currently a polemical affair. In a paper presented to the *Sixth UK Conference on Computers and Writing*, Mark Torrance discussed the writing strategies of research students in the social sciences and identified three distinct groups (Torrance et al 1993). In comparison with the "planners" and "revisers" described above, the "mixed strategy" writer not only plans before starting to write but also revises extensively. In the ensuing debate however, it was pointed out that given the statistical methods used to place writers into the categories, the categories were self-defining.

Establishing a polar taxonomy of writing behaviour is even more problematic. Following Wason and Odell, who both advocate writing without a plan as a means of discovering ideas about a subject (Wason 1980, Odell 1980), Galbraith goes further and claims to have confirmed experimentally that discovery through writing "is a consequence of the spontaneous spelling-out of ideas in continuous prose" (Galbraith 1991, p.151). He contrasts this "romantic" view with the "classical" view, which asserts that "discovery is a consequence of planned rhetorical organisation" (Galbraith 1991, p.151). In relation to the two breeds of writer, the classical view maintains that the planner will discover new

ideas, whereas the romantic view claims that the writer without a plan will discover new ideas. To select the two groups of subjects for his experiment, Galbraith has to find a way of placing writers into one of the two categories. An initial attempt to do this based on their writing strategies is abandoned because of "large individual differences in the strategies they actually employed" (Galbraith 1991, p.153). The two groups are then selected using a questionnaire developed by social psychologists to measure differences in self-monitoring (the ability to present ourselves to others in order to create a desired effect). Galbraith makes the assumption that subjects rated as high and low self-monitors based on the results of this questionnaire can also be classed as planners and non-planners in terms of their writing behaviour - the grounds for making such an assumption are omitted from his argument.

The above research into writing behaviour explores academic writing, and the subjects of the experiments are often research students writing essays or theses. Are there any similarities between academic writing and fiction? Is the process of writing a thesis, for example, fundamentally different from the process of writing a novel, or do the above observations on writing behaviour apply equally to "creative" writing?

Evidence for poles of behaviour in the writing of fiction can be found in the anecdotes of professional writers. Josephine Hart's description of writing seemingly places her in the category of "planners", while Hilary Mantel's methods might place her at the other extreme in the category of "discoverers". Hart claims she has four novels completed in her head (Hart 1993, p.209), while Mantel writes:

> "When I am putting a book together my aim is never to think about plot, to think even less about structure. I like to let these things sort themselves out..."
> (Mantel 1993, p.39)

In the literature however, the notion of "planning" either refers to a mental process of reflective thinking (Burtis, Bereiter,

Scardamalia & Tetroe 1983, Haas 1989, Schilperoord 1994), or suggests the externalisation of ideas into some form of physical representation such as notes, diagrams, sketches or outlines (Sharples & Pemberton 1992, Galbraith 1991, Galbraith & Reed 1994). In Josephine Hart's case, the conceptual process that we have translated as "planning" is more akin to daydreaming or using the imagination than to reflective thinking; moreover, her account of completing a novel mentally does not suggest any physical representations. Only one writer in Boylan's collection of essays explicitly mentions starting a story with an outline, and in that case, "once a character gets going they push it off in their own direction" (Moggach 1993, p.135). Although some writers have a notion that plot is necessary (Highsmith 1993, Davies 1993, Mortimer 1993), a greater number would agree with Moggach's notion of a character as the "driver" of the imagination. If we assume that a "plan" for writing fiction might be the outline of a plot, then a translation of the division into "planners" and "discoverers" would consist of writers who start with a plot outline, and writers who work without a plot and allow the imagined lives of their characters to lead the story. Most fiction writers in Boylan's collection would then be located in the latter category.

But, as Josephine Hart's anecdotes indicate, a "plan" for a piece of fiction does not have to be realised through external representations but can be formulated in the mind. Scenes can be visualised, stored in memory and described at a later date. Hence, writing fiction with a "plan" could be understood as starting with a plot outline, or with some sort of visualisation that is not necessarily externalised. The category of "planners" therefore contains writers who might find themselves at opposite ends of the Platonic spectrum of inspiration.

Is the notion of "discovery" relevant to the writing of fiction? In the experiment mentioned above (Galbraith 1991), Galbraith measures "discovery" by asking his subjects to rate the depth of their knowledge about a specific topic before and after writing an essay. An advocate of "teaching writing by teaching

the process of discovery", Odell (1980) suggests techniques that are derived from Aristotelian exercises in logic; although these techniques may be appropriate for developing arguments, they do not seem to be relevant to the writing of fiction. The notion of "discovery through writing" that is advocated by Wason (1980), Odell (1980) and Galbraith (1991) assumes a particular genre of writing and argues that thinking can be clarified through the "spontaneous spelling-out of ideas in continuous prose" (Galbraith 1991, p.151).[2]

Yet some fiction writers claim that their work is more a result of thinking through ideas rather than a product of the imagination. Hilary Mantel confesses:

> "I don't think I have much imagination. What talent I have is for seeing the connections between things, and in finding a dramatic form for abstract ideas. It seems to me that my books are ideas-driven..."
> (Mantel 1993, p.37)

We labelled Hilary Mantel as a "discoverer" above in contrasting her method of writing with Josephine Hart's. Pinned at random on a notice-board, Mantel's index cards of words, phrases and ideas accumulate "until one day I see a sequence, a logic, begin to emerge" (Mantel 1993, p.40). Mantel's discovery of a structure for her novel would appear to be an example of the clarification of thought which, according to the romantic view, only arises through writing without an initial plan. She also discovers her themes: "I tease them out through the act of writing itself" (Mantel 1993, p.41). For this writer then, the category of "discoverer" seems to be relevant.

---

[2] The *Research Degrees Guide* produced by the Faculty of Humanities at Middlesex University offers the following advice to prospective research students:

> "As Descartes once put it, 'the things which have seemed true to me when I think about them, have often appeared false when I tried to put them down on paper'. It may well be that trying to write is the best way of getting yourself to think effectively."

The argument for a taxonomy of writing behaviour is based on research into the writing strategies of academics. However, we have looked at the anecdotes of professional writers and found two writers of fiction who not only exhibit entirely opposite characteristics in terms of their writing strategies, but who also seem candidates for the categories of "planner" and "discoverer". For some writers, the writing of fiction might entail thought processes that are usually associated with writing argumentative texts; that is, "logical" rather than "creative" thinking (Thomson 1959). On the other hand, although Mantel writes without a "plan", she discovers a structure for an emerging novel by accumulating notes rather than writing continuous prose, so that we could equally label her as a "planner" who takes a long time to formulate a plan. In addition, we noted that when the imagination is involved in the process of writing fiction, planning can be visually orientated rather than text-bound.

It would therefore be unduly optimistic to assume that every fiction writer can be slotted into a taxonomy based on academic writing and whose principles remain questionable. Some fiction writers describe a process of writing in which a character "takes over", a strategy of writing that does not easily fit the categories of "planner" or "discoverer". Differences in writing behaviour among fiction writers might be related to the imagination in some way, and these differences may not be apparent in other sorts of writing. A writer may also adopt a different behaviour when turning from fiction to write an essay, or even during the same writing assignment. Finally, as Noel Williams points out, technology itself can also alter a writer's behaviour (Williams 1991a, Williams 1992a).

These observations make the notion of a behavioural taxonomy an inappropriate foundation for software design. Bearing in mind that writers can occupy opposite poles of behaviour, designers of flexible writing software would need to cater for these extremes and all the intermediate categories of writer. But the notion of writing behaviour is based on a writer's preferred writing strategies. If one writer can change her

behaviour, then to model merely this writer one would need to model the variety of strategies she might adopt. While still bearing in mind that approaches to writing can be radically divergent, one cannot avoid returning to consider the strategies that define the behaviour.

An alternative view of writing behaviour is that the categories of "planner" and "discoverer" represent pathological cases, while the majority of writers are both "planners" and "discoverers". In a paper presented to the *Sixth UK Conference on Computers and Writing* Mike Sharples suggests that "there is no simple continuum between discovery-type writing and planning-type writing" (Sharples 1993):

> "To describe Planners and Discoverers as sitting at opposite ends of a spectrum of writing types, would suggest that there are writers towards the middle of the spectrum who are able to merge the two approaches."
> (Sharples 1993)

He argues that this is not the case. Because the act of writing demands full attention, it is not possible to write without a complete engagement with the text; therefore, every writer is in some sense a "discoverer". Neither is it possible to simultaneously write and reflect; all writers must organise their ideas when they are not completely occupied with the text. Therefore, every writer is also a "planner". He describes "Planners" and "Discoverers" as extreme cases or "pathological writing types", whereas "for most writers, creativity arises from a rhythmic cycle of engagement and reflection" (Figure 1):

> "A writer's regular movement between production and reflection on the product sets up a rhythm of writing. It is the frequency of the writing rhythm, along with the proportion of time a writer spends on reflecting or engaging with the text, and how the writer chooses to begin the task (with a period of reflective planning or with a session of engaged writing) which situates the writer between the two poles of Discoverer and Planner."
> (Sharples 1993)

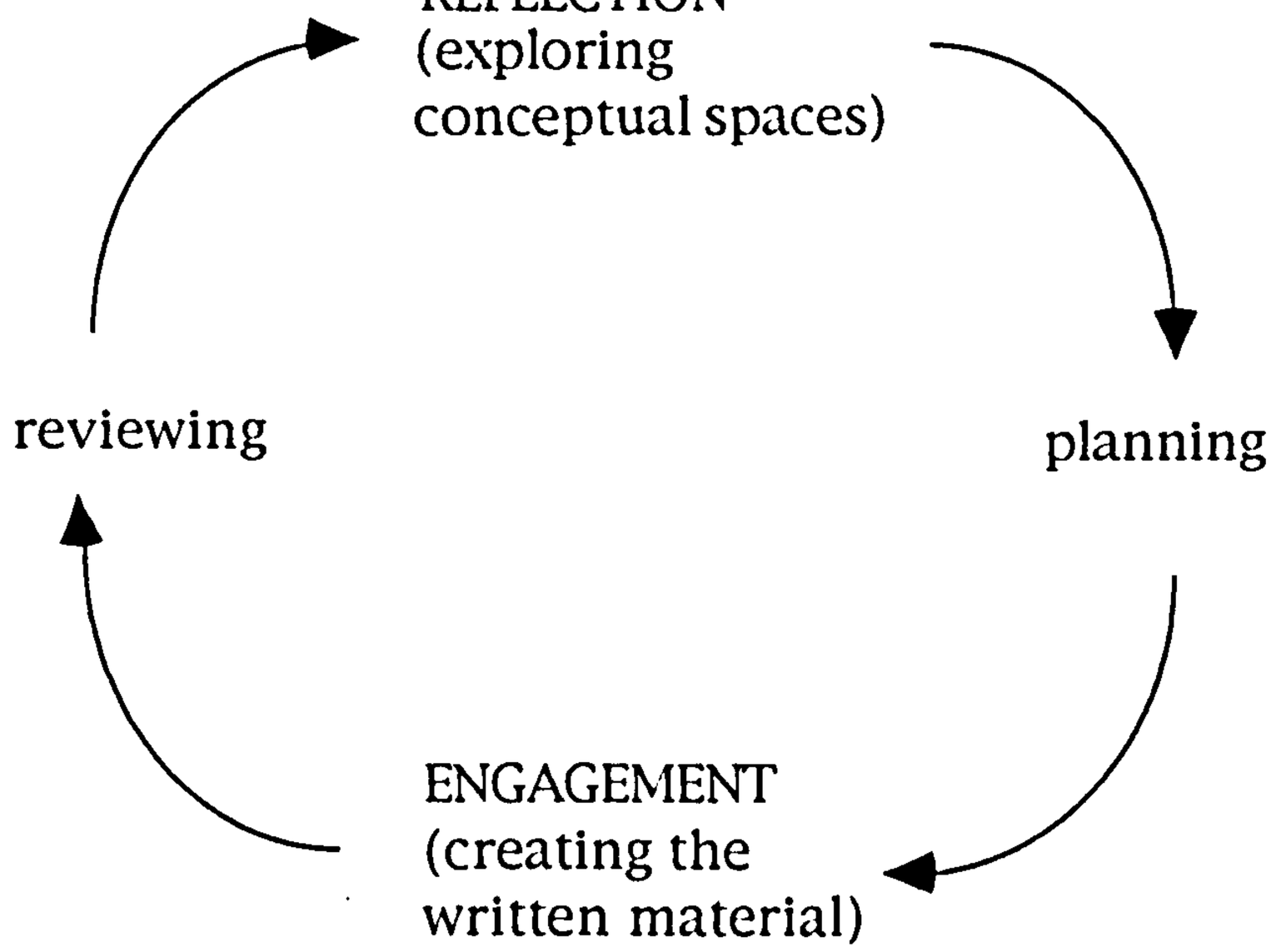


FIGURE 1: THE RHYTHM OF WRITING (Sharples 1993)

Walter Nash has also described a rhythm of writing, a rhythm that is a similar sort of alternation between reflection and engagement, between planning or deliberating on the one hand, and formulating on the other:

> "For most people there are periods of deliberation or creative daydreaming which alternate with active efforts at formulation; inner phases of imaginative exercise are followed by outer phases of technical exploration. The phases are interdependent, however, and in fluent composition it may be that we move more or less rhythmically from one to the other, sometimes letting technique follow the thrust of the imagination, sometimes training the imagination to the set of a technique. One process may in fact criticize the other. Formulation is a way

of rapidly testing the feasibility of long-deliberated notions; deliberation in its turn assesses the value of what has been formulated.

Modes of alternation between phases must certainly vary from writer to writer, from text to text, and even from one part of a text to another. Sometimes the transitions between inner and outer are quite swift; the composition takes shape sentence by sentence, brief muttering fits of abstraction being succeeded by rapid forays on to paper. In other cases the writer will dash off whole stretches of text without much forethought, but devote long periods of deliberation to refining and correcting what he has written. Then again, premeditation on the work can occupy long hours..."
(Nash 1980, p.160)

Following the classical Greek motto of "nothing in excess", Nash considers an imbalance of phases to be detrimental to writing and, like Sharples, to mark the pathological writer:

> "Experience suggests that whatever the mode of composition may be it is important to keep inner and outer phases in some sort of supportive relationship. Too much introspection undoubtedly paralyses the will to compose; too much unpondered formulation produces an aimlessly wordy semblance of composition, a zombie prose from which the governing spirit has fled. Imbalance of the inner and outer phases seems, in fact, to be a primary element in the pathology of writing, and a cause of compositional blocks."
> (Nash 1980, p.161)

We concluded above that the notion of a behavioural taxonomy is not an appropriate basis for software design. This alternative view of writing behaviour leads us to a similar conclusion. If we consider the process of writing as a cycle of reflection and engagement, then differences in writing behaviour reflect individual variations in this rhythm of writing. Sharples argues that it is "the proportion of time a writer spends on reflecting or engaging with the text, and how the writer chooses to begin the task (with a period of reflective planning or with a session of engaged writing) which situates the writer between the two poles of Discoverer and Planner" (Sharples 1993).

Consequently, whatever a writer's point of departure and however a writer's rhythm may fluctuate, at some stage a writer can be a "planner" by "exploring conceptual spaces", while at another stage the same writer can also be a "discoverer" by "creating written material" - unless the writer is a pathological case.

However, in associating the categories of "Planner" and "Discoverer" with reflection and engagement respectively, Sharples is assuming the romantic view of discovery, according to which "discovery is a consequence of the spontaneous spelling-out of ideas in continuous prose" (Galbraith 1991, p.151). In the classical view, "discovery is a consequence of planned rhetorical organisation" or invention (Galbraith 1991, p.151). Whether discovery arises from engagement or reflection is not a question we can answer at this stage, but in either case, the answer will not be inconsistent with the notion of a "rhythm of writing". The problem seems to be at what point of the cycle does discovery occur, and we shall return to this problem in chapter five, where we discuss planning in more detail.

3.4 STUDENT WRITERS AND WRITING TECHNOLOGY

Empirical evidence of a rhythm of writing can be found in a report on the effects of word processing on student writers (Williamson & Pence 1989). Williamson and Pence set out to investigate the question whether students revise more when using word processors. In their view, "the revision episodes that we observed in the composing of student writers using word processors seemed to have a rhythm unique to each writer" (Williamson & Pence 1989, p.114). Following Matsuhashi's use of the term tempo in her research into pauses in writing (Matsuhashi 1982), they use the same term "to describe the pace at which text is generated and reviewed, based on the cursor speed across the screen" (Williamson & Pence 1989, p.114).

Using Matsuhashi's method of direct observation, Williamson and Pence find that students generally adopt one of three strategies in revising, and make a distinction between "linear", "intermittent", and "recursive" revisers (Williamson & Pence 1989, p.114). The linear reviser completes a first draft before reviewing and correcting, whereas the intermittent reviser interrupts the process of writing a first draft to make substantial corrections before continuing the process of writing and reviewing. Recursive revision is the most frequent strategy when students compose with a computer. This is how they describe the recursive reviser:

> "The recursive revisers evidenced shorter periods of text generation uninterrupted by revising than the other two types of revisers. As recursive revisers composed, text inched across the video display screen, advancing as the writer generated text, then retreating as the writer deleted before the advance of text generation again. Recursive revisers often tried out numerous words, phrases, clauses, or sentences at close intervals in the text, sometimes experimenting with as many as three or four different versions of text at a given cursor location. Based on the slowness of their pace, they seemed to reread constantly but rarely scrolled backwards more than three lines. Unlike the other two types of revisers, the locus of their revision episodes seemed to be tightly bound to the point at which text was being generated. One revision episode usually followed right after another, with all revision episodes embedded within the generation of text."
> (Williamson & Pence 1989, p.116)

Williamson and Pence find that student writers do tend to revise more when using a word processor, compared with those writing by hand. Moreover, they distinguish between the strategy of the recursive reviser and that of the basic writer, who tends to get stuck in a syntactic quagmire:

> "At first, the description of the recursive writer seemed similar to the descriptions of the composing processes of basic writers. However, only one student in this study consistently demonstrated the composing behavior of a basic writer as it has been described in the literature... Unlike basic writers, the recursive revisers' close attention to the text seemed enabling rather than disabling, a productive

> experimentation with alternate forms of larger text structure..."
> (Williamson & Pence 1989, p.116)

According to Williamson and Pence, recursive revisers plan regularly, adjusting their plans as they progress, and, unlike basic writers, "were focusing upon meaning, not linguistic forms" (Williamson & Pence 1989, p.117). They conclude that "word processing appears to change certain students' approach to text production, pointing the way to greater experimentation with their texts" (Williamson & Pence 1989, p.120).

Other reports on the effects of word processing on student writers do not present such a positive picture. Noel Williams, for example, describes a situation in which students appear to think and write simultaneously:

> "... one fault of student word processing is, in composing at the keyboard, that their writing veers to the natural fluidity of their speech, by incorporating their speech characteristics. Sentences tend to be heavily rightward branching, for example (by which I mean that, as students type, new modifications and new thoughts occur and are simply tagged on as modifications to the current sentence). Rather than capturing a thought entire in a single sentence, then placing that sentence on the page, the thought emerges during the process of typing and modifications are made as the sentence or paragraph goes along."
> (Williams 1992a, p.15)

As we mentioned in the introduction, Haas (1989) notes that word processing has an adverse effect on planning, while Eklundh (1991) finds writers unable to achieve a global view of their text when composing with a computer. Haas suggests that writers may be inhibited from considering global discourse because of a tendency to become immersed in local planning - that is, planning words and syntax (Haas 1989, p.184). On the other hand, Haas and Hayes find that "some of the most frequent complaints about the computer were that it caused difficulties in reading", and argue that reading difficulties may explain why writers are unable to "get a sense of their text" (Haas & Hayes 1986, p.24).

However, in a recent paper we argued that there are three problems in trying to identify the effects of writing technology (Bloor 1995). The first is due to what Williamson and Pence call "the laboratory effect" (Williamson & Pence 1989, p.105). In their investigation of revision strategies, they compare two groups of students on a writing course, one group learning to write with a word processor and the other without. However, they point out that "crucial differences emerged between the kinds of instruction that students received in some sections of the handwriting mode of instruction as compared to the word-processing mode" (Williamson and Pence 1989, p.105). Students using word processors were taught in a computerised classroom, and had to write during class because of limited access to the machines. On the other hand, students using pen and paper did most of their work outside of class. As a result, students using computers received more tutorial assistance with their writing than the others. When a writing course involves the use of computers, the "laboratory effect" is the tendency for a student to perform all aspects of her writing in the writing laboratory. Haas notes that in this environment, students are under pressure to produce a text, and that planning may suffer as a result (Haas 1989, p.202). A lack of planning may therefore be due to the laboratory effect of word processing, rather than the technology itself.

The second problem is the basis for making generalisations about the effects of writing technology. This problem partly arises out of an inadequate definition of "the medium of writing", and partly because of the changes in technology since the earlier studies of the effects of word processing (Bloor 1995). Writing software now includes many features that were absent in earlier word processors (Dorner 1992, Williams 1991a, 1992b), and if we define the "medium of writing" as the writing environment rather than the electronic computer - an environment that consists of the hardware, the peripherals, and the range of software tools available to the writer - then the only constant feature of the medium is its mutability.

The third problem is how do we measure the effects of technology? Haas' concern is to investigate what happens to planning (Haas 1989), while Williamson and Pence (1989) investigate what happens to revision. However, what Haas describes as "local planning" bears a striking similarity to what Williamson and Pence describe as "recursive revision". How do we explain this discrepancy? One explanation is that in order to measure the effects of a new technology, we resort to using a familiar model or terminology based on an older technology, but the familiar terms and models are no longer adequate to describe the observed effects.

Following the comment that "writing software and writing teaching always use a model of writing" (Williams 1991a, p.31), we might add that models are also found in research into the effects of writing technology. Williamson and Pence construct a model of revising to account for the behaviour they observe in student writers. Haas, on the other hand, seems to adopt a model based on observations of writing behaviour in a medium of pen and paper - the model of "Plan, Draft and Revise" - to assess what happens in the electronic medium. Studies into the effects of word processing seem to indicate that computers discourage the approach of the "Planner", but encourage the approach of the "Discoverer" (Bloor 1995). Haas, however, assumes that writing normally begins with planning, and so its initial absence is a cause for concern (Haas 1989, p.204).

In conclusion, although writing technology has an effect on writing behaviour, this effect will vary according to the kind of software tools available, the nature of the task, and the working environment in which the technology is used. In addition, how we assess those effects depends on our initial assumptions about writing behaviour, and on the models that we use to interpret empirical research. In a recent paper, we sought to identify the distinctive features of the computer as a medium of writing (Bloor 1995), and the results of that inquiry can be summarised as follows (the Hayes and Flower model of writing, and the opera-

tions that they define as *planning*, *translating*, and *reviewing*, are discussed in detail in the next chapter):

1. Electronic text is characterised by its visual instability as a flickering image and its erasability. The first feature makes reading on-line text potentially more demanding than reading print, and therefore has a negative ergonomic effect on tasks that require sustained reading (Hulme 1984; Galer 1987, pp.124-139; Grandjean 1987, pp.55-65; Iketani 1984). When using the computer as a medium of writing, a writer may find reviewing long documents a daunting task to perform on-line, and easier with hard copy (Haas & Hayes 1986).

2. While the erasability of electronic text makes the correcting aspect of reviewing easy, its effect on writing strategies is dependent on writing software. Word processing software was initially designed to support the strategy of "Plan, Draft and Revise", with the computer seen as an advanced form of typewriter (Williams 1991a). A writer may successfully pursue this model of writing using different media, for example using pen and paper to plan and draft and using the computer to transcribe and revise. Pursuing this strategy with a computer however, a writer may face writing software that gives little support to planning, and will encounter difficulties in reviewing (Haas 1989, Eklundh 1991, Haas & Hayes 1986).

3. These effects of the medium can be encouraged or counteracted by other factors that influence writing strategies, such as the social environment in which technology is used. For student writers, the writing laboratory and teaching strategies are equally influential. In addition, both planning and reviewing are task related. For some tasks, a writer may not see any necessity to plan to the end or review from the beginning (Williamson & Pence 1989).

4. When a writer is composing with a computer, then what Hayes and Flower (1980a) describe as a process of translating semantics into syntax may be interrupted by syntactic exploration and a

subsequent modification of semantics (Williamson & Pence 1989). Together with the above factors, this aspect of composing can encourage a strategy of writing where the Hayes and Flower operations of reviewing and planning are closely related to translating. The presentational features of integrated writing software may be a further encouragement to this strategy; a sense of the reader can change the way a writer reads her own text, so that a short episode of translating is followed by episodes of syntactic manipulation, reviewing and planning (Williamson & Pence 1989). For some writers, these operations are so closely related that they appear to merge (Williams 1992a, p.15).

5. Research into the effects of word processing on writing behaviour may be inconclusive because of discrepancies in terminology; different notions of what constitutes revision, for example, is one explanation for the disagreements about whether student writers revise more when word processing. What some researchers describe as "local planning" (Haas 1989) is similar to what other researchers describe as "recursive revision" (Williamson & Pence 1989). Hayes and Flower's definitions of planning, translating, and reviewing are derived from observations of writers who work with pen and paper (Hayes & Flower 1980a); these definitions may need to be reviewed in the light of electronic writing behaviour.

6. Improvements in writing technology create opportunities for writers to develop strategies of writing that Sharples and Pemberton would describe as "techniques" in a medium of pen and paper (Sharples & Pemberton 1992). For example, the windows environment of many word processors enables multiple views of a document: different parts of the same document can be viewed simultaneously, and more than one document can be open at any time. These features enable a writer to manipulate text in ways that are less feasible using pen and paper, and were more difficult using older writing software. For example, a writer may use a technique of "Cut and Paste" to copy quotes from a number of sources into her current document. Developing this technique as a strategy of writing, the same writer may choose to recycle text

from her previous writings as a basis for writing something new. Conversely, she may anticipate the use of this strategy at a later date and organise her current writing accordingly.

7. While professional writers have developed their skills so that many have become "automatic" (Bereiter 1980), student writers have the advantage over professionals in that their writing strategies have not become habitualised. For student writers, there is evidence that writing technology encourages exploration and play. Williamson and Pence (1989, p.100) claim that "the paramount finding of our study is that writing on a computer appears to change the way in which student writers approach composing"; they conclude that "student writers can benefit from tools which encourage them to experiment with their texts" (Williamson & Pence 1989, p.122). Whether one claims that computers are an aid to writing as "discovery" (Galbraith 1991) depends on whether one takes the "romantic" view of discovery through spontaneity or the "classical" view of discovery through planning. Some would argue, at least, that word processing encourages spontaneity at the expense of planning (Haas 1989, Eklundh 1991, Williams 1992a).

8. We concluded above that a behavioural taxonomy is inappropriate for modelling purposes. In addition, considerations of a writer's "rhythm" (Sharples 1993) led to the observation that all "planners" are "discoverers" at some stage of writing; likewise, all "discoverers" are also "planners". Although the model of "Plan, Draft and Revise" is based on observations of writers who work with pen and paper, writers still need to plan at some stage when working with a computer. There is therefore a need for planning tools, particularly where the "laboratory effect" has created a situation where all student writing takes place in a computerised writing class (Williamson & Pence 1989). However, while on-line support is needed for planning, we also need to take into account the different relationship between planning and other writing operations that occurs when some writers compose with a computer.

3.5 CONCLUSION

In this chapter we began our review of current models of writing by discussing the notion of writing behaviour. We argued that it is the role of the unconscious in the process of creative writing which makes this process seem mysterious and not amenable to detailed investigation. We considered the reports of writing behaviour given by professional fiction writers, and found evidence of different approaches to writing. We compared these accounts with the findings of behavioural psychologists, who have studied the writing behaviour of academics and are trying to classify writers according to their behaviour. We found that two fiction writers seemed to fit the categories of "planners" and "discoverers", but this finding was not without qualification, and we concluded that a taxonomy of writers is not an appropriate basis for software design. An alternative view of writing behaviour is that of writing as a cyclical process of engagement and reflection. We discussed research into the effects of writing technology on the behaviour of student writers, and found further justification for this view of writing behaviour. We also found that research into technological effects often adopts a model of writing in order to measure effects, and concluded by summarising the features of the computer as a medium of writing.

CHAPTER FOUR:

COGNITIVE MODELS OF WRITING

4.1 INTRODUCTION

In this chapter we discuss cognitive models of writing in more detail. We concentrate on two models in particular: Hayes and Flower's (1980a) information processing model, and Sharples and Pemberton's (1992) external representation model. There are two reasons for concentrating on these particular models. The first is that they are frequently cited in the literature; the Hayes and Flower model has been called "the standard model accepted by composition theorists as well as cognitive psychologists who study writing" (Smith & Lansman 1989, p.17). The second reason is that they provide two different answers to a question asked in the last chapter. There we argued that a flexible software tool should be able to cater for different approaches to writing, and asked how can a single model of writing accommodate a range of writing strategies? The models discussed in this chapter provide two ways of accommodating diverse strategies, and we begin by discussing the relation between writing strategies and models of writing. At the end of the chapter, we return to the question of modelling writing.

4.2 WRITING STRATEGIES AND MODELS OF WRITING

In the last chapter, we mentioned that many students have ideas about writing processes that reflect the Platonic tradition of possession by the muse (Flower & Hayes 1980a, p.32). Flower and Hayes refer to these ideas as a "simple model of composing" - a Think and Write model. An alternative to the "Think and Write" model is the "Pre-write, Write and Re-write" model (Flower & Hayes 1980a, p.32). This is equivalent to the model of "Plan, Draft and Revise", which Noel Williams names as "the most common implicit model of writing found in software and teaching" (Williams 1991a, p.31). Underlying this model are the assumptions that writing proceeds in a linear sequence of discrete stages and that each stage is marked by the emergence of a certain product. At the end of the first stage, the writer will have produced an outline or a plan. In the second stage, the writer uses

the plan to produce a draft. The writer revises and corrects the draft in the third stage to produce the final copy.

According to Flower and Hayes, linear models of composing are based "not on a study of the process of writing, but on the product" (Flower & Hayes 1980a, p.32). A further assumption underlies this linear product-based model: that thinking and writing are separate activities. Thus the stage of "pre-writing" is the stage where ideas are discovered; these ideas are then translated into writing in the next stage. Against this notion, Flower and Hayes cite the experience of discovering ideas through the act of writing itself; this is the romantic idea of "discovery" that we discussed in the last chapter, where the writing behaviour of the "discoverer" was compared with that of the "planner".

However, the preferred writing strategies of the "planner" seem to provide an argument for the linear model of "Plan, Draft and Revise". Torrance and Thomas point to recent research which suggests that the most productive academic writers do indeed adopt this method of writing (Torrance & Thomas 1993). On the other hand, they fail to mention that over half the academics in the survey to which they refer (Hartley & Branthwaite 1989) think as they write and do not follow a sequential mode of writing; these writers are therefore excluded from the three-stage model of "Plan, Draft and Revise".

In the last chapter, we concluded that a flexible design should accommodate diverse writing behaviours. We concluded further that this aim would best be served by considering the strategies that define behaviour. The three-stage model of writing is based on one strategy only: "Plan, Draft and Revise". What other strategies might a flexible model of writing encompass? Sharples and Pemberton list the following strategies that "research into the writing process has identified" (Sharples & Pemberton 1992, p.324):

- Plan, Draft and Revise -

The writer begins by generating a plan, uses this to form a draft, and then checks over the draft making corrections and alterations.

- Outline and Draft -

The writer creates a list of section headings, in the order they appear on the page, and then fills them out with text.

- Draft and Revise -

The writer sets down a hurried stream of ideas as words on the page. These form both a first draft and a source of inspiration for further cycles of drafting and redrafting.

- Cut and Paste -

The writer collects together already written material, such as notes, quotes and extracts, and then organises and alters them to fit the current task.

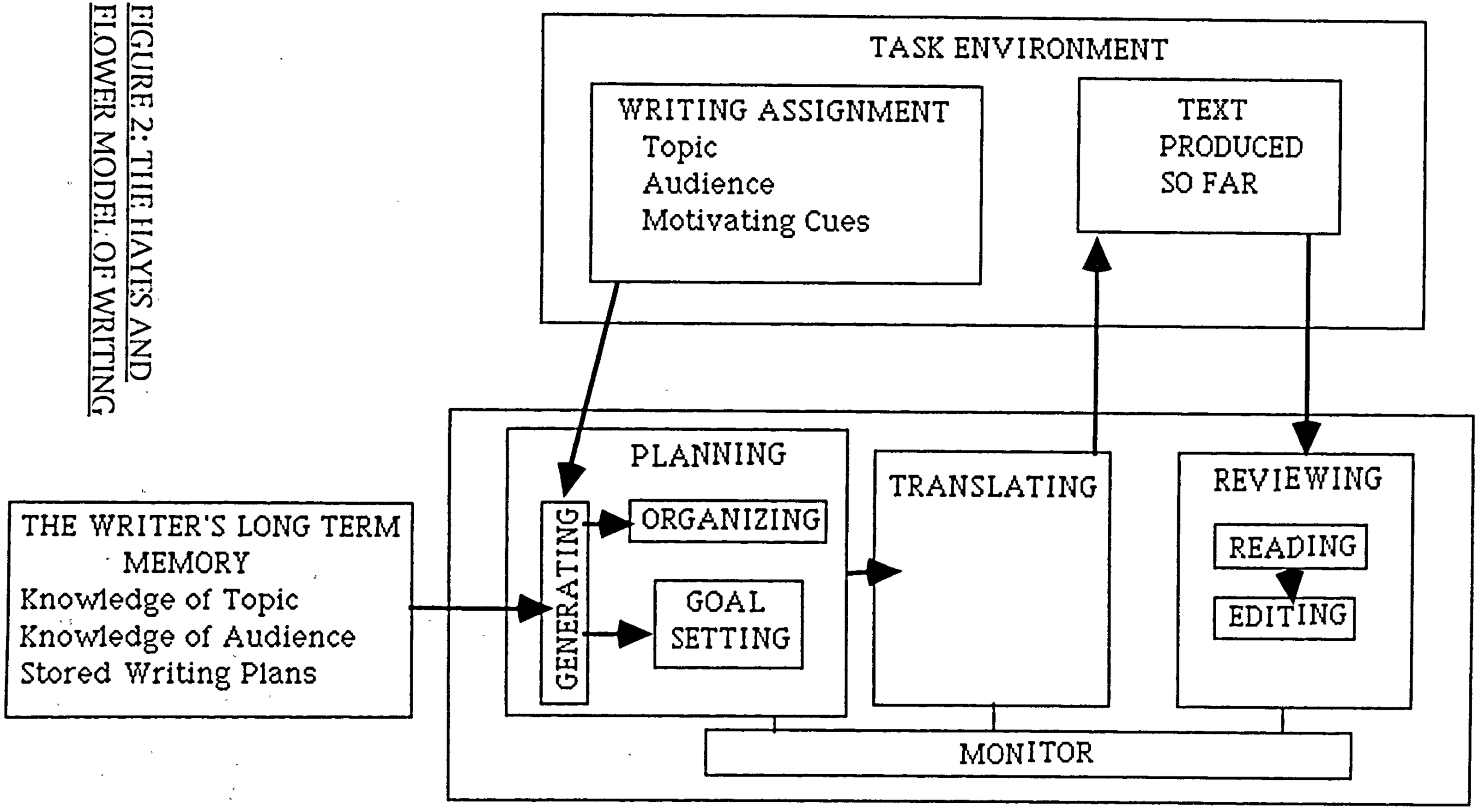
Sharples and Pemberton distinguish between "general approaches" to writing, and a specific strategy "to meet the task at hand" (Sharples & Pemberton 1992, p.324). The distinction between "planners" and "discoverers" in writing behaviour is based on a writer's general approach to writing. However, a writer's general approach is defined by a writer's preferred strategy of writing. The planner might adopt the strategy of "Plan, Draft and Revise" or "Outline and Draft"; these variants form the basis of the implicit model of writing that is prevalent in teaching and software. The discoverer will prefer the strategy of "Draft and Revise". The strategy of "Cut and Paste" may presumably be adopted by either where it is appropriate to the task.

How might a flexible model of writing incorporate these different strategies? In particular, how can a model of writing accommodate writing behaviours that seem to be polar opposites? On the one hand, a writing strategy can be described by referring to written text as an external object which is subject to the writer's manipulation and which passes through a series of transformations. These transformations can turn disorganised

notes into organised notes, notes into a plan or an outline, and an outline into continuous prose. The different terms used to describe this textual object indicate its status in relation to the final shape of continuous prose. This method of describing a "strategy" is demonstrated by the second model discussed below (Sharples & Pemberton 1992). On the other hand, a strategy can also be described by referring to the thought processes involved in the various transformations, such as "planning", "organising" or "retrieving items from long-term memory". This method of describing a "strategy" is demonstrated by the first model discussed below (Hayes & Flower 1980a).

The process of writing involves both an internal mental process that we call "thinking", and the manipulation of an external object. While these aspects of writing may concur in practice, in descriptions of writing one may be emphasised more than the other. In the first example below, the emphasis is on "thinking"; in the second, the emphasis is on the manipulation of text as an "external representation". Consequently, the two models provide different accounts of writing strategies.

FIGURE 2: THE HAYES AND FLOWER MODEL OF WRITING



4.3 A PROCESS THEORY OF WRITING

We mentioned above that the most common implicit model of writing is the three-stage model of "Plan, Draft and Revise", and that this model is open to three sorts of criticism (Flower & Hayes 1980a, p.32). Firstly, the model is based on an analysis of the products of writing and not the process. Secondly, the model assumes that writing is a linear process, and thirdly that thinking and writing are separate processes.

Linda Flower and John Hayes have developed an alternative theory of writing (Flower & Hayes 1980a, Flower & Hayes 1981, Hayes & Flower 1980a, Hayes & Flower 1980b) that is the basis for what Mike Sharples and Lyn Pemberton call a "consensus model of writing" (Sharples & Pemberton 1992, p.326). Hayes and Flower present a model of writing that is derived from protocol analysis (Hayes & Flower 1980a, p.11). In this model (Figure 2), the process of writing is divided into five basic operations or sub-processes: planning (which consists of goal-setting, generating, and organising), translating and reviewing. Hayes and Flower explain these processes as follows:

> "The function of the GENERATING process is to retrieve information relevant to the writing task from long-term memory".
> (Hayes & Flower 1980a, p.12)

Writing takes place in the task environment. This includes the writing assignment, which consists of the topic, the intended audience, and possible motivational cues such as rewards and punishments. Knowledge is stored in the writer's long-term memory: knowledge of many topics, audiences, and different sorts of writings - perhaps in the form of a generalised plan such as a "genre scheme" (Bereiter 1980, p.78). Initially using cues from the task environment about the topic and the audience, the GENERATING process retrieves useful items from long-term memory. The output of the process may either be notes on areas to be written about or criteria by which to judge the text.

> "The function of the ORGANIZING process is to select the most useful of the materials retrieved by the GENERATING process and to organize them into a writing plan."
> (Hayes & Flower 1980a, p.14)

While the ORGANISING process sorts the notes into a plan, the GOAL-SETTING process identifies and stores the criteria by which the text may be assessed at the reviewing stage. "Goal-setting" is the process that allows for individual differences in writing strategies, and we return to this process below.

The function of TRANSLATING is to find the appropriate semantics, which is stored in memory, and to translate this into syntax:

> "The function of the TRANSLATING process is to take material from memory under the guidance of the writing plan and to transform it into acceptable written English sentences."
> (Hayes & Flower 1980a, p.15)

Finally, the REVIEWING process consists of READING and EDITING. Hayes and Flower make the following distinction between editing and reviewing:

> "On the one hand, EDITING is triggered automatically and may occur in brief episodes interrupting other processes. REVIEWING, on the other hand, is not a spur-of-the-moment activity but rather one in which the writer decides to devote a period of time to systematic examination and improvement of the text. It occurs typically when the writer has finished a translation process rather than as an interruption to that process."
> (Hayes & Flower 1980a, p.18)

Hayes and Flower make two assumptions concerning editing. The first is that the editing process has the form of a production system, which is defined as "an ordered sequence of condition-action rules" (Hayes & Flower 1980a, p.17). This is a formal way of representing knowledge which has frequently been used in expert systems technology. According to Bratko, "the language of *if-then*

rules, also called *production* rules, is by far the most popular formalism for representing knowledge" (Bratko 1986, p.316). He points out that "in general, such rules are conditional statements". Examples of such rules are:

- if precondition P, then postcondition Q
- if situation X, then action Y
- if condition A is true and condition B is true, then condition C is true

In the editing example, the conditions specify both the kind of language to which the rule applies and a particular type of error; the consequent action is the means of rectifying the error. If we let "condition A" represent a formal sentence and "condition B" represent the statement "first letter of a sentence is in lower case", then "condition C" is equivalent to "change first letter to upper case". Hayes and Flower explain:

> "If the writer is producing formal sentences, this production will detect and correct errors in initial capitalization. However, if the writer is only producing notes, the conditions of the production will not be met and capitalization will be ignored."
> (Hayes & Flower 1980a, p.17)

The second assumption concerning editing is that "the process is triggered automatically whenever the conditions of an editing production are satisfied" (Hayes & Flower 1980a, p.18). Thus, the EDITING process will interrupt any other process. The GENERATING process can also interrupt any other process. This feature of "process interrupts" distinguishes this model from a linear one:

> "We are *not* saying that writing proceeds in order through successive stages of PLANNING, TRANSLATING, and REVIEWING... The model is recursive and allows for a complex intermixing of stages... the whole writing process of PLANNING, TRANSLATING, and REVIEWING, may appear as a part of an EDITING sub-process. Because EDITING can interrupt any other process, these processes can appear within any other process." (Hayes & Flower 1980a, p.29)

As an example of recursion, Hayes and Flower mention a writer who, on editing a first draft, "recognised that the reader would not have sufficient context to understand the relation between two sentences" (Hayes & Flower 1980a, p.18). As a result, "the writer constructed a small explanatory essay to insert between the sentences" (Hayes & Flower 1980a, p.18). In this case then, editing invoked the processes of planning, translating and reviewing.

In their summary of what is new about this model of writing, Hayes and Flower claim:

> "In particular, it specifies an organisation that is goal directed and recursive, that allows for process interrupts, and that can account for individual differences."
> (Hayes & Flower 1980a, p.29)

How does this model of writing account for individual differences in writing behaviour? According to Hayes and Flower, the entire writing process is controlled by a "monitor"; in a similar model, this is referred to as a "high-level executive" (Bereiter 1980, p.78). Like the editing process, this monitor has the form of a production system. In this case, the production system has ten rules, four of which are concerned with setting goals. A writer's goal is one of the four processes of generating, organising, translating or reviewing. Any writing strategy will involve, at some stage, these four processes. A set of production rules for goal setting determines when these processes occur. Thus, this model of writing accounts for individual variation by the diverse conditions that can trigger each process.

The production rules are of three kinds. Firstly, a pair of rules state that the editing and generating processes may interrupt any other process; these two rules take priority over goal-setting rules. Secondly, there are four rules which state that once a goal has been set, the writer will persist with this goal unless it is interrupted by conditions which trigger the editing or generating processes. Following the interrupt, the writer will

return to the original goal. The third group of four rules relate to goal setting and here, Hayes and Flower offer four variations or "configurations".

As an example, the authors describe four methods of writing an essay. At one extreme, we have the writer who tries to produce a perfect first sentence, followed by a perfect second sentence, and so on: "the work of planning, translating and reviewing each sentence is completed before the writer proceeds to the next sentence" (Hayes & Flower 1980a, p.19). At the other extreme, "a draft is planned and then written out in full before any review takes place" (Hayes & Flower 1980a, p.19).

There are two problems with this explanation of how writing processes are monitored. The first concerns the specific claim that it can account for individual variation. Is a set of rules the property of an individual writer, or a group of writers? The example implies that each of the four sets of rules is common to a group of writers. Indeed, Hayes and Flower cite evidence of writing behaviour that corresponds to two of the four configurations. But does this mean there are only four sorts of writer? Are these examples intended to be exclusive? One can imagine not only other combinations of the given rules, but also alternative rules; that is, other conditions which fire the processes. Can the rules ever change, or is the production system like some sort of genetic imprint and permanently encoded? If the latter is the case, then writing behaviour must be a fixed characteristic, like brown hair or green eyes.

The second problem with this explanation is more general and concerns the account of writing as a goal-driven process. The notion that writing is a goal-orientated activity has become absorbed into what Sharples and Pemberton call the "consensus model of writing" (Sharples & Pemberton 1992, p.326). Elsewhere, Flower and Hayes write about goals in relation to "solving a rhetorical problem" (Flower & Hayes 1980a, Flower & Hayes 1980b). In this model of writing however, we are given two

explanations of the process of goal setting, and the two accounts are inconsistent.

In the first place, goal setting is explained as a sub-process of planning. The output of the generating process can include criteria by which to judge the text at the reviewing stage; the goal setting process identifies and stores these criteria. Here, the "goals" are related to the "rhetorical goals" that Flower and Hayes describe elsewhere (Flower & Hayes 1980b). As the writing process is recursive, planning can occur more than once during the same assignment, and so these goals can be reviewed and revised.

In the second place, the rules for goal setting belong to the production system that constitutes the monitor. This monitor determines the entire process of writing including planning and goal setting. In this context, the goals are the processes themselves. The configuration of the monitor as a set of production rules determines what conditions will activate a goal or process. These rules and conditions are general and make no specific reference to the writing assignment. Hayes and Flower offer no explanation whether the rules themselves can change; in their account, it is only the goal as process that changes. As we mentioned above, the rules seem to be encoded like some sort of DNA that perpetually determines a writer's behaviour.

Hence we have two sorts of goals. On the one hand, the goals that are set by the planning process do not have any influence on the monitor and are not integrated into the production system. On the other hand, the goals that are set by the monitor are the processes themselves, and these include planning. In other words, while the process of planning sets goals, it is also a goal in itself, and is subject to the production rules of the monitor. What might happen when a goal set by the planning process comes into conflict with a goal set by the monitor? One way of resolving this conflict is by the distinction between meta-cognitive and cognitive activities, as we shall see in the next chapter, but the Hayes and Flower model does not make this distinction.

In summary then, there are two problems with this explanation of how writing processes are monitored. The first is the claim that this explanation can account for differences in writing behaviour; as we have seen, this account is inadequate. The second problem is one of consistency in their accounts of writing as a goal-driven activity. Both these problems are associated with the representation of writing as a knowledge-based system, consisting of a set of production rules that determine a writer's strategy. Indeed, this process theory of writing exemplifies the computational models of cognition that we discussed in chapter two. Turning from the specific criticism of how writing processes are monitored, let's now consider their theory in general.

Firstly, what sort of model does this process theory of writing provide? According to Hayes and Flower, the model is a "cognitive model of writing" or a "model of writing as a cognitive process". But this description blurs an important distinction between the two aspects of modelling that are involved here. Modelling writing as a cognitive process is one, and modelling a cognitive process is another. Cognitive processes themselves need models, and these models can be quite different. As we explained in chapter two, models of cognitive processes have evolved with developments in computer architecture. Initially, psychologists modelled the human as an "information processor"; these models reflect the function of first generation computers, which were generally restricted to data processing. In these models, a process receives input data, transforms it in some way, and passes on output data to the next process in the system. Hayes and Flower's model of writing follows this pattern; writing is presented as a kind of information processing. The structure of their model resembles a computer architecture, and a series of flow charts indicate the flow of information around the system. Calling their model a "cognitive model of writing" hides this assumption: that information processing models of cognition are the only cognitive models.

If one models writing as a kind of information processing, then each process in the system will require an input and produce an output. In their critique of models of writing, Flower and Hayes refer to the "product" and the "process" as though the two were at loggerheads. Yet, much like William Blake's God and Satan, the two are usually found hand in hand. The notion of one implies a notion of the other, and, although Flower and Hayes prioritise the process; the product has a nasty habit of sneaking in through the back door. For example, the generating process receives an input in the form of an essay topic and "may produce notes", typically "single words or sentence fragments". The organising process turns these notes into other notes; the latter "often have an organizational form" of a plan or an outline. Each process receives an input and produces an output; both input and output are some sort of textual representation, or "product".

Indeed, the products in this model are more clearly differentiated than the processes themselves. For example, the generating process involves searching the memory and "evaluating the usefulness of a retrieved element". The organising process involves the ordering of notes, and "evaluating the usefulness of a topic". While both processes involve the same operation of "evaluating the usefulness", the respective inputs and outputs are clearly different. It is therefore easier to identify the processes in this model by the type of product that they manipulate, than to identify them by any distinctive properties that they themselves possess. Like the contents of the "black box" which often features in this sort of model (Boulay, O'Shea & Monk 1981), the process remains a mystery, although its input and output may be well-defined.

In addition to processes that are insufficiently differentiated, there are other mysteries in this model of writing. For example, although Flower and Hayes have a notion of "discovery through writing", there is no obvious way that this can be achieved within their model. The process of translation is one of finding the appropriate semantics, which is stored in memory, and translating this into syntax:

> "The function of the translating process is to take material from memory under the guidance of the writing plan and to transform it into acceptable written English sentences. We assume that material in memory is stored as propositions but not necessarily as language."
> (Hayes & Flower 1980a)

As the semantics of a proposition already exist in memory, the writer's task is merely to locate it and then to transcribe it into syntax. Yet the romantic school of discovery would claim that semantics can be created, or modified at least, through "the spontaneous spelling-out of ideas in continuous prose" (Galbraith 1991, p.151). Moreover, according to Williamson and Pence's (1989) account of students composing with a computer, the recursive reviser works equally in the other direction, from syntactic manipulation to semantic exploration. How this can be achieved in the model is unclear.

In a similar fashion, although Flower and Hayes criticise the separation of "thinking" and "writing", there is no indication in their model of how the two might be related; they remain separate processes. While "writing" is a translation of semantics into syntax, "thinking" is merely the search for information. This occurs in translation, and in generation, whose function "is to retrieve information relevant to the writing task from long-term memory". This reduction of "thinking" to information retrieval goes hand in hand with a particular notion of memory. In this model of writing, memory plays a passive role; its function is to store information, which is retrieved at the appropriate stage.

In short, the model excludes the possibility of "discovery through writing", and any connection between "thinking" and "writing". Moreover, Hayes and Flower's representation of writing as information processing has the following consequences: a notion of "writing" as the translation of semantics into syntax, the reduction of "thinking" to information retrieval, and a passive role for the memory.

There is a further consequence of this information processing model: a text becomes pure information, of the same status and as undifferentiated as the information which is retrieved from long-term memory. Emphasising "process" while neglecting the "product", Hayes and Flower have no notion of a text as an entity that might exercise a continuous influence on the writing process. In their account, "the task environment includes everything outside the writer's skin that influences the performance of the task" (Hayes & Flower 1980a, p.12). Once writing has begun, this environment includes "the text which the writer has produced so far". Yet, in the model, the reviewing process is the only process where this text becomes an object of manipulation; notes do not appear to be "external" in the same way. Although Hayes and Flower differentiate between notes on the text and the text itself, the model does not entertain any notion of a meta-language that a writer may consciously use to manipulate a text.

Apart from the absence of "textual interaction" (Holt 1989) in this model, there is a further significant omission, and that is the medium of writing. Patrik Holt refers to this model as "dated" (Holt 1989, p.53), and these two absences can be explained by the context of computer technology at the time when Hayes and Flower were developing their model. Given that cognitive models have tended to follow computer architecture, then it is not surprising that an information processing model of writing does not mention the medium of writing. While technology had yet to produce microcomputers and interactive computing was still in its infancy, cognitive models would be data processing ones at the same time as word processing was not generally available. It is the development of the latter that has significantly enhanced a writer's ability to interact with her text, as noted by Williamson and Pence (1989). The model does not mention the medium because, in the late seventies, it would have been safe to assume a medium of pen and paper.

Finally, there is another significant absence in the model. Apart from the presence of the "genre scheme" in long-term

memory, there is no indication that different sorts of writing might influence writing processes. The function of a "genre scheme" is a further mystery; we have seen that the role attributed to the memory is purely passive. In the model, the task environment includes the writing assignment, but this latter is constantly referred to as an essay topic. Hayes and Flower assume that "writing" means "writing essays".

Let's now summarise the above comments:

• To allow for individual difference in writing behaviour, Hayes and Flower suggest that the writing process is monitored by a knowledge-based system which has four configurations. However, there is no provision in this system for changing the rules, and the explanation of writing strategies is inadequate. Moreover, they offer two accounts of goals which are inconsistent.

• In presenting a model of writing as a "cognitive model", Hayes and Flower obscure the distinction between two sorts of modelling; their model is essentially an information processing model of writing.

• In a model of this sort, process and product are bound together.

• In this model, products are more clearly differentiated than processes. Although Flower and Hayes criticise models of writing that emphasise the product, their description of writing as information processing is an inadequate explanation of process. Ironically, the processes in this model can be distinguished by the products that they manipulate.

• In this description of writing as information processing, "writing" is the translation of semantics into syntax, "thinking" is the retrieval of information, and the memory plays a passive role as a data bank. Consequently, this model cannot explain how discovery through writing can be achieved, nor can it suggest

corresponding ways in which thinking and writing might be related.

• The status of the text in this model is reduced to a sort of undifferentiated information; the model does not entertain any notion of interacting with a text (Holt 1989).

• There is no mention of the medium of writing in the model; nor is there any indication how different sorts of writing might influence the writing process.

Must we then conclude that the account of writing given by this model is utterly inadequate? Despite the above comments, the Hayes and Flower model is the basis for what Sharples and Pemberton describe as a "consensus model of writing" (Sharples & Pemberton 1992, p.326) and is a regular point of reference in current writing research (Levy & Ransdell 1994, Winter 1994, Milian 1994, Torrance 1994). Two American researchers claim that "for more than a decade, a considerable body of research in writing has been guided by a model developed by Hayes and Flower" (Levy & Ransdell 1994, p.122), while a German researcher comments: "Since Hayes and Flower have presented their famous process model of writing, it is obvious that text producing is a cognitive activity" (Winter 1994, p.183). Smith and Lansman write: "In 1980, John Hayes and Linda Flower first outlined what has since become the standard model accepted by composition theorists as well as cognitive psychologists who study writing" (Smith & Lansman 1989, p.17). Describing this consensus, Sharples and Pemberton write:

> "The picture of cognition and writing that has emerged from the past ten years of research is of a goal-directed task governed by multiple constraints. There is no simple progression from one stage to another, but instead a cycle of planning, text generation and revision, with the written words acting as triggers for further planning."
> (Sharples & Pemberton 1992, p.325)

However, the connection between the model that we have just discussed and this consensus is somewhat mysterious. We have

shown that Flower and Hayes give inconsistent accounts of goals, and although they write about constraints elsewhere (Flower & Hayes 1980a), these constraints do not figure in the model itself (Hayes & Flower 1980a). In addition, the notion of writing as a "cycle" has more in common with the "rhythm of writing" (Sharples 1993) than the Hayes and Flower model.

Sharples and Pemberton go on to describe the implications of the model for teaching and software design, and, here again, these implications have a mysterious connection with the model that we have just discussed. The first implication is that "students need to learn not only what to write, but also how to write" (Sharples & Pemberton 1992, p.325) - but does the model show us how to write? The second implication is that teachers need "a meta-language to communicate with the student about writing operations...and to describe the structure of plans and texts" - but does the model feature such a meta-language? Thirdly, the teacher should promote ways of writing as discovery - but we have shown that the model excludes the possibility of discovery. Fourthly, the teacher should note that each writer will adopt her own approach to writing - but Hayes and Flower do not give an explanation of writing strategies that can account for individual difference. In short, it is impossible to arrive at these conclusions on the basis of the Hayes and Flower model. Indeed, Sharples and Pemberton respond to the model's deficiencies by inventing another one, which is the subject of the next section.

In the light of these observations, we might conclude that the Hayes and Flower model has a fanciful relation to the consensus that Sharples and Pemberton describe.[1] Yet, given the frequent references to this model in current writing research, we cannot avoid searching for some way in which the model might meet with common approval. Our last criticism above was that the model does not take into account different types of writing or

---

[1] Attempts to clarify this relation are not aided by an ambiguity in the authors' use of the term "consensus model". On the one hand, the "consensus model" is the result of ten years of research, but on the other hand, the "consensus model" that Sharples and Pemberton seek to extend is clearly identifiable as this Flower and Hayes model.

writing technology. However, in the model's defence, we might respond by describing it as a model of writing operations of a general sort that can be performed in any medium and are independent of the genre of writing. Is this the case? Let's look again at the three major operations that Hayes and Flower identify: planning, translating and reviewing.

Planning consists of goal setting, organising and generating. Two of these processes are thinking processes that do not necessarily produce writing: goal setting is associated with a writer's motivation, while generating involves the retrieval of propositions from memory. If we extend the definition of generating to include the retrieval of other items from memory, then "planning" could include the sort of visualisation or mental planning that can motivate or influence the writing of fiction. In addition, goal setting may produce notes on the text to be written, and in that respect is similar to organising, which entails the externalisation of thought in the form of written plans or outlines. While the organising process may be more active in the development of arguments, this notion of planning as a whole, which we can summarise as "thinking and note taking", is wide enough to accommodate different types of writing and diverse technologies. Translating and reviewing are not only mental processes but require the management of external text. Translating is the operation that produces syntax, while reviewing consists of reading and editing. We can summarise these two operations as "writing, reading, and revising". Like planning, these operations are so comprehensive that their performance is inevitable, whatever the medium or type of writing.

In conclusion then, we can describe the Hayes and Flower model as a model of writing operations of a general sort that can be performed in any medium and are independent of the genre of writing. This description seems to be a way of siting the model as the basis for a "consensus model of writing" (Sharples & Pemberton 1992, p.326). However, our summary of these operations leads us to re-label them as "thinking", "writing" (which includes note taking and revising), and "reading". In other

words, the basis for a consensus is the observation that all writing involves thinking, writing and reading. Moving beyond this consensus, we would like to know how those activities are related; the answer to this question may vary with types of writing and writing technology. If we model writing as information processing, then the activities of thinking, writing and reading are confined to the data processing roles that this type of model imposes on them. Despite Flower and Hayes' criticism of the three-stage model of composing, a data processing model also imposes relations of sequentiality, and the result is a logical sequence of thinking, writing and reading - a model of writing that we can summarise as "Plan, Draft and Revise".

4.4 WRITING STRATEGIES AND EXTERNAL REPRESENTATIONS

Sharples and Pemberton discuss a model of writing that aims to "rationalise and extend" what they call the "consensus model of writing" (Sharples & Pemberton 1992, p.326). The "consensus model" is a composite model, a general picture which the authors describe by summarising the results of ten years research into cognition and writing. It is also based on the Hayes and Flower model (Hayes & Flower 1980a). In addition, Sharples and Pemberton take into account recent research into writing behaviour, and the differences in general approaches that we discussed in the last chapter.

Four limitations of the model are noted. Three of these limitations have already been mentioned. Firstly for example, Sharples and Pemberton comment on the absence of the medium of writing: "the model does not account for the characteristics of different media...and the ways that these affect the practice of writing" (Sharples & Pemberton 1992, p.326). A second limitation is the explanation of writing strategies, whose inadequacy we discussed above. As Sharples and Pemberton remark, "the model offers no indication whether the list of writing approaches and strategies... is complete, nor does it provide a framework within which to place them". Thirdly, our comment on the status of the

text as a sort of undifferentiated information is reflected in their observation that the model does not specify the various "representations of the text at each stage of its construction".

Sharples and Pemberton's response to these limitations gives their model its distinctive feature. In their model, "representations of the text" play a central role and are used to describe writing strategies in relation to diverse media. However, this response is also guided by the fourth limitation of the "consensus model", which is the absence of a "clear distinction between mental structures and analogous ones on an external medium"; they point out that "physical marks are not ideas" (Sharples & Pemberton 1992, p.326). Having distinguished between "mental structures" and "representational structures", Sharples and Pemberton then use the latter as the basis for a description of writing. We said above that writing is both a mental process that we generally call "thinking", and the manipulation of an external object. In this model, the latter aspect is emphasised.

According to Sharples and Pemberton, the process of writing is an activity which involves the symbolic representation of ideas in diverse external media (Sharples & Pemberton 1992, pp.326-328). A writer may use a number of writing surfaces for recording ideas, keeping notes and writing continuous prose. These include paper note-pads, plastic marker-boards and electronic computer. Some may be more suited to the particular task at hand, and consequently some may be more associated with particular "representational structures". Sharples and Pemberton define a representational structure by two typologies: firstly, of "text items", and secondly, of "views". They identify two main types of text item. The first is "instantiated" and has "the status of a piece of connected prose"; they call such items "notes" but point out that this category can include an entire document. The second item is "uninstantiated" and serves as an "idea-label" which acts "both as an index to a mental schema and as a place-holder for a piece of text that has still to be created". A third type of item is

"annotational", where the writer comments on other text items.

Type of item

Organisation of items	UNINSTANTIATED	INSTANTIATED
UNORGANISED	*Techniques:* 1 Brainstorming *Representations:* Idea-labels	*Techniques:* 2 Note-taking (verbatim) Collecting quotes *Representations:* Notes
NON-LINEAR ORGANISATION	*Techniques:* 3 Following a thread Writing as dialectic *Representations:* Network of idea-labels	*Techniques:* 4 Organising notes Filing *Representations:* Network of notes
LINEAR ORGANISATION	5 *Techniques:* Linear planning *Representations:* List of idea-labels Table of contents	*Techniques:* 6 Drafting text Revising text Copying text *Representations:* Linear text

FIGURE 3:
EXTERNAL REPRESENTATIONS AND THE WRITING PROCESS

They also identify three types of "views" or "arrangements of items on a page or screen":

"The items may be unordered, for instance when a writer creates an unsorted set of topics during a brainstorming session. They may be formed into a non-linear structure, such as an associative network or a taxonomic tree. Or they may be arranged linearly, as a series of words....The two dimensions, of *instantiation* and *view type*, characterise a writer's representation of items on some external medium." (Sharples & Pemberton 1992, p.328)

The "representational structures" defined by these two typologies are the "external representations" that a writer manipulates during the process of writing. Figure 3 shows this framework for describing the writing process.

Sharples and Pemberton go on to explain that the various writing strategies outlined above "can each be described in terms of transitions from box to box, or from representation to representation" (Sharples & Pemberton 1992, p.329). Thus, although the normal goal of a writer is box six, there are various routes to get there. For example, the strategy of "Outline and Draft" is a movement from box five to box six, whereas the strategy of "Draft and Revise" is carried out entirely within box six. The strategy of "Plan, Draft and Revise" is a movement from box three to box six, while the strategy of "Cut and Paste" is a movement from box two to box six via box four. In the last chapter, we referred to the notion of writing behaviour as a cycle of engagement and reflection, a cycle that Sharples calls the "rhythm of writing" (Sharples 1993). Alluding to this rhythm, Sharples and Pemberton point out here that "progression through the grid rarely happens just once".

In comparison with these general approaches, a "technique" is "a means of creating all or part of a representational structure, such as a list of idea-labels or a network of notes", and "each type of representation will lend itself to a variety of creative techniques" (Sharples & Pemberton 1992, p.330). Techniques can be carried out using a variety of methods, where a method is defined as "a technique conducted on a particular medium". Sharples and Pemberton then go on to review the properties of various media in terms of the techniques that they support. For

example, the browsing of large documents is supported by a word processor and sheets of paper, but not by sticky notelets. Techniques include the following:

- Brainstorming -

The writer jots down notes without worrying how to organise them.

- Following a thread -

The writer creates a conceptual network around a topic, in the form of sub-topics, expansions, examples and definitions.

- Filling a template -

The writer recalls a template for a plot, event, or argument from long-term memory and then fills it out.

The authors conclude with the claim that "the model can inform both the teaching of writing and the design of computer-based tools to support the writing process" (Sharples & Pemberton 1992, p.335). In the last chapter, we concluded that flexible writing software should be able to accommodate a range of general approaches. We concluded further that this aim would best be served by considering the strategies that define behaviour. Sharples and Pemberton follow a similar path, distinguishing firstly between "general approaches" or "global strategies", and "specific strategies", chosen "to meet the task at hand". Here, a writer's behaviour is defined by her general approach, with "planners" and "discoverers" occupying opposite poles of the behavioural spectrum, while specific strategies include the now familiar "Plan, Draft and Revise". They then make a second distinction; that is, between a "strategy" and a "technique". Sharples and Pemberton then explore the methods that a writer might adopt in applying techniques to diverse media, and the "external representations" which result. In theory, if a design can incorporate the features of diverse media and accommodate a range of "representational structures", then it should be able to accommodate a range of general approaches to writing.

At this point however, in considering the model from the perspective of a student writer of fiction, we discover that it raises some questions that remain unanswered. For example, what is the effect of genre on external representations? Are some representations preferable for particular types of writing? Would a student writer of fiction use the same representations as an experienced writer of academic papers? Is the list of representations complete?

In order to compare types of writing and describe differences between texts, we need to use some sort of meta-language. This requirement is also recognised by Sharples and Pemberton:

> "An important aspect of the teaching of writing should be to describe the process of writing... This means developing a meta-language to communicate with the student about writing operations, strategies and approaches and to describe the structure of plans and texts."
> (Sharples & Pemberton 1992, p.325)

Elsewhere, Mike Sharples argues that the development of a meta-language is a stage of development in writing, a stage which is necessary in order for the child to gain conscious control of her language (Sharples 1985). However, a meta-language that describes the structure of texts may not be the same as one that describes writing operations. The meta-language that Sharples and Pemberton adopt here is one of "representations": "views", "instantiations", and so on. While this meta-language is designed to describe writing operations, a meta-language that describes textual structure has a linguistic foundation, as Jonathan Culler points out (Culler 1975). This sort of meta-language is absent from the model.

According to Noel Williams, the absence of linguistics is a common feature of cognitive models of writing. Criticising their adequacy, he writes:

> "For example, writing can be viewed as a linguistic activity, a business of presenting words in appropriate linguistic form. If the cognitive model says nothing about how linguistic items are chosen, or how the conditioning factor of 'appropriateness' works, that model will be to that extent inadequate."
> (Williams 1991a, p.40)

The absence of linguistics in this model is accompanied by a rejection of textual analysis. In describing the "consensus model", Sharples and Pemberton point to a "shared conviction that we can find more about *how* people write by observing writers in action than by analysing finished texts" (Sharples & Pemberton 1992, p.320). While this may be the case, it is difficult to describe textual structure without utilising the results of some sort of textual analysis. Moreover, the process model of writing, which Sharples and Pemberton aim to extend, is based on the results of protocol analysis, and this involves the analysis of writers' texts (Hayes & Flower 1980a). A hostility to the text may be a reflection of the emphasis on "process" rather than "product", and, in this emphasis, Sharples and Pemberton follow Flower and Hayes. Here, the consequence is not a failure to consider the product, but a particular way of describing it, and with this method of description, the text itself becomes insignificant.

Another question which the model leaves unanswered is whether there are any links between mental structures, textual structures and representational structures. In the last section, we referred to the assumption made by product based models that thinking and writing are separate processes (Flower & Hayes 1980a). Here, however, Sharples and Pemberton claim such a separation as an advantage of their model:

> "One advantage of the six box framework is that it allows an explicit distinction to be made between those processes which a writer carries out on an external medium, and those which are performed mentally, or by-passed altogether."
> (Sharples & Pemberton 1992, p.329)

Sharples and Pemberton thus perpetuate the distinction between thinking (as a process that involves "mental structures") and writing (as a process that involves the manipulation of "representational structures" or "representations of the text"). In this separation of "mental structures" and "representational structures", what connections might exist between the two are unclear. Although Noel Williams characterises this model as "a cognitive model with some behavioural components" (Williams 1991a, p.40), Sharples and Pemberton leave mental structures unexplored. Indeed, a recent summary of the model makes the comment:

> "Briefly, the model says that what goes on inside writers' heads is too difficult to analyze reliably: the processes are too complex, and are interfered with by observation."
> (Headland 1994, pp.12-13)

However, in the assertion that we can understand writing by observing what writers do and what objects they work with, their approach to writing is similar to behavioural studies. Using this model, writing strategies can be inferred by tracing routes across the map of external representations. On the one hand, this makes it possible to imagine new strategies of writing by following untraversed routes across this map:

> "A further advantage is that the various strategies already identified by Flower and Hayes and others can be set in a broader context, so that they can be seen as possible choices of route out of a finite set of such choices, rather than an ad hoc listing. Other possible strategies now readily present themselves..."
> (Sharples & Pemberton 1992, p.329)

On the other hand, the exclusion of thinking processes from the model makes it impossible to imagine new representations of writing by following a deductive route that moves in the reverse direction. Instead of starting with representations and going on to infer strategies, we might consider how writing strategies relate to thinking processes, and then go on to explore the possibility of using technology to create new sorts of representations, and new

strategies of writing. If we use current types of representations to make inferences about writing strategies, then that possibility is not open to us. Following Sharples and Pemberton's method of inference, we can only discover a new strategy by traversing routes across the map of current types of representations. If this list is complete, then so is a list of strategies.

4.5 MODELLING WRITING

Having looked at examples of behavioural and cognitive models, we can now return to the question of what might constitute a model of writing. For a model to be as comprehensive as possible, Noel Williams identifies "four aspects of the writing process one would need to model": the physical process itself, behavioural elements, cognitive processes, and social and cultural processes (Williams 1991a, pp.29-30). His major criticism of current models is that researchers have tended to concentrate on one of these elements while neglecting the others; consequently, models of writing are biased towards a certain perspective.

In prescribing a list of ingredients and then comparing current models with this list, Williams follows a reverse path to the one we have just traversed. In chapter two, we referred to this method as moving from prescription to description. Compared with Williams' list of ingredients, any current model is bound to have shortcomings; the comprehensive model that he outlines does not exist. However, should a model of writing have to be this comprehensive? For example, Williams offers no guidelines on how one might model writing as a "social and cultural process", nor is this feature an obvious aspect of the software whose design Williams describes elsewhere (Williams 1989, Williams 1991b). In relation to software design, modelling serves a specific purpose. Consequently, a biased perspective can sometimes be explained by looking at the purpose of the model.

From the perspective of human-computer interface design, Sutcliffe identifies various types of "user models":

"User models come in several varieties depending on the interest of the authors. The terminology is further confused by ambiguity about who constructs the model, and what is being modelled. User models can be inside the user's head (often called *mental models*), the designer's idea of what is inside the user's head (*conceptual models*), and finally a piece of software enshrining the designer's model."
(Sutcliffe 1988, p.56)

The various types "current in the human-computer interface literature" include "theoretical cognitive models constructed by psychologists in order to understand human mental processes" and "models of user knowledge", which attempt to capture "the knowledge categories in a domain and the inter-relationships between the categories" (Sutcliffe 1988, p.57). Here, a theoretical cognitive model is concerned with "human information processing" in general, and might include processes such as attention, perception and memory. Such a model may provide general guidelines for human-computer interface design. "Models of user knowledge" are inspired by computer based training and embedded in software; these models are concerned with a more specific domain of knowledge.

Another sort of more specific modelling is concerned with "the user's model of a system structure"; these models are referred to as "user views" (Sutcliffe 1988, p.58). This is the sort of modelling a systems analyst will undertake during the initial stage of system design. According to Sutcliffe, "user views are the way in which users describe and visualise the structure of the current system". A "system" can be manual or electronic. For example, a systems analyst might be faced with the task of converting a manual filing system to an electronic system, or making improvements to an established electronic system. At this stage, the analyst will also develop another sort of specific model, which is concerned with "the user's concept of how a task is constructed in terms of its functions and operational sequence"; these models are referred to as "user task models" (Sutcliffe 1988, p.57). If the analyst's assignment is to improve an established system, then she may re-organise this specification to produce a

more logical sequence of operations or a more comprehensible interface.

How do these various models relate to the modelling of writing? In developing their process model, Flower and Hayes use the method of protocol analysis to identify writing operations (Hayes & Flower 1980a). At this stage, their approach to writing is similar to the systems analyst developing a "user task model". Here, however, it is not feasible to develop a "task model" in the same way as the analyst developing conventional systems. The operations themselves are not obvious, and the sequence in which they are performed is a variable factor that allows for differences in writing strategies. Despite these difficulties, Flower and Hayes succeed in identifying a set of writing operations, and provide a context for them; the operations are informed by the task environment and the writer's long-term memory. However, we now face the problems that we discussed above, of how these components are connected and how the entire process operates. In modelling writing as a cognitive process, Flower and Hayes turn to the "theoretical cognitive model" as their model. Consequently, they assume that writing is like information processing, and can be modelled in the same way as human attention or perception.

Sharples and Pemberton are "broadly in agreement" with this process model but aim "to rationalise and extend it" (Sharples & Pemberton 1992, p.326). Having noted the limitations that we discussed above, they respond by modelling writing as the handling of external representations. If we continue with the analogy between modelling writing and systems analysis, then this model has closer affinities with a "user view" rather than a "user task model". The relationship between the Sharples and Pemberton model and the Flower and Hayes model is therefore similar to that between a "user view" and a "user task model"; the two are complementary. Just as the analyst might develop both sorts of model, in modelling writing we need both a model of writing operations and a model of the external representations that a writer manipulates.

If we now return to the criticism that current models of writing are not comprehensive and offer a biased perspective, then we can respond by saying that, from the perspective of human-computer interface design, specific models are needed. "User views" and "user task models" both serve a specific purpose, and models of representations and operations are complementary. Our criticism is not that these models are too biased and uncomprehensive, but rather that they are either too general and not specific enough in relation to types of writing, or claim to be general when they are biased towards the writing of essays.

When we compared the anecdotes of professional fiction writers with the findings of behavioural psychologists, we concluded that a taxonomy of "planners" and "discoverers" could only loosely be applied to the process of writing fiction. We said that when the imagination is involved in this process, planning can be visually orientated rather than text-bound. We also concluded that differences in writing behaviour among fiction writers may be related to the imagination, and that these differences may not be apparent in other sorts of writing. We also noted that a writer might adopt different behaviours for different types of writing. We concluded therefore that a behavioural taxonomy did not provide a useful basis for modelling; the logic of a rigid taxonomy is that different sorts of software need to be created for different categories of writer.

On the other hand, if we adopt the notion of a "rhythm of writing" (Sharples 1993) instead of a taxonomy of behaviour, then we can accommodate different behaviours by modelling the sorts of activities that are common to the majority of writers. While Sharples and Pemberton (1992) take behaviour into account, they do not use it as a basis for modelling. They distinguish between a behaviour that is defined as a general approach, a strategy and a technique. For modelling purposes, it is not the general approach that is their starting point, nor is it the strategy, but the technique. Although writing behaviour is one of the ingredients that Williams prescribes for a comprehensive model of writing, it is not an aspect of writing that is feasible to model directly, if

one's aim is to produce a flexible piece of software that will accommodate different behaviours.

The two cognitive models that we discussed above give two different accounts of writing strategies. We concluded that the account given by the Hayes and Flower (1980a) model was inadequate. We also concluded that this model represents writing as information processing, with limited roles for the memory, the text, and the processes of thinking and writing. On the other hand, Sharples and Pemberton (1992) affirm a separation of thinking and writing, and view writing as the management of external rather than internal representations; "thinking processes" and "mental structures" are excluded from the model. Consequently, the deductive route of inferring strategies from external representations denies the possibility of relating strategies to thinking processes, and using technology to create new sorts of representations.

The questions that we discussed in relation to the Sharples and Pemberton model apply equally to the Flower and Hayes model. Both models fail to consider how different sorts of writing might affect the writing process, and both models are marked by the absence of a meta-language that is appropriate to the discussion of genre and types of writing. Both models are marked by the absence of the text and textual structures, and, in the Sharples and Pemberton model, the connections between textual structures, representational structures, and mental structures, are unclear.

So, from the perspective of writing fiction, there are many questions still to be answered concerning models of writing, and we have yet to answer the general question of what might constitute a model. We have argued that specific models are needed, and these include models of writing operations and external representations. However, we have also found these models inadequate to our purpose. The models remain general models in relation to different sorts of writing, and say little about writing fiction. A characteristic feature of this lack of specificity is

the absence of the text and textual structures; we shall discuss structure in more detail when we investigate linguistic approaches to modelling in chapter six.

After discussing the two models above, Holt (1992) reaches a similar conclusion regarding this lack of detail. He argues that "cognitive models of writing provide an important clue to how writing tools should be designed, but the models only allow us to identify the major components" (Holt 1992, p.62). In his view, there is a need for more detailed models of all the tasks involved in writing, particularly the task of planning - a "vital part of writing" that is not well supported by writing software. In the next chapter, we shall look at notions of planning in more detail.

4.6 CONCLUSION

In this chapter we have continued our review of current models of writing by discussing cognitive models. We concentrated on two in particular partly because they are frequently cited in the literature; indeed, the Hayes and Flower (1980a) model has been called a "consensus" model of writing. The second reason for this concentration was that they offer two different answers to the question, how can a single model of writing accommodate a range of writing strategies? We found the one account of writing strategies to be inadequate, while the other failed to explain how writing strategies might be related to thinking processes. Both models are general models that make no reference to different types of writing or to the text that a writer is producing. Returning to the question of modelling writing, we argued that while there is a need for models of writing operations and models of external representations, the lack of detail in these models concerning the text, textual structures, and types of writing, made them inadequate to our purpose. Before we explore linguistic approaches to modelling, we continue with the question of how writing strategies are related to thinking processes by looking at notions of planning in more detail.

CHAPTER FIVE:

PLANNING, THINKING, AND MODELS OF WRITING

5.1 INTRODUCTION

In this chapter we discuss notions of planning. From the perspective of designing software tools to assist planning, we ask whether the planning observed in different writing behaviours is the same operation. We show how differences in writing strategies are related to differences in thinking processes, and how all these differences are tied up with differences in planning. We identify three kinds of planning. One is concerned with a writer's motivation, while the other two are concerned with metacognitive and cognitive processes. We also identify a problem with the literature on planning, which is whether a plan refers to a mental schema or an external representation of ideas. Having discussed this problem, we conclude that if we are consistent in our definitions, the planning observed in different writing behaviours is the same operation.

As a way of resolving the ambiguities concerning notions of planning, we argue for a model of writing based on the three activities of thinking, writing, and reading. Further reasons for this kind of model are provided, and we discuss a basic model of writing based on observations of writing behaviour and the two cognitive models of chapter four. We show how the model accommodates different writing strategies, and how the model compares with other models. We then discuss the notion of cognitive planning as textual structuring, and show how the notion of a rhythm of textual structuring - or simply put, a rhythm of thinking - resolves the apparent divergence between invention and discovery in writing. Finally, we ask how writing software assists writers in textual structuring.

5.2 WRITING STRATEGIES AND PROBLEMS WITH PLANNING

In chapter three, we looked at writing technology and its effects on writing behaviour, paying particular attention to accounts of student writing. What are the consequences for a model of writing and for the design of writing software? We concluded our

summary by recognising a need for on-line support for planning. At the same time, we recognised a need to take into account the different relationship between planning and other writing operations that occurs when writers compose with a computer. This last consideration takes us back to models of writing.

Let's assume we are going to design a planning aid for student writers. Given the conclusions of chapter three, the question arises whether the sort of planning understood by the model of "Plan, Draft and Revise" is the same as the planning of the "recursive reviser" (Williamson & Pence 1989). If these are different operations, then what sort of planning should we assist? The sort of planning aid we might design is dependent on our model of writing.

In chapter three we mentioned three problems in studying the effects of writing technology. The third problem was the adoption of a model of writing to measure those effects, a model based on observations of writing in a medium of pen and paper. From this perspective, technology is seen as a problem for writers and a source of bad habits in student writing (Haas 1989, Williams 1992a). In that case, we might design writing software that is intended to eliminate those bad habits, for example a planning aid that will attempt to restore writing behaviour to its former homeostasis, to what it was like before computer technology. However, the second problem was the basis on which one can generalise about technological effects, given the evolution of writing technology. An alternative view of technology is that it represents a source of possibilities for the writer and a means of creating new strategies of writing. From this perspective, technology is seen as a potential benefit to student writers by providing "tools which encourage them to experiment with their texts" (Williamson & Pence 1989, p.122).

Using behaviour as the basis for software design presents the designer with a dilemma. On the one hand, if we use a model that describes behaviour in a medium of pen and paper, such as "Plan, Draft and Revise", then this model will not describe the

behaviour of the "recursive reviser". On a negative note, we might adopt this model given the first perspective above, in which the computer is seen as an advanced form of typewriter, and new strategies of writing are not encouraged. On the other hand, if we adopt a positive perspective on technology, we still face the problem that a behavioural model will not accommodate diverse behaviours. If we take into account the latest reports of technological effects, incorporate them into our model, and subsequently design a planning aid that is intended to assist on-line composition, the result will not accommodate writers who prefer to "Plan, Draft and Revise" - unless we can show that planning is the same sort of operation.

Noel Williams suggests a solution to this problem by adopting a "flexible model of writing", a mutating model that will accommodate "the changing behaviour of writers" (Williams 1991a, p.43). However, such a model does not avoid the dilemmas associated with using behaviour as a basis for design. The paradox here is that, if we acknowledge that writing technology can change behaviour, then we also have to acknowledge that, whatever model we adopt, providing additional software tools based on our model might itself have an effect on writing behaviour. One could indeed argue that the main purpose in designing software is to change writing behaviour in some way, whatever perspective one adopts on technology - the planning aid that attempts to redress the apparent lack of planning is intended to change writing behaviour back to its former state. The mutating model that Williams envisages must therefore fulfil the impossible condition of being able to adapt to a behaviour that cannot be foreseen at the stage of the model's conception, and is therefore liable to a process of infinite revision.

If we use a behavioural model as the basis for design, dilemmas such as the above appear to be inescapable. In chapter three, we concluded that as the notion of writing behaviour is based on a writer's preferred writing strategies, we should rather consider the strategies that define the behaviour. In the last chapter we discussed two models of writing that gave different

accounts of writing strategies. In the first the writing process is monitored by a knowledge-based system, and we concluded that this explanation provided an inconsistent and inadequate account of different approaches to writing. In the second, mental processes are deliberately excluded from the model, and writing strategies to be inferred from the physical representations that a writer manipulates. This model has the advantage that alternative strategies of writing can be realised by following a variety of routes across the map of representations. However, we also suggested that we might consider how writing strategies relate to thinking processes, and we now attempt that task.

Sharples and Pemberton criticise the Hayes and Flower model of writing for the lack of differentiation between mental structures and representational structures. They make the comment that "there is no clear distinction between mental structures and analogous ones on an external medium"; they also point out that "physical marks are not ideas" (Sharples & Pemberton 1992, p.326). Having made this distinction, Sharples and Pemberton use external representations as the basis for their model of writing.

In order to discuss writing strategies in relation to thinking processes, we need to make a similar distinction between mental processes and physical operations. When we introduced the two models of writing in the last chapter, we said that the process of writing involves two activities: a mental activity that we call "thinking", and a physical one of manipulating external representations. We also said that while these aspects of writing may concur in practice, in descriptions of writing one may be emphasised more than the other. In their model of writing, Sharples and Pemberton are more concerned with external representations, relating writing strategies to their manipulation, while our current purpose is to consider how writing strategies relate to thinking processes. A strategy of writing involves both thinking and textual manipulation; and if we compare the four strategies that we described in the last chapter, strategies that have been identified by "research into the writing process"

(Sharples & Pemberton 1992, p.324), we find a lack of differentiation between mental processes and physical operations carried out on external objects.

For example, let's consider the strategy of "Cut and Paste". On the one hand, "Cut and Paste" refers to the physical operation of moving text, either by using scissors and glue in a medium of pen and paper, or by using a mouse or keyboard in an electronic medium. This operation of moving text might occur whenever a writer is composing or editing a draft, and whatever the strategy adopted for composing. On the other hand, in addition to its regular occurrence in composing or editing, the operation of moving text by "Cut and Paste" can feature more conspicuously as part of a writer's general strategy. With the strategy of "Draft and Revise", a writer may use "Cut and Paste" as a method of generating new text by copying samples of old texts. With the strategy of "Outline and Draft", a writer may use "Cut and Paste" as a method of generating an outline by collecting a set of quotations. In chapter three, we suggested ways in which a writer might develop the technique of "Cut and Paste" as a writing strategy using writing technology. In addition to using "Cut and Paste" when recycling text from old files or documents, a writer may anticipate the use of "Cut and Paste" at a later date, and organise her current writing accordingly. This involves file managing, or making decisions about what files to put text into, and this is the sort of activity that Hayes and Flower identify as the process of organising - an aspect of planning (Hayes & Flower 1980a, p.14).

Compared with other strategies of writing, "Cut and Paste" refers to the physical operation of moving text, an operation that occurs regularly in composing and editing. However, an operation of moving text does not by itself constitute a strategy of writing. In relation to writing strategies, the operation of moving text is subordinate to a writer's general approach. As we said above, "Cut and Paste" is a method of generating text or an outline when a writer is using the strategies of "Draft and Revise" or "Outline and Draft"; developing "Cut and Paste" as a writing strategy for an

electronic medium involves file management or planning. We are suggesting that, while the other strategies might form a writer's general approach, "Cut and Paste" is an operation that is performed in connection with a broader strategy or plan.

Let's now consider the other three strategies of "Plan, Draft, and Revise", "Outline and Draft" and "Draft and Revise". The strategies of "Plan, Draft, and Revise" and "Outline and Draft" both involve reflective activity in developing a plan or an outline. While developing a plan suggests a process of logical reasoning, creating an outline might involve brainstorming. An outline is a provisional table of contents that serves as a cue for generating text. Creating an "outline" rather than a "plan" suggests a process in which logical questions are largely postponed to a later stage of writing. Discussing the development of planning in writing, Burtis and colleagues suggest that the first type of identifiable planning is that of finding content for a composition; thus a primitive plan consists of "a listing of content possibilities" (Burtis et al 1983, p.154). Compared with the other strategies, "Outline and Draft" varies in its similarity to "Plan, Draft, and Revise" and "Draft and Revise". The similarity depends on the extent to which logical questions have been resolved before a writer starts composing; an outline might serve equally as a cue for developing a plan as a cue for writing a draft. With the strategy of "Draft and Revise", a writer abandons reflective activity before writing and follows the advice of Sir Philip Sidney's muse, to "looke in thy heart and write" (Flower & Hayes 1980a, p.36; Flower & Hayes 1980b, p.21).

In relation to writing behaviour, the basic difference between these three strategies is whether a writer starts with a session of reflective activity or engaged writing, as Sharples comments (Sharples 1993). As we said above that developing "Cut and Paste" as an electronic writing strategy involves file management and organising, we are led to the conclusion that it is the initial presence or absence of some sort of reflective activity or planning that distinguishes all four strategies. Therefore, as our aim is to consider how writing strategies relate to thinking processes, we need to explore the variety of processes that are

embraced by the term "planning". In comparing the absence of planning in "Draft and Revise" with its presence in the other strategies, we have used the term "planning" to describe three sorts of activity. Firstly, we referred to electronic file management or organising. Secondly, we referred to making a provisional table of contents before writing, and thirdly, we have used "planning" in the sense of logical reasoning.

The first sort of activity involves the cutting and pasting of text, while the second results in a list that serves as a cue for generating text. An "outline" refers to the external representation that a writer produces, but does the third kind of "plan" refer to an external representation or some sort of mental schema? We have described the third sort of planning as logical reasoning. Does this process necessarily involve making external representations? If logical reasoning is associated with the "specificity of argumentative planning" (Coirier, Dellerman & Marchand 1994), then this process might involve the management of polyphony by imaginary conversations - a process that does not necessarily involve the production of external representations. According to Flower and Hayes (1980a), each stage in the model of "Plan, Draft, and Revise" is marked by the production of an artefact, and the first stage is complete when the first is produced. Is this a plan, or the representation of a plan? Is a plan a mental schema, and its representation a physical object? Some would argue the reverse, that a plan is a mental representation of the text, rather than an external representation of ideas:

> "People produce plans, that is *mental representations* of the text to be produced according to which sentences and textual structures come about."
> (Schilperoord 1994, p.148)

The problems with discussing planning are twofold. The first is that the term refers to all manner of activities; we have used it to describe three above. Secondly, we find the lack of differentiation between thinking processes and physical operations particularly marked when discussing planning. In chapter three, we said that the notion of "planning" either refers to a mental

process of reflective thinking (Burtis et al 1983, Haas 1989, Schilperoord 1994), or suggests the externalisation of ideas into some form of physical representation such as notes, diagrams, sketches or outlines (Sharples & Pemberton 1992, Galbraith 1991, Galbraith & Reed 1994). In the definition given by Hayes and Flower (Hayes & Flower 1980a, pp.12-15), planning is both a mental process that generates ideas and an organising process that produces notes, and we have noted the criticism that the consensus model does not distinguish between the two (Sharples & Pemberton 1992, p.326). Let's take a closer look at the different notions of planning.

Some researchers have commented that "the term planning has a variety of meanings in current usage, and one can find it applied to almost any kind of constructive mental activity" (Burtis et al 1983, p.154). One can go further, and find the term planning applied to any kind of mental activity, constructive or otherwise. The tendency to equate planning with any type of thinking is shown by temporal studies of writing. Temporal or "real-time" studies of writing involve the indiscreet observation of writers at work. A writer is recorded on video-tape, the tape is replayed, and the writer's body language is analysed in relation to the text in production:

> "The assumption throughout all of this chronographic analysis is that pauses - moments of scribal inactivity during writing - reflect time for the writer to engage in planning and decision-making behavior... Relying on pause data from one writer and additional observational data from his hand movements, gazing and rereading activity, I looked for behavior patterns that were associated with language choices in the text and that suggested planning activity... I assume not only that pauses reflect planning, but also that patterns of body language associated with pauses will corroborate notions about the functions of pauses."
> (Matsuhashi 1982, pp.270-277)

While a pause in writing is equated with planning, the length of the pause together with a writer's body language indicate what sort of planning is occurring. Here, Matsuhashi makes a distinction

that was mentioned in chapter three, between local and global planning:

> "The taxonomy of body language during long pauses suggests a distinction between global decisions and local ones. When the hand holding the pen remains tense, close to the previously written word, the decision is, most likely, a local one, one that the writer expects to resolve quickly... By contrast, when the writer relaxes his hand, removes it from the vicinity, and gazes away, he is involved in a substantially more complex, global decision concerning the writer's knowledge base or the overall semantic structure of the developing text."
> (Matsuhashi 1982, p.287)

There is no suggestion here that the writer may also be thinking about liquid refreshment, what to buy for dinner, or any other distraction not connected with the task of writing. More recent temporal studies of writing also stress the significance of scribal inactivity in relation to planning (Chanquoy, Foulin & Fayol 1994, Schilperoord 1994). Discussing a "listening word processor", John Reece comments:

> "Our analysis of pause times revealed that, compared with dictation, the LWP encouraged a higher number of long pauses during composition, which can be interpreted as an increase in planning time."
> (Reece 1994, p.10)

John Gould claims to have shown quantitatively that "planning is the main process in composition" (Gould 1980, p.112). The results of his experiments on composing letters showed that "planning, on average, was two-thirds of composition time, regardless of composition method" (Gould 1980, p.112). This observation also relies on the assumption that the absence of writing can be equated with planning; pausing replaces planning as one of the fundamental processes in Gould's model of writing (Gould 1980, p.111).

Given the tendency to equate planning and thinking, one can understand the concern about the apparent lack of planning when

students write with a machine. However, if the absence of writing is also equated with planning, then how does one design or evaluate writing software whose purpose is to assist planning? Given one side of these equations, such an aid would be an aid to thinking, however general or specific, but on the other, such an aid would not assist writing but encourage the pathological state of scribal inactivity that we described in chapter three. There is therefore a paradox in advocating planning as a worthwhile activity while measuring its presence by the absence of writing: in this light, writer's block, which is also marked by the absence of writing, appears to be a similar activity to planning.

Temporal studies of writing appear to maintain the distinction between thinking and writing criticised by Flower and Hayes (Flower & Hayes 1980a, p.32). We distinguished earlier between mental processes and physical operations in order to investigate the relationship between thinking processes and writing strategies, which led to this discussion of planning, but that was not to say that thinking and writing are mutually exclusive activities. However, to find out how they become inseparable, and when they become indistinct, we need to continue with this investigation of definitions.

In a developmental study of planning in writing, Burtis and colleagues use a definition of planning as "the predetermination of a course of action aimed at achieving a goal" (Hayes-Roth & Hayes-Roth 1979):

> "That defines the ultimate or ideal form of planning activity, however. Most of our attention will be directed toward the rudimentary forms of goal-directed planning."
> (Burtis et al 1983, p.154)

Researchers in the field of artificial intelligence have studied goal-directed planning in their investigations of story comprehension (Schank 1972, Schank & Abelson 1977). They argue that a reader needs various kinds of knowledge to understand stories, and in their attempts to model this knowledge, "it became apparent that an understanding of the *plans* and *goals* of characters in narrative

is essential to story understanding" (Ide & Veronis 1990, p.43). According to Black and Bower, the knowledge that "most readers could be expected to have about planning" includes the knowledge that "goals are derived from basic personal themes such as survival, love, duty, service, greed, avarice...", while plans are "(real or imagined) series of actions undertaken with the intention of bringing about one or more compatible goals within certain constraints" (Black & Bower 1980, p.245). Summarising Schank and Abelson's taxonomy of goals, Black and colleagues distinguish satisfaction goals that are associated with biological needs, pleasure goals, achievement goals, and goals that are associated with self-preservation (Black, Wilkes-Gibbs & Gibbs Jr. 1982, p.332).

As Ide and Veronis point out, "the kinds of goals that are attributed to characters in a story and the plans and planning strategies that are assumed to achieve these goals, are not limited to modelling the behaviour of fictional characters but instead model human behaviour in general" (Ide & Veronis 1991, p.171). Schank and Abelson's taxonomy of goals therefore apply not only to the characters in a story, but also to the readers and writers of stories. In the case of writing, a writer's goals may be associated with pleasure, with achievement, or both. However, these kinds of goals are all associated with the question of motivation. According to Charniak and McDermott:

> "...we recognize the intentions of others by attributing to them the same planning abilities that we have. When we see another person doing something, we ask 'Given this action, what task could it be in the service of?' Thus determining motivation can be thought of as the inverse of the planning problem, 'Given a task, what action is appropriate to carry it out?'"
> (Charniak & McDermott 1985, p.557)

Determining a writer's motivation may not be such an easy task, as this problem of interpretation takes us back to the mystery of writing that we described in chapter three. The accounts of professional fiction writers show that a writer's motivation is not

necessarily the result of reflective thinking, or planning, but could equally be the product of unconscious factors.

The above goals are concerned with a writer's motivation to write in the first place, and all could be described as satisfaction goals in one sense: the seeker anticipates that, once the goal is achieved, some personal benefit will be the result. However, having decided to write, or given a job of writing, a writer then faces another set of decisions that are concerned with the immediate task of writing. Flower and Hayes describe writing as a process of "juggling constraints" (Flower & Hayes 1980a, p.40). By juggling constraints, a writer reduces cognitive strain - the demand placed on short-term memory or attention (Miller 1956). Flower and Hayes classify constraints as follows: "the first constraint we describe as the demand for integrated knowledge; the second is the more inclusive linguistic conventions of written texts; and the third is the encompassing constraints of the rhetorical problem itself" (Flower & Hayes 1980a, p.34). Explaining the first, they refer to expository writing and the writer's need to sort out ideas when confronting a new or complex topic; thus "knowledge becomes a constraint... when it is not in acceptable form" (Flower & Hayes 1980a, p.34). Explaining the second, they point out that, "for the inexperienced or remedial writer, the rules of grammar and conventions of usage and syntax may make an enormous demand on time and attention" (Flower & Hayes 1980a, p.36). Thirdly, solving the rhetorical problem is related to a writer's purpose when writing with a specific reader or group of readers in mind. An example of the rhetorical constraint is the need to be persuasive or entertaining; this type of constraint has a pervasive influence on the others.

Flower and Hayes describe various strategies for reducing constraints, such as setting priorities, breaking down goals into sub-goals, and developing routine procedures. They conclude that "one of the most effective strategies... is planning" and suggest the hypothesis that "writers draw on three major kinds of plans which are hierarchically related to one another" (Flower & Hayes 1980a, p.44). At the top of the hierarchy are plans for dealing with the

largest problem, the rhetorical problem; these plans are defined as plans for what the writer needs "to do". Lower down the hierarchy is the second type of plan, a content plan or outline, defined as a plan for what the writer wants "to say". At the same level as the second, the third type of plan is a plan for composing, and this sort of plan is a writing strategy such as one of the four that we discussed earlier.

When we discussed Hayes and Flower's model of writing in the last chapter, we noted the potential for goal conflict between rhetorical goals set by the goal-setting process, and composing plans set by the monitor. In this hierarchical model of planning, the problem of goal conflict is resolved in favour of the rhetorical problem. However, Hayes and Flower's claim is that this model of planning applies to all writers, whereas the model is more a reflection of their model of teaching, in which the student is asked to solve a rhetorical problem presented by the written assignment or essay topic. They argue that the task of writing with a purpose for a specific audience improves student writing:

> "If you want to get better writing from your students, one of the most effective ways to do it is to create assignments that have a realistic purpose and a real audience (not a teacher), who actually needs to know something."
> (Hayes & Flower 1980a, p.45)

The definition of this first level of planning presents us with two problems, and both are associated with the confounding of a model of teaching with a model of planning. The first is that Hayes and Flower do not make a clear distinction between the rhetorical problem and its solution; neither is it clear who is doing the planning. In the following example, an instruction (or the problem) is equivalent to a plan (or the method of solving the problem): "...a rhetorical plan could be as conventional and limited as 'write another essay for Freshman Composition class'" (Hayes & Flower 1980a, p.45). While the rhetorical problem is presented to the student in the form of a written assignment, the plan for its solution appears to be the student's interpretation of this task in terms of an instruction to be persuasive or entertaining, for

example. If a plan to do something is no more than an internalised instruction, then the only difference between the problem and its solution is that the first refers to a teacher's instructions while the second refers to a student's mental representation of those instructions. If a plan is the predetermination of a course of action aimed at achieving a goal, then it is the writing teacher rather than the student who is planning at this level. The teacher predetermines a student's writing by setting the rhetorical problem; the goal is to achieve better writing.

The second problem with this level of planning is one that has a pervasive influence on the rest of the model. Hayes and Flower consistently refer to writing as a speech act (Searle 1970): "In essence, writing is also a speech act and therefore subject to all the constraints of any interpersonal performance" (Flower & Hayes 1980a, p.40). Their model of teaching is based on the argument that "when people treat writing as a speech act, they are more likely to draw on many of the well-learned strategies adults use everyday for arguing, explaining, or describing" (Flower & Hayes 1980a, p.45). The definition of high-level planning therefore reflects this notion, and solving the rhetorical problem is equivalent to performing a speech act:

> "To begin with, writers generate plans for dealing with their Rhetorical Problem. These rhetorical plans are called plans *To Do* something in or by language. These are essentially plans for performing a speech act - for responding in some way to that rhetorical problem, which includes the writer, the reader, and a purpose."
> (Flower & Hayes 1980a, p.44)

In another context, developmental psychologists have shown that there is a close connection between speech and writing in the early stages of writing development. Describing the development of symbolism in play and drawing, Vygotsky claims that, in order to learn how to write, "the child must make a basic discovery - namely that one can draw not only things but also speech" (Vygotsky 1983, p.289). Discussing the influence of speech on writing development, Burtis and colleagues note that "in the first two years of writing, children almost all show some indications of

vocalizing or subvocalizing as they write, and these vocal movements appear to be synchronized with their writing" (Burtis et al 1983, p.155). Not only do children spell or sound words as they write them (Burtis et al 1983, p.155), but "at the age of four, a child borrows production techniques and linguistic structures from conversation" (Sharples 1985, p.18). The early phases of writing development are marked by "the gradual differentiation of written from spoken language" (Bereiter 1980, p.75). When forms of speech continue to feature in children's writing, this is thought to be a sign of slow development. According to Sharples, "the speech forms found in immature writing are indications that the child is still producing text as if for conversation" (Sharples 1985, p.31). In chapter three we also noted the observation that "one fault of student word processing" is the intrusion of "speech characteristics" (Williams 1992a, p.15).

There appears to be an incongruity, therefore, in advocating a method of teaching that describes writing as a speech act: having learnt to distinguish written from spoken language, the student is then told to consider writing as a branch of oratory. Indeed, this model of planning appears to parallel the early stages of writing development. The next level is concerned with what a writer wants "to say", in the form of a content plan or outline. This type of planning is the same activity that Burtis and colleagues identify as the development of planning in writing:

> "In the course of writing development, planning becomes gradually differentiated from text production... Gradually, as writing ability develops, there is a separation of the problem of finding content for a composition from the problem of actually writing the composition. At this point, clearly identifiable planning can be seen, but the planning remains at the same time tied to the content needs of text production, so that the plan that is generated consists of a listing of content possibilities."
> (Burtis et al 1983, p.154)

As writing develops, a child learns to distinguish between speech and writing, and planning evolves from a stage in which plans

reflect premeditated conversation. Here, a student learns that writing is a speech act, then plans what to say accordingly.

Research into the planning of argumentative texts has highlighted a specific function of inner speech:

> "To argue is to confront different opinions, and formulate arguments and counter-arguments. In some way, argumentation requires the integration of a potential dialog in the form of a monolog... Thus, to argue is to manage the polyphonic dimension."
> (Coirier et al 1994, p.80)

While planning argumentative texts might involve imaginary conversations, the result of this mental discourse is somehow transformed into writing. Flower and Hayes refer to knowledge as a constraint when its form is unacceptable, and claim that "much of the work of writing can be the task of transforming incoherent thought" (Flower & Hayes 1980a, p.34). However, the model gives no indication that any process of knowledge transformation takes place. Bereiter and Scardamalia describe two types of planning, distinguished by two approaches to retrieving and using stored knowledge (Bereiter & Scardamalia 1987). The first, a strategy of "knowledge telling", is similar to the content plan in this model, while the second, a strategy of "knowledge transforming", is concerned with a rhetorical problem space that has some similarities with the rhetorical problem described by Flower and Hayes. In this model however, a rhetorical plan is an internalised instruction, as we noted above: the first level of planning represents a student's initial response to an assignment. Once this task is interpreted as an instruction to be persuasive or entertaining, for example, the student then proceeds to think about what to say, but not, apparently, about what to write.

Haas refers to this model of planning as an example of the distinction between "rhetorical plans for the writing situation and plans for the text" (Haas 1989, p.183). Does a rhetorical plan have any connection with a textual plan? In this model, a rhetorical plan is an internalised instruction, while a textual plan is a list of

what to say. Describing writing as a speech act, Flower and Hayes are unable to explain how a rhetorical plan might influence a textual plan. To meet a rhetorical requirement to be persuasive, for example, a writer must "constantly monitor the tone of voice projected" (Flower & Hayes 1980a, p.34). The idea that a writer has a voice or a tone is not uncommon: for example, Nash refers to a tone as the writer's "style of address" to the reader (Nash 1980, p.128). However, Nash also identifies linguistic "indices of tone", and gives lexical and syntactic examples (Nash 1980, p.135). For Nash, a writer's voice is expressed in writing; for Flower and Hayes, a writer's voice is projected and never leaves the realm of oratory.

This model of planning assumes that planning is a hierarchical activity. We have already suggested a hierarchy of planning when we concluded that the strategy of "Cut and Paste" is subordinate to the other three strategies of writing. In a hierarchical model, there is some kind of process at the top or bottom which drives all the others. Discussing the plans and goals described by researchers into artificial intelligence, we concluded that those kinds of goals are all associated with motivation. A writer's motivation seems the most likely candidate for the driving process at the top of a hierarchical model of planning. We suggested that a writer's motivational goals may be associated with pleasure, with achievement, or both, and that the unconscious might also be involved in these goals. For Flower and Hayes, the driving process is the rhetorical goal. Are rhetorical goals associated with motivation? A writer may be motivated by anger at social inequalities, for example; this anger may influence the writer's rhetorical purpose of informing a specific group of readers about the existence of social injustice. However, in the model of planning described by Flower and Hayes, this kind of motivation is absent. Apparently lacking such motivation, a student receives it in the form of the writing assignment; for Flower and Hayes, a rhetorical goal associated with motivation is given by an internalised instruction.

Other writing researchers also describe planning as a hierarchical or multi-levelled activity. For example:

> "Writing texts involves different levels of planning: cognitive planning (activation and organization/linearization of the content); linguistic planning (linguistic translations)."
> (Passerault & Coquin 1994, p.139)

In addition to distinguishing between cognitive and linguistic planning, psychologists also distinguish between cognitive and metacognitive planning (Winter 1994). Metacognitive activities involve thinking about thinking. According to Hammond, "meta-cognition refers to people's ability to self-regulate their cognitive processes, and in many respects metacognitive skills can be considered much like other skills in that they can be learned and refined with experience" (Hammond 1993, p.63). For a writer, such thinking might include thinking about the process of writing or thinking about writing strategies. Metacognitive planning might include structuring a timetable of writing activities or deciding on a strategy of writing; thus metacognitive processes are thinking processes that are not involved with mental representations of the text. In the model of planning described by Flower and Hayes, the third type of plan, at the same level of the hierarchy as a content plan, is a plan for composing - this kind of planning is an example of a metacognitive activity.

If we assume that a writer's motivation is the "unquantifiable element" (Boylan 1993, p.xi) that drives a writer's cognitive and metacognitive processes, then we can represent a writer's thinking processes by the Venn diagram of Figure 4. In mathematics, this kind of diagram is used to represent sets of entities, or categories, and their intersections. In Figure 4 the entities consist of different kinds of thinking processes, and in this model we make the distinction between motivation, metacognitive processes, and cognitive processes. Cognitive processes in writing are concerned with mental representations of the text. The distinction between cognitive planning and linguistic planning is discussed in the next chapter; this distinction is based on assumptions concerning the relation between syntax and

semantics. At this stage, we include both types of activity in the category of cognitive processes.

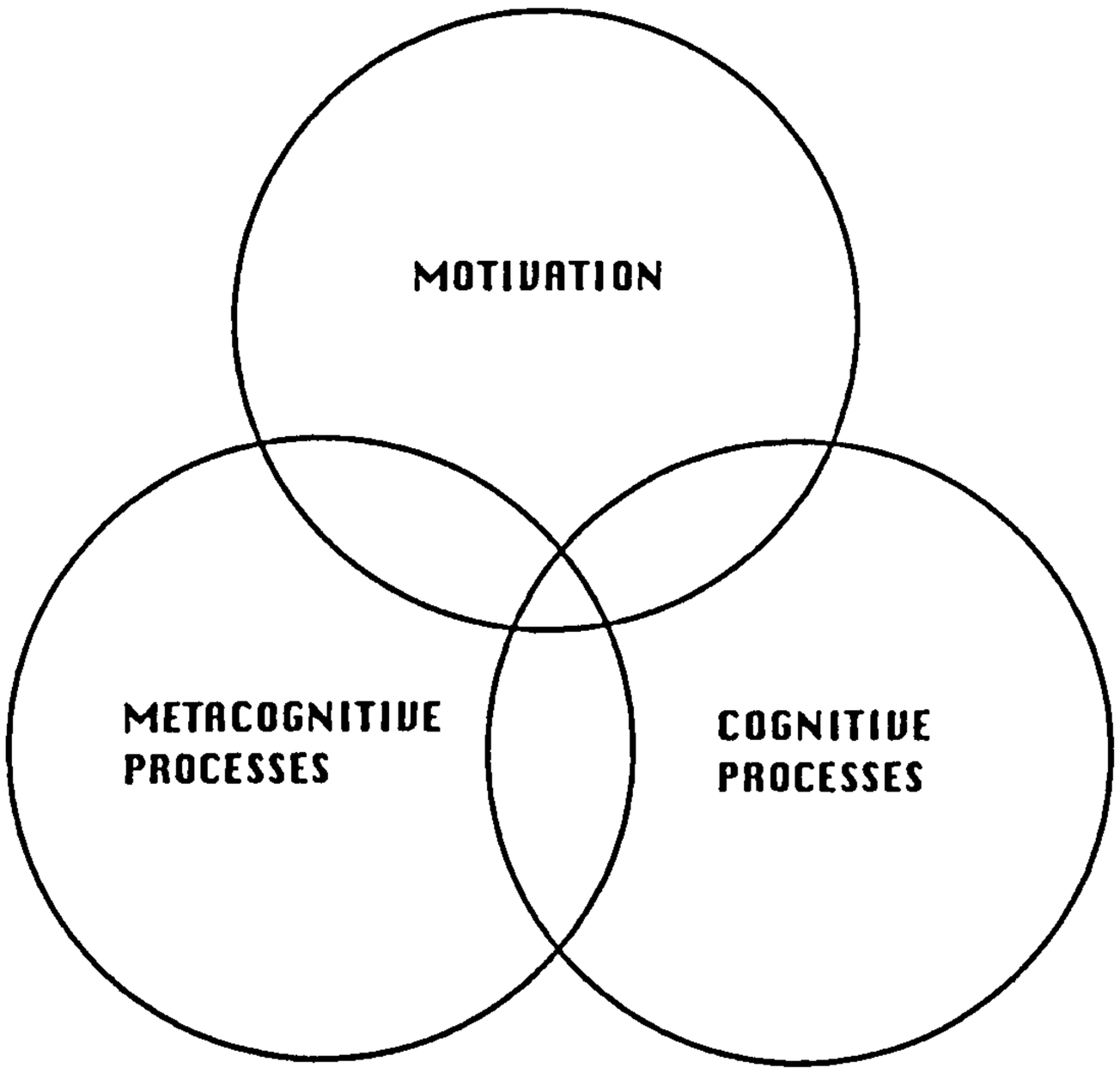


FIGURE 4: A MODEL OF A WRITER'S THINKING PROCESSES

In the diagram, the circles are overlapping to represent areas where the distinctions between the three activities become indistinct. For example, a session of daydreaming might result in notes, and these notes might form the basis of a story. Is daydreaming a cognitive or a metacognitive process, or is it, as in Freud's analysis, a process of wish fulfilment that is associated with a writer's motivation?

If cognitive processes in writing are thinking processes that are concerned with mental representations of the text, then what is cognitive planning? The study of mental representations is a research area of cognitive psychology (Roth & Frisby 1986), and we have to make a further distinction between mental representations, mental schemata or mental structures and the represent-

ations that researchers use to investigate them. For example, psychologists have used a grammatical representation of story structure to investigate mental representations of stories. Jean Mandler points out that these representations are not the same:

> "A story grammar is a formal rule system used to describe regularities in the structure of stories. A story schema is a kind of mental structure or processing mechanism."
> (Mandler 1982, p.207)

Likewise, a mental representation of the text is not the same as the external object that a writer produces, and we have yet to answer the question whether a plan refers to a mental schema or an external representation of ideas. Discussing divergent opinions about planning, Haas concludes that "planning is generally seen as a reflective activity" (Haas 1989, p.182); she also remarks that writing notes helps this activity (Haas 1989, p.185). For Burtis and colleagues, the production of notes indicates planning activity; that is, planning is also viewed as a thinking process (Burtis et al 1983, p.154). Above, we referred to the idea that a plan is a mental representation of the text, rather than an external representation of ideas:

> "People produce plans, that is *mental representations* of the text to be produced according to which sentences and textual structures come about."
> (Schilperoord 1994, p.148)

If we assume that a plan refers to a mental schema - a writer's mental representation of the text - cognitive planning must refer to the mental activity that produces this representation. However, Schilperoord (1994) defines a plan as a mental representation of a "text to be produced", a text whose existence is only a future possibility. How is it possible to have a mental representation of an object that has no material existence? In the first instance, ideas that are visualised or vocalised in the head have to be externalised into writing before a text exists, and before a mental representation of a text can be created. Writing of some kind, whether this involves writing notes or sentences, is

therefore a necessary rather than optional activity that creates a text and a writer's mental representation of that text.

On the other hand, if we assume that a plan refers to an external representation of ideas, then cognitive planning must also refer to the thinking processes that produce such a representation. In the model of writing discussed in the last chapter, Hayes and Flower describe planning of this sort (Hayes & Flower 1980a, p.12). The generating process is a cognitive process of remembering that also results in notes; this process is similar to their content planning above. The organising process orders these notes into a plan, and this plan is an external representation that is used as a guide to writing. The third type of planning in this model, that of goalsetting, involves the motivational input that we discussed above, while the monitoring process is a metacognitive activity that is concerned with managing a writer's strategy. For Flower and Hayes then, planning encompasses the triad of motivation, metacognitive planning and cognitive planning, and we have noted the criticism that they fail to distinguish between these activities. Our criticism of the Hayes and Flower model was that it represented writing as information processing, in which the logical sequence of operations is "Plan, Draft and Revise"; in this model, a plan is an external representation of ideas that is used as a guide to writing a draft.

Let's adopt the definition of a plan as a writer's mental representation of the text. We have noted that writing of some kind is a necessary activity that creates a text and a writer's mental representation of that text. For the planner, this writing consists of note-taking; for the discoverer, it consists of continuous prose or sentences. Both approaches to writing involve the reflective activity that is called "planning" at some stage of writing. If we define cognitive planning as the mental activity that creates a mental representation of the text, then what is the relation between cognitive planning and the physical activity of writing? In the first instance, we said that writing is indispensable to creating a mental representation; but this mental representation must also be modified as the text in production changes. If a

plan is defined as a mental schema, a plan is always changing with writing.

Confusion is created when both definitions of a plan are used in the same text. For a planner, a plan does not change: but this plan is defined by the alternative definition of a plan as an external representation. The model of "Plan, Draft and Revise" assumes that a plan only changes at the reviewing stage: but this plan is defined by the definition of a plan as a mental schema. If we redefine cognitive planning as the mental activity that creates *or modifies* a mental representation of the text, then this is the activity that occupies a planner before writing sentences, and later when reviewing. A discoverer writes sentences before creating a mental representation of the text.

Further confusion is created when two definitions of planning are also used in the same text; these correspond to the two definitions of a plan. The first is that planning is the activity that produces an external representation of ideas, while the second is that planning is the activity that produces a mental schema of the text. On the one hand, in the case of the planner, it appears that planning is an essential prelude to writing continuous prose; but this kind of planning is the planning activity that produces an external representation of ideas. On the other hand, in the case of the discoverer, it appears that writing continuous prose is an essential prelude to planning; but this kind of planning is the planning activity that produces a mental schema of the text.

On the one hand then, in defining cognitive planning as the mental activity that creates or modifies a mental representation of the text, we have assumed the existence of a text; some kind of writing activity must serve as a prelude to this type of thinking. On the other hand, some kind of thinking must precede writing, and to describe this initial thinking, we have to resort to a general definition of planning as a reflective activity, or the definition of planning as an activity that produces an external representation of ideas.

Is there a way of reconciling these different notions of plans and planning? The problem is that these notions are diametrically opposed, which suggests that the only escape is to avoid using the terminology of planning. The term is applied to different types of thinking, and can be equivalent to thinking. Sometimes a plan refers to a mental schema; sometimes it refers to an external-isation of ideas. Instead of using a term whose ambivalence appears to be unavoidable, perhaps we should return to the consensus that all writing involves thinking, writing, and reading.

5.3 A BASIC MODEL OF WRITING

There is another reason for basing a model of writing on these activities rather than writing operations. Writing operations require a medium of writing. In chapter three, we said that Hayes and Flower's definitions of planning, translating and reviewing are based on observations of writers who work in a medium of pen and paper, and that these definitions need to be reviewed in the light of electronic writing behaviour. Moreover, their definitions of writing operations confuse three types of processes, as we have seen above: motivational, metacognitive and cognitive. Discussing their model of writing in more detail in the last chapter, we looked for some way in which it might represent a consensus model of writing. We concluded that the operations of planning, translating and reviewing could be considered as general operations that apply to different types of writing, and to different media of writing - but only if we translate them into the activities of thinking, writing and reading. So, instead of modelling operations, let's model these activities.

We called the Hayes and Flower model of writing operations an information processing model. Modelling writing as information processing results in the sequential model of writing operations that Hayes and Flower attempt to escape - the model of "Plan, Draft and Revise": In chapter three, we discussed the view of writing behaviour as a cycle of engagement and reflection, a cycle

that Sharples refers to as the "rhythm of writing" (Sharples 1993). Here, we apply that notion to the three activities of thinking, writing and reading. Taking into account the discussion of writing behaviour, we suggest the model of writing given by Figure 5.

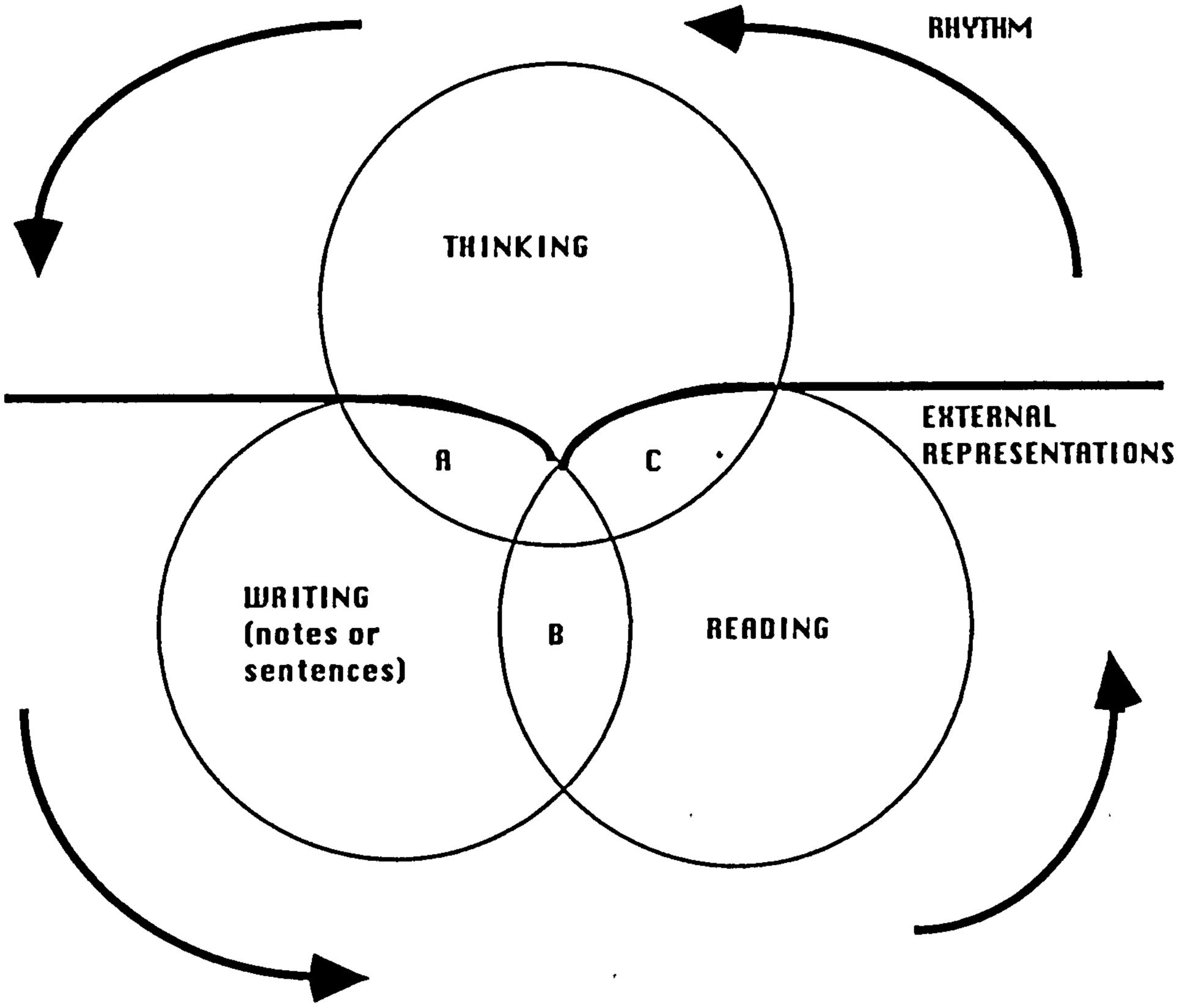


FIGURE 5: A BASIC MODEL OF WRITING

The model accounts for the strategies of "Plan, Draft and Revise", "Outline and Draft" and "Draft and Revise" as follows. Pursuing the first strategy, a writer engages in the thinking activity that we referred to as one definition of planning; that is, planning as an activity that produces an external representation of ideas. According to Hayes and Flower, this involves remembering (thinking), writing notes (writing), and organising these notes into a plan (reading, thinking and writing). On the

second cycle, a writer is engaged not only in externalising ideas but also in creating a mental schema of the text. The plan, which can refer to a mental schema or written notes, is then used as a guide to writing a draft (reading, thinking and writing). The reviewing stage involves a further cycle of reading, thinking and writing.

Pursuing a strategy of "Outline and Draft", a writer engages in a similar cycle of remembering (thinking), externalising ideas into notes (writing), and either writing a draft while using the notes as an outline (reading, thinking and writing), or organising them further (another cycle of reading, thinking and writing). Pursuing a strategy of "Draft and Revise", a writer engages in a cycle of remembering (thinking), drafting (writing) and revising (reading, thinking and writing). However, on this occasion, a writer externalises ideas into continuous prose; that is, writes sentences rather than notes. In describing this method of writing as "writing without a plan", we are using a plan to refer both to a mental schema of the text and to written notes.

How does the model account for discovery? Discussing the notion of discovery in chapter three, we compared the anecdotes of Hilary Mantel with the accounts of behavioural psychologists. We labelled Mantel a discoverer on the basis of her approach to writing, a method she describes as "growing a book" (Mantel 1993, p.41). This involves writing notes and collecting index cards of words, phrases and ideas until "one day I see a sequence, a logic, begin to emerge" (Mantel 1993, p.40). In relation to Figure 5 then, Mantel engages in several cycles of thinking, writing and reading before creating a mental schema of a text and writing sentences; this writer appears to discover a structure for her novel. In contrast, Josephine Hart (1993) spends a long time thinking about an entire novel before writing a word, followed by a relatively short time writing. We labelled Hart a planner in comparing her approach with Mantel's. However, the difference between these approaches can be explained by referring to the cycle of thinking, writing and reading. While Mantel pursues several circuits in accumulating notes, Hart pursues two or three in writing

sentences. According to the romantic view, discovery occurs when a writer writes continuous prose. Although Mantel writes without a plan, her writing consists of notes rather than continuous prose. Referring to our model, we could label her as a planner who spends a long time planning; a plan as a mental schema is what she appears to discover.

In the model is a line that delineates external representations. This line marks the distinction between activities that do not involve handling external representations (above the line) and activities that do (below the line). Above the line, a writer is preoccupied with thinking. As Figure 4 shows, a writer's thinking includes motivational, metacognitive and cognitive processes. In Figure 5, it is the latter type of thinking that is represented. Below the line, a writer is engaged in the activities of writing or reading, and external representations are implied by these activities.

The circles are overlapping to represent the cases where two activities are indistinct or concurrent. These cases are labelled as A (a concurrence of thinking and writing), B (a concurrence of writing and reading), and C (a concurrence of reading and thinking). Under what conditions do two activities become indistinct? These situations all occur below the line of external representations; above the line, a writer is preoccupied with thinking. In cases of concurrence then, thinking is not carried out as a separate activity, but remains attached to the activities of writing and reading. At A there is an overlap between thinking and writing. Here, a writer is externalising ideas into writing without the mediation of reflective thinking. This situation arises when a writer is pursuing a strategy of "Draft and Revise" and writing spontaneous continuous prose; in the romantic view, this is the strategy that leads to discovery. The situation also arises with the technique of brainstorming when a writer captures thoughts as soon as they occur, with confessional writing, and with the writing of the possessed that Plato mentions.

At C there is an overlap between reading and thinking. This situation is a consequence of the techniques and strategies just

described. The results of Galbraith's experiments in discovery suggest that discovery occurs, not in the process of generating spontaneous prose, but in the subsequent process of reading and thinking (Galbraith 1991, p.154; Galbraith & Reed 1994, p.98). Discovery is achieved by the modifications to mental schemata that occur at this stage. Hilary Mantel discovers a mental schema over a long period of note writing and reflection. For some writers however, reflective activity only occurs when writing continuous prose and reading the results; for these writers, external representations are essential for reflective thought. In the case of the writer who pursues the strategy of writing spontaneous prose, the discovery that results from thinking is achieved in reading.

The above observations take into account the discussion of writing behaviour in chapter three. However, while the strategy of "Draft and Revise" can be carried out in any medium, the concurrences that we have just described are frequently reported as a specific feature of composing with a computer. On the one hand, reports of writing behaviour show a two-fold concern for the absence of planning before student writers compose, and the absence of revision after composing. On the other hand, an alternative view of writing behaviour is given by Williamson and Pence (1989); the student writers who are labelled recursive revisers plan and revise as they write. In either case, the tendency that dominates student writing is the laboratory effect; that is, the tendency for all thinking, writing and reading to take place in the writing laboratory. In this situation, thinking, writing and reading are on-line activities; thinking occurs, not as a separate activity, but concurrently with the activities of writing and reading. At B there is an overlap between writing and reading, and we are suggesting that this situation arises with on-line composition. The recursive reviser, therefore, cycles around each of the zones labelled A, B and C.

In the centre of Figure 5 is the hypothetical place where thinking, writing and reading all occur simultaneously. Following the observations of Noel Williams on student writing (Williams

1992a, p.15), one could argue that some writers seem to achieve this state of nirvana with minimal effort.

How does the basic model compare with other models of writing? Is the model capable of handling information processing? Can the model be tested? What are the implications for software design?

In chapter two, we noted that different kinds of models may undergo different kinds of tests, and that testing tends to reflect the derivation and purpose of the model. The basic model of Figure 5 is based partly on the observations on writing behaviour in chapter three, and partly on the two cognitive models discussed in the last chapter. It is a construction that serves to summarise the results of those investigations. We have taken into account the argument that differences in writing behaviour can be explained by the notion of a rhythm of writing (Nash 1980, Sharples 1993), and found evidence to support that argument (Williamson & Pence 1989). As we pointed out in chapter two, a model based on writing behaviour may need to be revised in the light of new observations, and this is one test of the above model. If there is evidence of writing behaviour that can not be explained by the model, then the model will need to be amended.

The second justification for the model rests on the two cognitive models discussed in the last chapter. Sharples and Pemberton (1992) make the distinction between external and internal representations, a distinction that is reflected in the basic model. However, this distinction becomes blurred in the Hayes and Flower (1980a) model, as does the distinction between motivational, metacognitive and cognitive activities. We also identified problems with their notion of the "translation" process, in which semantic propositions are transformed into syntax. For a further discussion of the linguistic assumptions underlying this notion, we must wait until the next chapter. We have sometimes used the term "generate" to refer to the physical activity of writing text, whether notes or sentences, while Hayes and Flower use the term to denote recall. In the last chapter, we showed how

it was possible to deconstruct the operations of "planning", "translating", and "reviewing", and reconstitute the activities of "thinking", "writing", and "reading". We will now show how those operations can be reconstructed from the basic model.

If we remove the motivational and metacognitive elements from Hayes and Flower's (1980a) definition of planning, then the remaining (cognitive) element of planning consists of "generating" or recall (included in thinking on the basic model), note-taking (included in writing), and organising (transforming notes into a plan). So for certain kinds of planning, writers are concerned with thinking and writing, but not with reading their text, and this activity is omitted from the cycle (Figure 6); we return to the case of organising below In the case of reviewing on the other hand, writers are concerned with reading and thinking, but not with writing, so that this activity is omitted from the cycle (Figure 7). In the case of editing, Hayes and Flower argue for a production rule system, so that editing is fired automatically under certain conditions. As editing is an automatic process, in this case it is thinking which is omitted from the cycle, while reading and writing - in this case, correcting - remain (Figure 8).

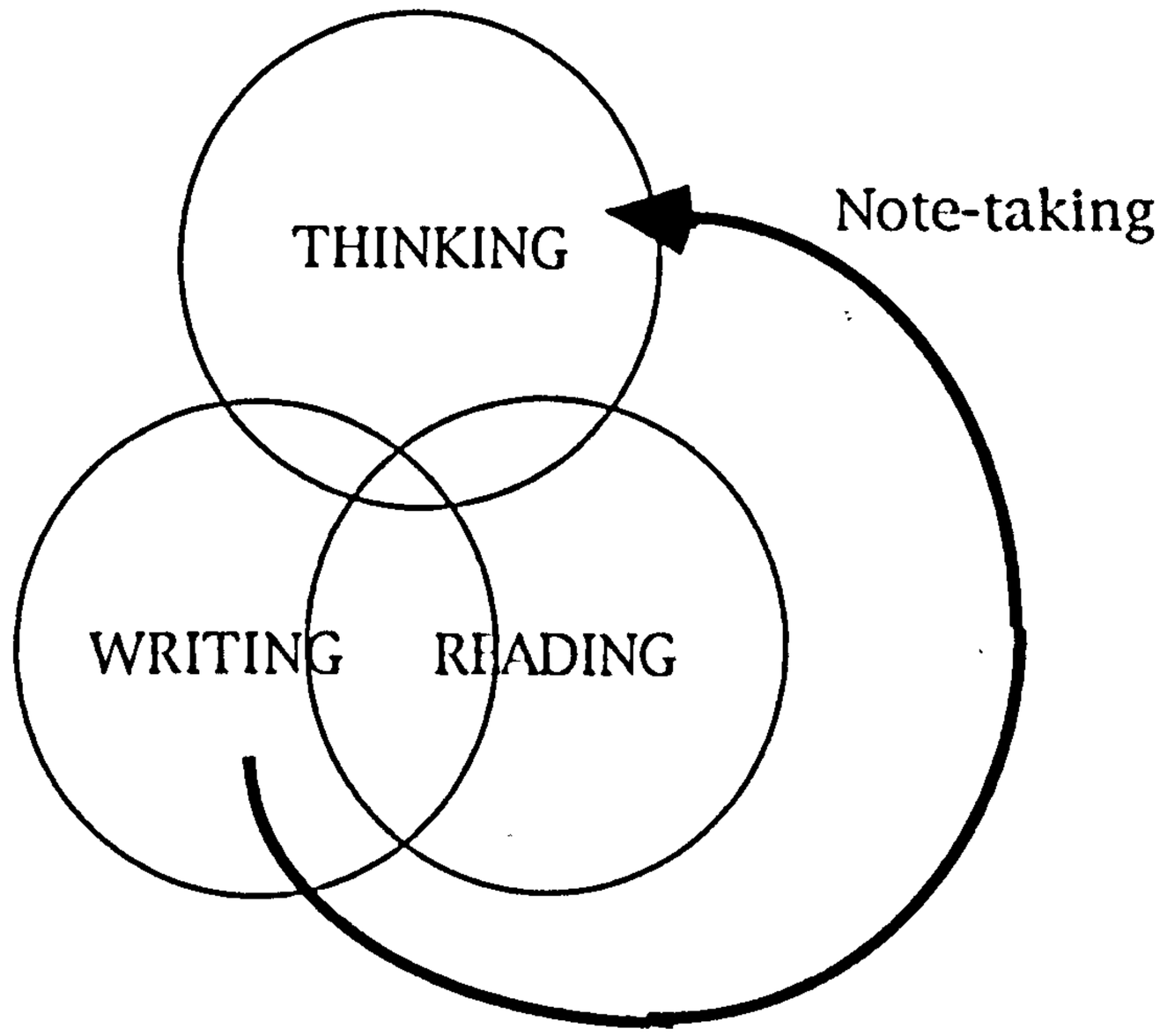


FIGURE 6: THE BASIC MODEL AND PLANNING

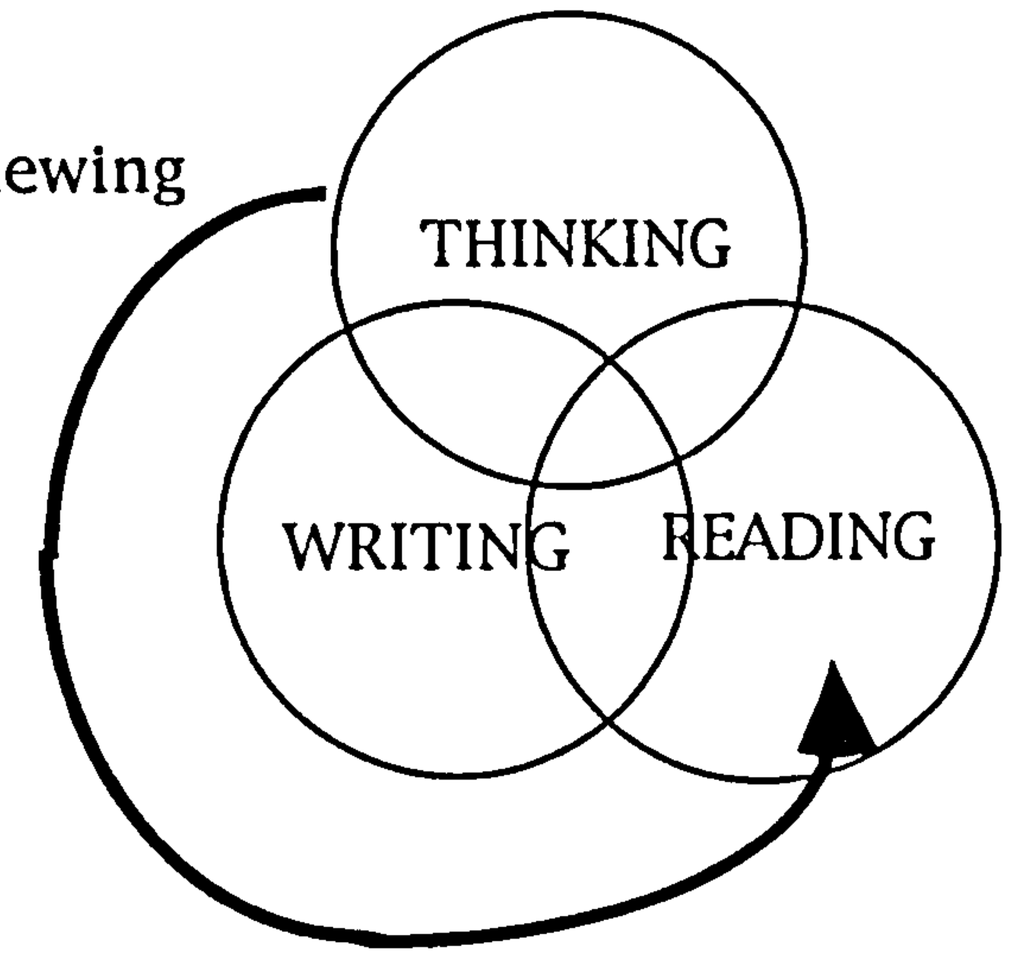


FIGURE 7: THE BASIC MODEL AND REVIEWING

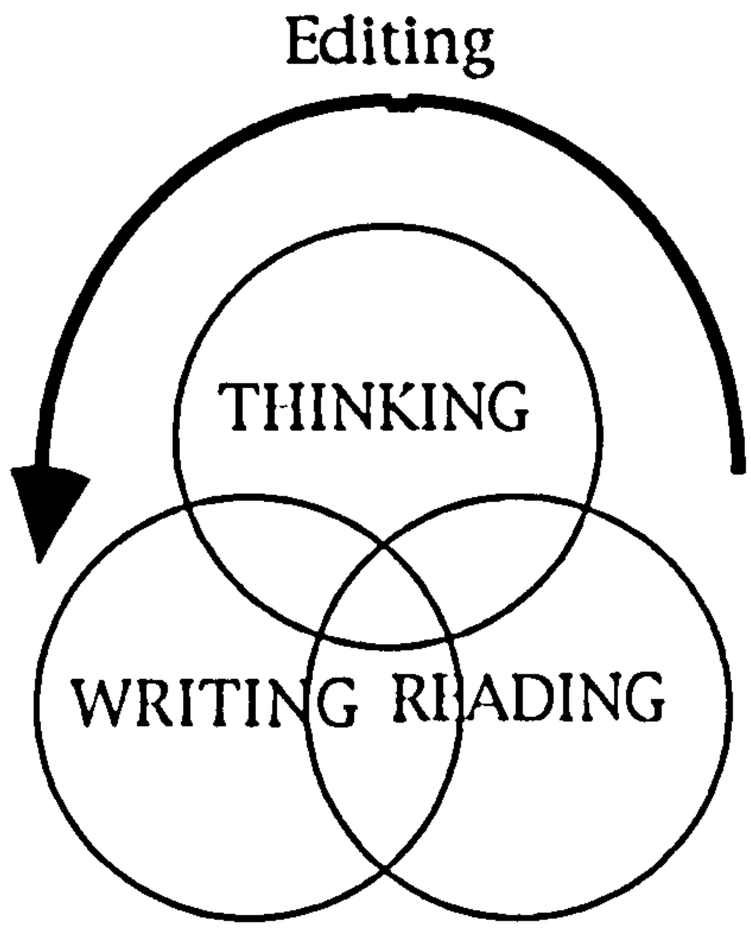


FIGURE 8: THE BASIC MODEL AND EDITING

In the case of translation however, writers are engaged in all three activities of thinking, writing, and reading; reading is necessary in order to create the "acceptable" cohesive sentences that fit Hayes and Flower's (1980a, p.15) definition of this operation. As translation consists of all three activities, this provides one explanation why student writers find this aspect of writing particularly difficult. In the case of organising, we face the problem we have discussed in this chapter - that of knowing whether a plan is a mental schema or a written outline. In the former case, organising is similar to reviewing and consists of reading and thinking; in the latter, organising is similar to translating and consists of all three activities.

Given that the Hayes and Flower model can be reproduced from the basic model, we could argue, therefore, that the basic model is a consensus model, and that there is no need for any tests - all we have done is merely represent the consensus model in a different fashion, so that the test will be a coherent argument that the Hayes and Flower model cannot be interpreted in this way. Of course, we would need to add the task environment and the writer's long-term memory to the diagram of Figure 5. We would also need to add the monitor - the monitor would decide what activities are to be omitted from the cycle; the result would be the operations observed by Hayes and Flower. The model could then handle information processing by inserting the appropriate inputs and outputs in the appropriate places: an initial instruction (the input of "reading"), followed by various cycles of activities that merely reproduce the Hayes and Flower operations as shown above, with a final output stemming from "writing", or "reading", depending on how assiduous our machine is in reviewing and correcting.

The basic model is lacking in details, apart from the obvious omission of the task environment and the writer's long-term memory: for example, of different kinds of reading strategies, of different kinds of thinking processes, and of different kinds of memory input. However, these details can not be identified at this stage of our investigation, and may vary according to the type of

text a writer is producing. Our aim is now, therefore, to develop this basic model into a model of fiction writing, and to fill in those details as we proceed. Firstly however, we need to discuss the computational consequences of the model, and in order to do that, we need to return to the question that was asked at the beginning of the chapter.

5.4 COGNITIVE PLANNING AS TEXTUAL STRUCTURING

At the start of this chapter we raised the question whether the sort of planning understood by the model of "Plan, Draft and Revise" is the same as the planning of the "recursive reviser" (Williamson & Pence 1989), and we suggested that a planning aid would assist both types of writing behaviour if that were the case.

The above discussion has highlighted the ambivalence in notions of plans and planning. Firstly, a plan can be defined as a mental representation of the text. On the one hand, a plan as a mental schema is created and modified by thinking; on the other hand, writing notes or sentences is necessary for this type of thinking to occur, and a mental schema changes with writing. Cognitive planning is a mental activity, but writing of some kind is a necessary preamble to this activity. For some writers, this entails writing prose. Secondly, a plan can be defined as an external representation of ideas, and planning as the activity that results in this representation. This is the definition of planning to which we must turn when describing a writer's initial thinking, before any text has been generated and before a mental schema of a text can be created.

In the light of these observations, let's return to the question whether the planning understood by the model of "Plan, Draft and Revise" is the same as the planning of the recursive reviser. In the first case, planning is a reflective activity that results in an externalisation of ideas. In the second case, planning is the mental activity that creates a mental representation of the text. As explained above, the recursive reviser cycles around the

A, B and C zones in Figure 5, and with this strategy of writing, a plan is achieved by on-line manipulation of the text (using the technique of cut and paste, for example). On the one hand therefore, these activities are not the same; but on the other hand, we are using different definitions of planning to describe these activities.

If we reconsider these activities using the same definition of planning, then we arrive at two possible conclusions. On the one hand, if a plan is an externalisation of ideas, then both strategies involve planning; while the first involves externalising ideas by writing notes, the second involves externalising ideas by writing sentences. On the other hand, using the alternative definition of planning, both strategies involve creating a mental schema; the first by reading and manipulating notes, the second by sentences. If we are consistent and use the same definition of planning in considering these activities, they turn out to be the same.

These remarks apply in a similar fashion to the behavioural taxonomy of planners and discoverers. Given the definition of a plan as an external representation of ideas, then the spontaneous prose generated by discoverers must also be a plan. On the other hand, planners and discoverers both create schemata; the first by reading and manipulating notes, the second by sentences.

Because of the ambivalence in different notions of planning, we suggested abandoning the terminology. There is a further reason for an alternative terminology, and it concerns the labels of planners and discoverers. The problem with these labels is that they assume the romantic view of discovery; that is, that ideas are discovered by writing without a plan. In the classical view, ideas are discovered by invention or planned rhetorical organisation. Both positions assume that ideas are discovered, the difference between them is how this occurs: by invention, or by writing without a plan.

Flower and Hayes have a marked preference for planning. They point out that, as well as a benefit to the writer in reducing

constraints, "planning has another virtue; it is a highly teachable strategy" (Flower & Hayes 1980a, p.43). In comparison, teaching discovery presents problems:

> "Discovery... is a perplexing notion. On the one hand, it metaphorically describes an intellectual process we want to teach. On the other hand, the metaphor and mythology of discovery itself often distorts our vision of the process."
> (Flower & Hayes 1980b, p.22)

They argue that "the myth of discovery... is based on the premise that hidden stores of insight and ready-made ideas exist, buried in the mind of the writer, waiting only to be 'discovered'"; this mythology "obscures the fact that writers don't *find* meanings, they *make* them" (Flower & Hayes 1980b, p.21). Invention, rather than discovery, seems a more appropriate term to describe a creative process of making meanings. If we adopted the classical view of discovery, we would attach alternative labels to writing behaviour: a division of writers into inventors and non-inventors, for example, rather than planners and discoverers.

We defined cognitive planning as a mental activity that creates or modifies a mental representation of the text. All writers initially write without a plan as a mental schema, and all writers develop a schema by thinking. What is it that discoverers discover and inventors invent? In both cases, Galbraith claims the result is ideas (Galbraith 1991, Galbraith & Reed 1994). But these ideas are only achieved by writing. In both cases, these ideas are mental schemata that depend on writing for their existence and therefore obey the definition of a plan as a mental representation of the text. In the romantic view, cognitive planning is a process of discovery. In the classical view, cognitive planning is a process of invention. From the perspective of cognitive planning however, discovery is invention, and if we use the term "textual structuring" to describe this mental activity of making meanings, then we can abandon the terminology of writing behaviour - the terminology of planners and discoverers, or inventors and non-inventors. All writers engage in textual structuring, which is illustrated by Figure 9.

In Figure 1, the process of writing is represented as a cycle of engagement and reflection - the "rhythm of writing" (Sharples 1993). Invention traditionally refers to the movement in Figure 1 between reflective activity and planning or outlining activity. However, this movement is represented in Figure 5 by the cycle of thinking, writing (notes), reading (notes), and thinking. Meanwhile, discovery traditionally refers to the creation of continuous prose, the engagement in Figure 1. However, we have suggested that discovery occurs, not in writing, but in the movement between reviewing and reflective activity. This sequence of events is represented in Figure 5 as a cycle of thinking, writing (sentences), reading (sentences), and thinking.

In Figure 5, the process of writing is represented as a cycle of thinking, writing and reading. On the one hand then, invention and discovery can both refer to a sequence of these activities. In this case, the difference between them is whether a writer is writing, reading and manipulating notes (invention) or sentences (discovery). On the other hand, invention and discovery can both refer to a mental activity, the creative process of making meaning. We have used the term textual structuring to describe this activity. In the cycle of activities illustrated by Figure 5, textual structuring is the mental activity that occurs before writing text, and after reading text. In this case then, invention is the mental activity of textual structuring that occurs before writing, while discovery refers to the textual structuring that occurs after reading.

If we apply the rhythm of writing, illustrated in Figure 1, to the model of writing illustrated in Figure 5, the result, therefore, is Figure 9. Figure 9 represents the process of writing as a cycle of invention and discovery. Following Sharples, we describe this cycle as the rhythm of textual structuring or, simply, the rhythm of thinking.

To conclude, we defined cognitive planning as a mental activity that creates or modifies a mental representation of the

text. To escape the ambiguities that surround the terminology of planning, we have used the term textual structuring in a similar sense to describe the mental activity of creating meaning. The process of writing is a cycle of thinking, writing and reading (Figure 5), and textual structuring is the mental activity that occurs before writing (invention), and after reading (discovery).

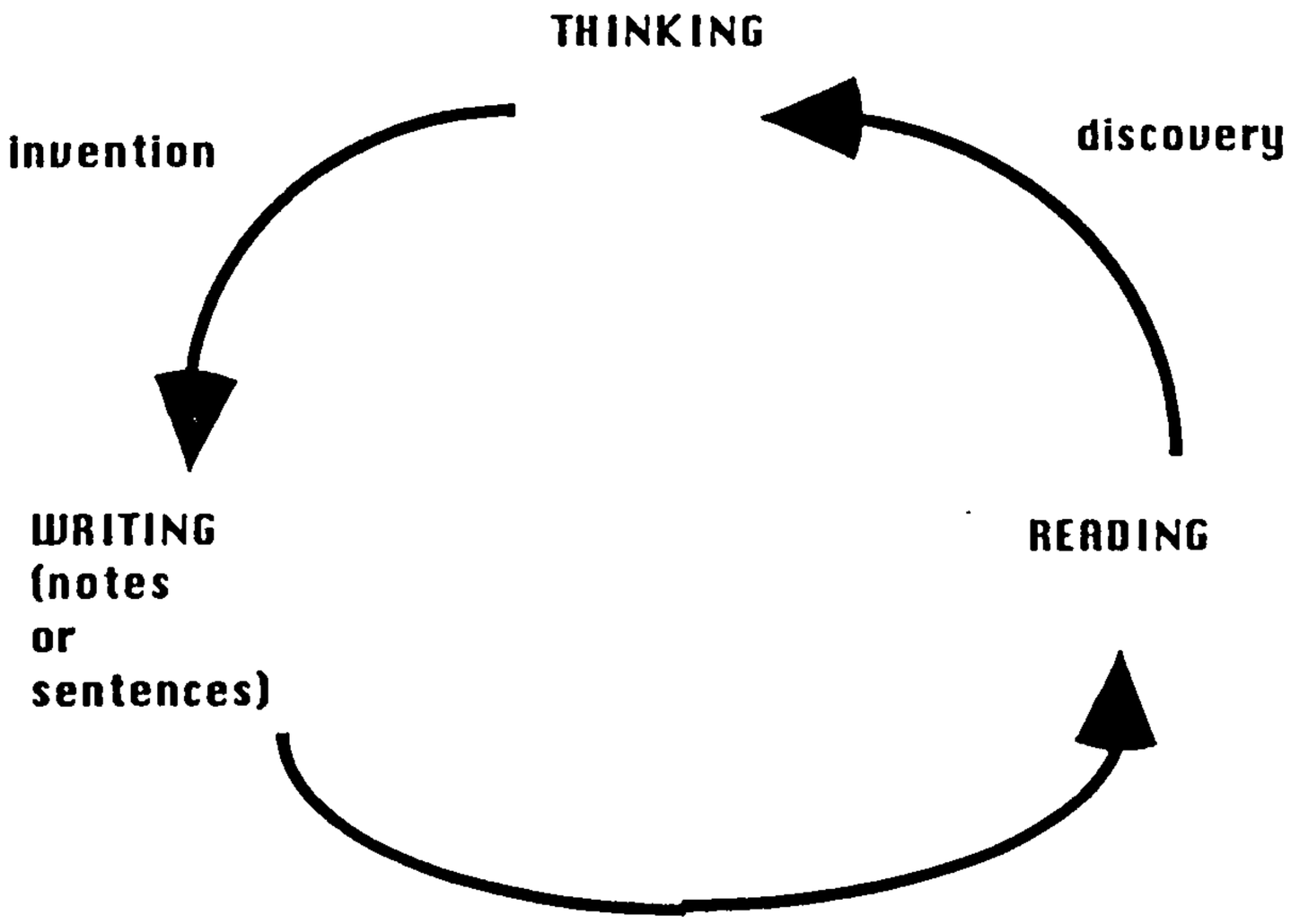


FIGURE 9: THE RHYTHM OF THINKING

This mental activity is assisted by writing notes or sentences, and by reading and manipulating them. Let's see how writing software helps writers in this activity.

5.5 WRITING SOFTWARE AND TEXTUAL STRUCTURING

Textual structuring was defined as a mental activity of making meanings, in which a writer creates or modifies a mental schema of a text in production. Given the discussion of writing behaviour in chapter three, we can suggest two ways in which this activity is assisted. The first is by writing and manipulating notes: that is, by generating, reading, editing, and ordering notes. The second is by syntactic manipulation. There are three ways in which writing software, in turn, can assist writers in textual structuring. The first method is to provide help with the manipulation of notes or sentences. The second method is to provide direct assistance with creating a mental schema. In this case, writing software is helping a writer to think, and thinking is helping a writer to write. The third method is to provide assistance in generating text. In this case, writing software is helping a writer to write, and writing is helping a writer to think. Taking these methods in reverse order, let's look at how textual structuring is assisted by current writing software.

WRITING

According to Kellogg's (1989) review of planning and composing aids, there are two ways in which writing software can encourage a writer to generate text. The first method is to provide some kind of event if a writer pauses too long between keystrokes. In one of Kellogg's examples, the screen starts flashing. In another, the software "automatically types a series of "Xs" if the writer takes more than a second between keystrokes" (Kellogg 1989, p.71). He calls this method an aid to "free writing" or "rapid writing":

> "free writing... refers to rapid writing, following whatever transient plan is available, without extensive planning or reviewing... It involves quickly writing off the top of one's head in a stream of consciousness manner."
> (Kellogg 1989, pp.70-71)

The second method of encouraging a writer to generate text is to provide a blank screen, so that the writer simply concentrates on the keyboard. Williams argues that this forces the writer to generate text without having to think about editing or reviewing (Williams 1991a, p.46). Kellogg calls both types of software "funnels"; given that writing is a process of juggling constraints (Flower & Hayes 1980a), he argues that funnels enable the writer to concentrate on one Hayes and Flower operation, such as "translating", while ignoring the others, such as "planning" or "reviewing". The second type of software - that of "invisible writing" - is also an aid to "free writing" according to Williams; in his view, "free writing is a useful technique for overcoming writer's block" (Williams 1991a, p.46).

THINKING

Given that the model of writing most often found in writing software is "Plan, Draft, and Revise", software that is intended to assist thinking is usually called "pre-writing" software (Williams 1991a, pp.45-46). According to this model of writing, pre-writing is the stage where ideas are discovered or invented (Flower & Hayes 1980a, p.32; Haas 1989, p.182); thus the purpose of pre-writing software is to assist the writer in forming, clarifying and ordering concepts (Kellogg 1989, p.72). Kellogg argues that "to assist with idea generation, a computer should serve the function of an inventor" (Kellogg 1989, p.72). According to Kellogg, the type of software called "idea generators" or "inventors" adopts a question and answer dialogue with the user, and uses heuristics derived from rhetorical theory, such as Aristotle's *Topics,* or linguistic theory, such as Pike's "tagmemes" (Kellogg 1989, pp.72-75).

The aim of a second type of pre-writing software - the "idea processor" - is to encourage a writer to specify the relations between her ideas. There are two varieties of this type of software. Each offers a particular method of specifying relations between ideas, and these methods depend on the data structures

which the software uses to represent ideas and the relations between them. The two types of data structure are the *tree* and the *graph* (Bamford & Curran 1987, Kruse 1989). In either case, an idea is represented as a *node*. In the case of a tree, a node can be visualised as a leaf at the end of a branch, while the links between the nodes can be visualised as the branches that connect the leaves. In the case of a graph, a node is a *vertex* connected by *edges* or *arcs*. A graph can be visualised as a map of villages and footpaths, with the set of nodes as the villages, and the edges or arcs as the footpaths which connect them. The difference between the two data structures is that one is a hierarchy, while the other is a network.

Kellogg describes these two methods of specifying relations as top-down and bottom-up. According to Kellogg, "the top-down method of organizing is to impose a hierarchical outline or tree structure on ideas" (Kellogg 1989, p.75). Using an example of this type of software, a writer creates a list of ideas and is helped to find the "hierarchical-category relationships" among them; "after developing the hierarchy, the program displays the resulting tree structure" (Kellogg 1989, p.75). The second method is to create a network of relations between ideas; Kellogg calls this method of organising bottom-up. He cites one example in which a program asks for a list of ideas, arranges them as another list of all possible pairs, and presents each pair in turn. It asks the writer if each pair is related, and if so, the writer is asked to specify the nature of the relation from a menu of possible relations: "After the relations are specified, the program displays in a graphical network each idea as a node, the links from each node, and a label indicating the type of relation for each link" (Kellogg 1989, p.75). Examples of such links are "is-an-explanation-of" and "is-an-example-of".

A third type of software assists thinking of the motivational rather than cognitive kind. While the aim of "rapid writing" software is to increase anxiety, the aim of "therapeutic" software is to reduce it:

> "To deal with affective problems connected with writing, the computer should serve as a therapist. Aids that try to reduce the anxiety, frustration, and lack of confidence of the writer serve the therapist function."
> (Kellogg 1989, p.76)

Kellogg points out that a therapeutic approach is frequently "embedded" in the question and answer dialogue of "inventory" software; for example, the computer might offer praise or encouragement when the student responds (Kellogg 1989, p.76). Finally, a fourth type of software "presents menus and prompts to lead a writer through a standardized genre, such as a monthly business report" (Kellogg 1989, p.72).

NOTE MANIPULATION

Note taking and storing is supported by specialised hardware devices, by the software environment in which many word processors operate, and by dedicated software tools. Noel Williams discusses the use of portable computers and databases for this purpose, and claims that a database of factual information or quotations can be useful to student writers (Williams 1991a; pp.52-53). The software environment of many word processors supports note taking and storage by the use of windows: multiple files can be open simultaneously, so that a writer can use a set of files for taking and accessing notes, another set for the text in production, and the technique of "Cut and Paste" for incorporating notes into the main text. Williams also discusses how to annotate the text in production by using particular markers, such as "μ" for example (Williams 1991a, pp.54-55). In addition, some writing software is designed specifically for taking notes, and runs in the background while the writer is using other software; Williams cites a program which displays notes in "pop-up" windows when it is invoked by the writer (Williams 1991a, p.56).

Ordering notes is an aspect of the operation that Hayes and Flower (1980a) call organising, a sub-process of planning. Traditionally, this is an activity that a writer has carried out with

pen and paper. Traditionally, it is also associated with pre-writing, and the kind of software that enables a writer to order notes is a variation of the pre-writing software that was described above - the "idea processor". Note ordering software is based on the same data structures (the tree and the graph) so that the two methods of ordering ideas (hierarchy and network) also apply to the ordering of notes. The hierarchical method is used in what are called "outliners" or "outline processors". Outliners enable writers to generate notes according to a hierarchy of headings, super-ordinate categories, titles, topics, themes, concepts or *names* (Wayner 1992; Smith & Lansman 1989, pp.42-44). Compared with a table of contents, outlines are more dynamic in that they enable writers to re-order notes by moving the titles to which they are attached, rather than the notes themselves. However, Williams argues that students find outliners difficult to handle: "Essentially they constrain a writer to create a hierarchical tree structure, which some find foreign and which, for certain kinds of text, is not always the most natural approach" (Williams 1991a, p.50).

The second method of ordering notes is used in what are called "network processors". In this case, the arrangement of nodes and links that was described above is used to order notes rather than ideas; notes are attached to nodes, and the links between the nodes form a "notes network". This is one example of the ways in which hypertext can be used to design tools for writers. Kellogg describes one such application called "NOTECARDS", in which notes are stored on the "cards" of a hypertext: "the program permits the writer to label relations, using, for example, the rhetorical relations of evidence, comment and argument" (Kellogg 1989, pp.75-76). Some writing environments give writers a choice of three methods of ordering notes. Sharples and colleagues describe a "Writer's Assistant", with which a writer can order text in a linear fashion, in an outline fashion, or by creating a "notes network" (Sharples, Goodlet & Pemberton 1989). Smith and Lansman describe a writing environment which also offers these three possibilities (Smith & Lansman 1989, pp.40-42)

SENTENCE MANIPULATION

There are two ways in which writing software assists sentence manipulation. The first allows for the manipulation of syntax by providing tools such as "grammar" or "style" checkers (Williams 1991a, pp.74-77). Such tools often give a measure of "readability" (Williams 1991a, pp.64-68). However, grammar checkers do not always provide explanations for their suggestions, nor do they provide any explanation of the readability measures which they adopt. Writers therefore need to interpret the information which they provide, and students may find this information mystifying. In Williams' view, "the popularity of readability formulae is as much a result of the ease with which they can be implemented on a computer as of any validity they may have" (Williams 1991a, p.66). On the other hand, grammar checkers can be useful in detecting features that the writer may not otherwise notice.

The second way in which writing software assists sentence manipulation is through a variation of the "outline processor". Some outliners enable the writer to manipulate sentences within a document by displaying the topic sentences of each paragraph. Kellogg cites a program that displays the first and last sentences of each paragraph; in another example, a program can select "any sentence specifically designated by the writer as a topic sentence" (Kellogg 1989, p.70). This type of software therefore enables the writer to manipulate a paragraph by manipulating the topic sentence, in a similar fashion to the manipulation of notes described above. With this type of software, a writer can structure a document by writing, editing and ordering topic sentences.

SOME PROBLEMS

There are two basic problems with some of the writing software described above. The first is a result of the model of writing which has informed their design, while the second is a result of the data structures on which the software is based. As Williams points out,

most writing software is based on the model of "Plan, Draft, and Revise", or "Pre-write, Compose, and Post-write" (Williams 1991a). Pre-writing is the stage where ideas are discovered or invented. From this perspective, ideas are seen as separable from language, as Saussure comments. For example, Collins and Gentner argue "it is important to separate idea production from text production" (Collins & Gentner 1980, p.53), and it is this view of writing which informs the design of "inventors" and "idea generators". The assumption is that writers need to sort out "ideas" before text, and that the clarification of ideas is an autonomous process that has no connection with writing. Yet writing involves the ordering of notes rather than ideas, and as Sharples and Pemberton remark, "physical marks are not ideas" (Sharples & Pemberton 1992, p.326). The problems of using this type of software have been indicated by Winterbauer (1992), who discusses a pre-writing aid intended for student writers. This discussion highlights the problems that can arise when the activities of thinking and writing are separated:

> "Students generally thought the approach was interesting but they objected to the time required to develop a topic. They believed that the approach was too exhaustive, and it caused them to spend more time than they wanted on an activity (prewriting) that they did not particularly enjoy." (Winterbauer 1992, pp.175-176)

Although "inventors" and "idea generators" might assist logical thinking, this thinking may not have any relation to the text a writer needs to produce. A related problem with inventors is that the Aristotelian exercises which they often incorporate may be too abstract for students to transfer the results to the text they need to write. A further problem is that the question and answer dialogue, which is intended to have a therapeutic function, also attributes the computer with an "intelligence" that it does not possess.[1]

---

[1] See, for example, Greene's discussion of "ELIZA", in Greene 1986, pp.105-107.

"Idea processors" merely perpetuate this distinction between thinking and writing, so forming relations between ideas, whether by a hierarchy or by a network, may also not have any connection with the text that a writer needs to produce. This only occurs when idea processors allow for note taking; that is, with the software known as "outline processors" and "network processors". In that case however, we face the second problem concerning the data structures on which the software is based. With the "outliner", the problem is whether the tree is an appropriate model for structuring the text. With the non-linearity of a network, we face the linearisation problem. Notes can be "cut and pasted" from a hypertext into the text in production, but in developing the linearity of an argumentative text, these notes may still have to go through a process of re-ordering.

In this review of writing software, we have been guided by the basic model of writing represented by Figure 5, and by the subsequent discussion of textual structuring. In other words, the model has provided a framework for examining how software tools assist writers; this is one of its computational consequences. Kellogg (1989) assumes a "pre-write", "write" and "post-write" model of writing, and as we have seen, this model is implicit in many of the tools we have discussed. If we view the tools from the perspective of an alternative model of writing, then we would have to impose a different set of categories onto the tools in question, as we have done above. The second implication of the model is that tools intended to help "pre-writing" will not be of much use to writers, unless they offer the facility for note-taking, and unless they are integrated into the writer's software environment. In addition, they should also be seen as relevant to the text that a writer is producing. As noted above, "pre-writing" tools that consist of Aristotelian exercises are generally seen as interesting but irrelevant to the task at hand (Winterbauer 1992). A further implication of the model is that software designers need to cater for the different reading strategies of writers who work with electronic text; we shall discuss strategies of reading in chapter nine.

5.6 CONCLUSION

In this chapter we identified three kinds of planning. One sort is concerned with a writer's motivation, while the other two are concerned with metacognitive and cognitive processes. We showed how differences in writing strategies are related to differences in thinking processes, and how all these differences are tied up with differences in planning. We also identified a problem with the literature on planning, which is whether a plan refers to a mental schema or an external representation of ideas. From the perspective of software design, we asked whether the planning observed in different writing behaviours is the same operation, and concluded that if we are consistent in our definitions, the two sorts of planning were the same.

As a way of resolving the ambiguities concerning notions of planning, we argued for a model of writing based on the three activities of thinking, writing, and reading. Further reasons for this kind of model were provided. We discussed a model of writing based on observations of writing behaviour and the cognitive models of chapter four. We showed how the model accommodates different writing strategies, and how it compares with other models. We then discussed the notion of cognitive planning as textual structuring, and showed how the notion of a "rhythm of thinking" resolves the apparent divergence between invention and discovery in writing. Finally, we asked how software tools assist writers in textual structuring, and identified some problems with tools intended to support planning.

Having looked at writing behaviour, cognitive models of writing, and notions of planning, we now have a basic model of writing. The basic model lacks many details, but these details may vary according to the type of text a writer is producing. Our aim is to develop the basic model into a model of fiction writing, and to do this, we need to identify the kinds of thinking activities that produce fictional texts. What constitutes cognitive planning or textual structuring in the case of fiction writing? The models we have discussed offer no guidance on how different kinds of

writing influence the process of writing. To seek an answer, we now turn to consider linguistic approaches to modelling writing.

CHAPTER SIX:

LINGUISTICS AND MODELS OF WRITING

6.1 INTRODUCTION

In this chapter we look at the ways in which linguistics is used to model writing. In the first part, we discuss the problem of identifying structures in written language. This involves a discussion of Chomsky's (1965) *Aspects of the Theory of Syntax*. The reason for this discussion is that the ideas and arguments of that work, although "out-of-date" in the context of the development of Chomsky's theories, continue to have a major influence on current writing research, and on the ways in which linguistics is used to model writing. We compare traditional grammar with Chomsky's transformational grammar, and show how the latter has influenced the development of story grammars and text grammars. We also show how Chomsky's (1965) ideas influence Culler's (1975) discussion of linguistic approaches to literature. We conclude this discussion of structure by making a distinction between semiological and structural analyses of written language.

In the second part of the chapter, we look at explanations of how the structures identified by textual analysis figure in the structuring activities of writers. One explanation is given by Frederiksen's (1986) model of discourse comprehension and production, and we show how this model is influenced once again by Chomsky's transformational grammar. A further influence of Chomsky lies in the distinction between cognitive and linguistic planning, a distinction that features in current writing research (eg Passerault & Coquin 1994, p.139). We argue that the notion of linguistic planning be replaced by that of syntactic planning, and that syntactic planning is an aspect of cognitive planning. In the course of this argument, we discuss two explanations of how syntax figures in the structuring activities of writers, comparing Witte and Cherry's (1986) account of sentence semantics with Cooper and Matsuhashi's (1983) functional sentence perspective. In conclusion, we highlight Chomsky's influence on linguistic approaches to modelling writing, and identify some problems with the approaches discussed in this chapter.

6.2 STRUCTURE

Some years ago, Graham Hough claimed that "one of the principal dogmas of current critical thought" was the rejection of the distinction between form and content in the literary work (Hough 1969, p.4). In the prevailing view, "the work of literary art is seen as an organic unity, in which matter and manner, thought and expression are indissolubly one" (Hough 1969, p.4). How is this unity to be perceived? One critic who looks for organic wholes is Jean Rousset. He explains:

> "... reading, which is developed in duration, will have to make the work simultaneously present in all its parts in order to be global... Similar to a painting in movement, the book is revealed only in successive fragments. The task of the demanding reader consists in overturning this natural tendency of the book, so that it may present itself in its entirety to the mind's scrutiny. The only complete reading is the one which transforms the book into a simultaneous network of reciprocal relationships..."
> (Rousset 1962, p.xiii)

According to Derrida, "a structuralist reading, by its own activity, always presupposes and appeals to the theological simultaneity of the book, and considers itself deprived of the essential when this simultaneity is not accessible" (Derrida 1978a, p.24). For some critics, the difficulty of achieving a simultaneous reading is associated with the linearity of the printed book (McLuhan 1969, McLuhan 1973, Howell & Douglas 1990). In contrast, the electronic book is seen as a non-linear document which encourages a different kind of reading (Bolter 1991a); the environment of hypertext, for example, can provide "an effective illusion of the simultaneity of experience" (Dickey 1991, p.144).

We shall return to this notion of different kinds of reading in chapter ten. Here, our concern is the structural unity that is perceived when the literary work is presented in its entirety. What kind of structures are perceived in a global reading? According to Derrida, Rousset refers to "spatial models, mathematical functions, lines, and forms" (Derrida 1978a, p.16). While

using spatial or geometrical metaphor, Rousset reduces time to a dimension; "it is only the element in which a form or a curve can be displayed" (Derrida 1978a, p.16). And it is the temporal aspect of reading that must be overturned in order to perceive structure.

As Derrida comments, structure is inseparable from space:

> "Now, stricto sensu, the notion of structure refers only to space, geometric or morphological space, the order of forms and sites. Structure is first the structure of an organic or artificial work, the internal unity of an assemblage, a *construction* ; a work is governed by a unifying principle, the *architecture* that is built and made visible in a location." (Derrida 1978a, p.15)

Now, strictly speaking, although Derrida concatenates spatial models and mathematical functions, there is a significant difference between Euclidean geometry and differential calculus. Euclidean geometry is concerned with the properties of abstract shapes or structures in one, two or three dimensional space, shapes such as lines, squares, and circles. Calculus, on the other hand, is concerned with the relationship between two or more variables, and one of the variables might be time. The formula expressing this relationship, for example $y = 1/x$, produces a particular shape or curve when values for the variables are plotted graphically. In the case of $y = 1/x$, the formula results in a hyperbola.

Moving from geometry to calculus then, we turn from structure to structuring; we are less concerned with the properties of abstract shapes than with the formulae that produce them. Euclidean geometry involves shapes that are static and bounded; differential geometry involves curves of infinite extension in time and space. At the same time, differential calculus is concerned with the infinitely small quantity, with what happens when the difference between consecutive values of a continuous variable approaches zero. Recent discoveries of formulae such as the Mandelbrot set (Gleick 1987) enable computers to represent complex shapes found in nature, shapes which recur in objects of increasingly infinitesimal size: the outlines of clouds, coastlines,

trees, leaves, crystals, grains of sand. Within the framework of Euclid, whose concern is the properties of regular shapes and solids, such discoveries would be impossible to achieve.

While calculus deals with infinitely small and infinitely large quantity, formulae such as the Mandelbrot set raise the question whether an infinite number of shapes can be generated by a finite number of formulae. In the realm of popular fiction, a basic formula of romance and mystery produces an endless number of best-sellers. Yet to generate an infinite number of shapes, do we not require an infinite number of formulae?

This question arises when we consider the problem that prompted much of Chomsky's work in linguistics. He describes this problem in the preface to *Aspects of the Theory of Syntax:*

> "The idea that a language is based on a system of rules determining the interpretation of its infinitely many sentences is by no means novel. Well over a century ago, it was expressed with reasonable clarity by Wilhelm von Humboldt in his famous but rarely studied introduction to general linguistics in 1836... His view that a language makes 'infinite use of finite means' and that its grammar must describe the processes that make this possible is, furthermore, an outgrowth of a persistent concern, within rationalistic philosophy of language and mind, with this 'creative' aspect of language use..."
> (Chomsky 1965, p.v)

According to Halliday and Hasan, the sentence is "the highest unit of grammatical structure" (Halliday & Hasan 1976, p.8). Crystal refers to a consensus among linguists that "the sentence is the maximal unit of grammatical analysis" (Crystal 1971, p.201). He qualifies this claim by pointing out that, although there are units of text larger than the sentence, "the sentence is the largest unit *recognized by the linguist* as being *capable* of accounting for the range of grammatical classes and structures which turn up in a language". So, the sentence is seen by most linguists as the principal structure of written language. It is finite in length, with a well defined spatial boundary marked by the full stop.

Chomsky's task is to define the finite set of resources that can comprehend an infinite number of sentences:

> "A fully adequate grammar must assign to each of an infinite range of sentences a structural description indicating how this sentence is understood by the ideal speaker-hearer."
> (Chomsky 1965, pp.4-5)

The resources are rules and grammars: "by a generative grammar I mean simply a system of rules that in some explicit and well-defined way assigns structural descriptions to sentences" (Chomsky 1965, p.8). Chomsky defines the descriptive adequacy of a grammar as follows:

> "A grammar can be regarded as a theory of a language; it is *descriptively adequate* to the extent that it correctly describes the intrinsic competence of the idealized native speaker. The structural descriptions assigned to sentences by the grammar, the distinctions that it makes between well-formed and deviant, and so on, must, for descriptive adequacy, correspond to the linguistic intuition of the native speaker (whether or not he may be immediately aware of this) in a substantial and significant class of crucial cases."
> (Chomsky 1965, p.24)

In turn, Chomsky defines a linguistic theory as descriptively adequate "if it makes a descriptively adequate grammar available for each natural language" (Chomsky 1965, p.24).

One problem with these definitions is quantity: how large is a substantial class of cases? In distinguishing between well-formed and deviant sentences, a descriptively adequate grammar would need to be consistent. However, logical consistency in dealing with an infinite number of cases is difficult to achieve. Mathematicians have problems proving the consistency of Euclidean geometry:

> "In the various attempts to solve the problem of consistency there is one persistent source of difficulty. It lies in the fact that the axioms are interpreted by models composed of an infinite number of elements. This makes it impossible to

encompass the models in a finite number of observations; hence the truth of the axioms themselves is subject to doubt. In the inductive argument for the truth of Euclidean geometry, a finite number of observed facts about space are presumably in agreement with the axioms. But the conclusion that the argument seeks to establish involves an extrapolation from a finite to an infinite set of data. How can we justify this jump?"
(Nagel & Newman 1989, p.21)

One area where well-formed and deviant sentences are well defined is computer programming. Programming languages vary in their similarity to human languages, but each has its own lexicon and its own syntax. The sequence of symbols written by the programmer is checked for errors by programs called compilers or interpreters. At some stage of writing a program, a programmer will ask the machine to interpret the program; a compiler will then inform the programmer of incomprehensible lexical items and errors in syntax. Chomsky's structural analysis of sentences has been invaluable for the development of computer software, and most compilers are based on this method of analysis (Chomsky 1957, Bornat 1979).

Programming a machine to understand programming languages is a task that requires finite resources. However, using mathematical logic to explain how humans can understand an infinite number of sentences is a task that requires an infinite number of rules:

> "Unfortunately, most of the postulate systems that constitute the foundations of important branches of mathematics cannot be mirrored in finite models... Finite models suffice, in principle, to establish the consistency of certain sets of postulates; but these are of slight mathematical importance. Non-finite models, necessary for the interpretation of most postulate systems of mathematical significance, can be described only in general terms; and we cannot conclude as a matter of course that the descriptions are free from concealed contradictions."
> (Nagel & Newman 1989, pp.22-23)

In Nagel and Newman's summary, Godel's work on logic showed firstly "that it is impossible to give a meta-mathematical proof of the consistency of a system comprehensive enough to contain the whole of arithmetic" (Nagel & Newman 1989, p.58). Secondly, Godel showed that any system "within which arithmetic can be developed... is *essentially incomplete* " (Nagel & Newman 1989, p.58):

> "In other words, given *any* consistent set of arithmetical axioms, there are true arithmetical statements that cannot be derived from the set."
> (Nagel & Newman 1989, pp.58-59)

The essence of Godel's proof is the construction of an arithmetical formula G that represents the meta-mathematical statement: "The formula G is not demonstrable" (Nagel & Newman 1989, p.85). Godel then showed that, although G is not formally demonstrable, it is nevertheless a true arithmetical formula (Nagel & Newman 1989, p.86).

The mathematical basis of Chomsky's grammar is arithmetic[1], and if we translate Godel's proof into its implications for a linguistic theory based on mathematical logic, then Godel showed that there is always a context for the deviant sentence. Jonathan Culler, discussing the meaningless sentence, points out in a similar fashion:

> "When anyone proposes an example of a meaningless sentence, listeners can usually imagine a context in which it would have meaning; by placing a frame around it, they can make it signify."
> (Culler 1983, p.122)

---

[1] "It seems clear that certain kinds of grammatical information are presented in the most natural way by a system of rewriting rules, and we may therefore conclude that rewriting rules constitute part of the base of the syntactic component. Furthermore, we shall assume that these rules are arranged in a linear sequence... Thus... the grammar consists of the sequence of rules $R_1, ..., R_n$..."
(Chomsky 1965, p.67)

One context for the deviant sentence is a book on linguistics. For Chomsky, the object of study is the isolated sentence, but written sentences are usually found in some kind of text, such as a linguistic text; we return to a typology of texts below. Syntax and semantics are separate components in Chomsky's (1965) model of sentence comprehension. However, psychologists have concluded that humans do not carry out a syntactic analysis before understanding a sentence (Greene & Coulson 1995). In the case of speech, the sentence does not exist as the well defined spatial entity that we can study on the printed page or computer screen; there is no spatial boundary marked by the full stop. In addition, sounds, words and "sentences" form part of a discourse or conversation (Beaugrande & Dressler 1981, p.19). The nature of the discourse, or the textual context of the sentence, is one factor that influences the assumptions people make about the meaning of a sentence, as text linguists and psychologists have pointed out (van Dijk 1979, van Dijk 1980, Beaugrande & Miller 1980, Beaugrande & Dressler 1981, Greene & Coulson 1995).

In *The Gutenberg Galaxy,* McLuhan shows that a concern for English grammar originated in the transition from an oral to a print culture in the seventeenth and eighteenth centuries. As McLuhan claims, "nobody ever made a grammatical error in preliterate society" (McLuhan 1969, p.285). The use of printing technology for the mass production of literature as a commodity demanded the standardisation of spelling and syntax. The authoritative King James version of the Bible, for example, was printed in 1611. According to Hawkes, seventeenth century rhetorical theory is characterised by the Aristotelian notion of metaphor as ornamentation, a notion that found expression in the concern for "Plain Style" in the English language (Hawkes 1989, p.28). This dominant view of metaphor involved a "cleavage between form and content, metaphor and language" (Hawkes 1989, p.29), a disjunction which Hough (1969) seeks to reinstate through the notion of style, as we noted at the beginning of this chapter.

From a different perspective, McLuhan claims that "schizophrenia may be a necessary consequence of literacy" (McLuhan 1969, p.32). In McLuhan's view, one effect of printing technology is a disjunction between eye and ear, between the visual and oral senses. However, McLuhan's notion of cognition is the subject for a debate that is not our current concern (Miller 1971, pp.92-133). A more modest claim is that traditional grammar treats the sentence as a structure which is split into two parts: the subject and the predicate. Phythian gives a psychological explanation of this grammatical division:

> "If you look at the sentence
>
> The museum is closed on Sundays.
>
> you will see that it has two parts. The first part names what the sentence is about: *The museum*. The second part tells us something about *the museum*.
>
> ...the first part - that which names what we are thinking about in the sentence - is called *the subject*. The remainder of the sentence, making a statement about the subject, is called *the predicate*.
>
> In every sentence... there is always a subject, naming the person or thing we are thinking about, and a predicate, which states what we are thinking about the subject."
> (Phythian 1980, p.5)

In this explanation of sentence structure, Phythian refers to the thinking processes of the person who produces a sentence: the sentence producer names a subject, then thinks about the subject. However, the name of the sentence is also an attribute of sentence structure, an attribute that is identified and named by the grammarian. For the sentence producer, does the grammatical subject necessarily name "what we are thinking about in the sentence"? In a similar fashion to Chomsky, traditional grammar only deals with the meaning of isolated sentences, and we need to provide a context for the exemplary sentence: a conversation, for example. We also need to provide a context for the conversation.

Let's imagine a Sunday afternoon on the Isle of Skye. A family are staying in self-catering accommodation for their summer holidays, it's raining, and the children are bored. Wendy wants to complete her latest novel, and suggests to Brian that

perhaps he could take the kids out for the afternoon. Brian has no objections to going out, but where do you take kids on a wet Sunday afternoon on the Isle of Skye? Wendy suggests the craft centre:

"The craft centre is closed on Sundays."

"What about the otter sanctuary?"

"The otter sanctuary is closed on Sundays."

"The osprey centre?"

"The osprey centre is closed on Sundays. The museum is closed on Sundays. The pub is closed on Sundays. Even the local shop closes on a Sunday. What a place! Those Presbyterians certainly have a stranglehold on Sunday opening. The only place that is open on Sundays is the local church."

Wendy smiled.

"Perhaps you could take the kids there?"

Brian did not reply to this last suggestion, but sat holding his head, wondering where other kids went on wet Sunday afternoons on the Isle of Skye.

In this example, we have provided a context for the exemplary sentence. In this context, if we were to name what Brian is thinking about when making this utterance, we might name the subject of his thoughts as "Sunday closing" or "wet Sunday afternoons on the Isle of Skye". If we describe his thinking activity as problem solving (Newell & Simon 1972, Kahney 1986), then we might name the problem he is trying to solve as "Where can we go?" In any case, the name of what he is thinking about when making the utterance is not the same as the grammatical subject of the sentence. Indeed, we might argue that the grammatical predicate, rather than the grammatical subject, is naming the subject of his thoughts. Following McLuhan, it is also tempting to ask whether sentences have names in pre-literate societies.

Naming is an important activity for writers, for grammarians and for natural scientists since the days of Adam. As the Water Genie tells Haroun in Salman Rushdie's novel, *Haroun and the Sea of Stories:*

> "To give a thing a name, a label, a handle; to rescue it from anonymity, to pluck it out of the Place of Namelessness, in short to identify it - well, that's a way of bringing the said thing into being."
> (Rushdie 1990, p.63)

By naming the sentence, the grammarian brings the sentence into being, but Phythian confuses this activity of naming the sentence, which is the activity of the grammarian, with the activity of the sentence producer, who is vocalising his thought. To explain a split in sentence structure made by the grammarian, Phythian invokes a split between naming and thinking on the part of the sentence producer. Naming is itself a thinking process, and the schism between naming and thinking is the result of an attempt to explain the meaning or semantics of an isolated sentence by attributing to the sentence producer the naming activity of the traditional grammarian. We return to naming as an activity of the sentence producer below.

How does Chomsky's transformational grammar differ from traditional grammar? Traditional grammar provides a lexical taxonomy consisting of nouns, verbs, adjectives and so on. It also provides a taxonomy of sentence structure which consists of phrases and clauses on the one hand, and the binary division into subject and predicate on the other. Chomsky, however, makes a distinction between grammatical categories and grammatical functions (Chomsky 1965, p.68). While a noun phrase is a grammatical category, the notions of subject and predicate are functional notions that suggest logical relations between grammatical categories; it is these logical relations, rather than grammatical categories, that determine sentence comprehension.

However, the traditional division of the sentence into subject and predicate frequently results in a lack of correspondence between the grammatical subject of the sentence on the one hand, and the logical subject of the sentence on the other. While the first traditionally represents the name of the sentence, the second functions as the subject in the sequence of subject, verb, and

object. In Chomsky's view, the order of words in a sentence represents the surface structure of the sentence, and the traditional categories of subject and predicate are a feature of this surface structure (Chomsky 1965, p.70). The logical relations expressed in the sentence (those of subject, verb, and object) represent the deep structure of the sentence. In Chomsky's transformational grammar, a set of rules transforms surface structure into deep structure (Chomsky 1965, p.135). When the grammatical subject of the sentence is the same as the logical subject, then surface structure is equivalent to deep structure.

In Chomsky's model of sentence comprehension, the word order or surface structure of a sentence conveys no meaning. Chomsky equates the semantics of a sentence with grammatical or logical relations; these relations are "semantically significant functional notions" which are represented by the deep structure of a sentence (Chomsky 1965, p.117). On the one hand, if we entertain the notion that a sentence has two structures, then we are not likely to see a sentence as an organic whole, in the way that some critics see the literary work. Chomsky's structural distinction is also a distinction between sentence form and sentence content:

> "... one major function of the transformational rules is to convert an abstract deep structure that expresses the content of a sentence into a fairly concrete surface structure that indicates its form."
> (Chomsky 1965, p.136)

On the other hand, both kinds of structure can be represented as a tree. A generative grammar consists of a set of rewrite rules that divide a sentence (or the crown of the tree) into a noun phrase and a verb phrase; each phrase is successively divided until we are left with the words of the sentence (the roots of the tree) at the bottom. Although a sentence might have two structures, both structures are represented by the same method of the tree. In computer software, the tree is a *data structure* that is often used to represent logical relations or structural hierarchies (Bamford &

Curran 1987, Kruse 1989); it is used, for example, to design *outlining* tools for writers (Wayner 1992).

The problem which this notion of sentence semantics leaves unresolved is how is it possible to comprehend global discourse? If the semantic elements of a sentence are purely its logical relations, then the semantics of a discourse must be constructed by adding up the logical relations expressed in each sentence. Discussing the exemplary sentence, we mentioned that the grammatical subject was not necessarily the name that best describes the subject of the sentence producer's thought. Referring to other linguists who point to the possibility that the subject and predicate are not necessarily words in the sentence, Chomsky comments that, "Whatever the force of such observations may be, it seems that they lie beyond the scope of any existing theory of language structure or language use" (Chomsky 1965, p.163). He concludes that the relation between syntax and semantics is a mystery:

> "To conclude this highly inconclusive discussion, I shall simply point out that the syntactic and semantic structure of natural languages evidently offers many mysteries, both of fact and of principle, and that any attempt to delimit the boundaries of these domains must certainly be quite tentative."
> (Chomsky 1965, p.163)

However, is the relation between syntax and semantics a relation between the mysterious structures that Chomsky attempts to define? While Chomsky's work has had immense consequences for developing machine understanding of programming languages, Greene and Coulson claim that it has had "little impact on psychological theories of language" (Greene & Coulson 1995, p.34). As we explained, syntax and semantics are separate components in Chomsky's model of sentence comprehension; according to Greene and Coulson, his transformational grammar "represents in its most extreme form the claim that syntax and semantics are quite distinct types of analysis" (Greene & Coulson 1995, p.32). Before computers can execute a program written in a "high-level" language such as COBOL, the program code has to be

checked for errors by programs called translators, compilers, or interpreters (Bornat 1979); in this analysis of program code, syntax and semantics are separate components. However, after testing Chomsky's model on humans, psychologists concluded that humans do not carry out a syntactic analysis before understanding a sentence, as we mentioned above:

> "People make assumptions about what a sentence might plausibly mean and, indeed, may sometimes bypass syntactic analysis altogether..."
> (Greene & Coulson 1995, p.32)

Yet cognitive psychologists have an ambivalent relation to Chomsky. On the one hand, psycholinguists have shown that Chomsky's theory of sentence comprehension is not valid for humans. On the other hand, psychologists investigating story comprehension and story memory have adopted Chomsky's notions of two structures, rewrite rules, and transformational grammar in analysing story structure (Rumelhart 1975, Thorndyke 1977, Mandler & Johnson 1977, Mandler 1978, Johnson & Mandler 1980). Rumelhart applies Chomsky's notion of the "well-formed" sentence to stories: "... the notion of 'well-formedness' is nearly as reasonable for stories as it is for sentences" (Rumelhart 1975, p.211). Giving an example of a simple story that consists of "a string of sentences", he then reorders the string so that the temporal sequence of events is jumbled. While the first string "seems to form a sensible whole" and exemplifies a "well-formed" story, the jumbled version "seems to be analyzable into little more than a string of sentences" (Rumelhart 1975, p.212). Yet if there is always a context for the meaningless sentence, then there are also ways in which a temporal reordering of events can be rendered "sensible". In Robbe-Grillet's *La Jalousie*, for example, "temporal reference is deliberately sabotaged", as Genette remarks (Genette 1980, p.35), but the novel can be read "as the interior monologue of a husband spying on his wife and imagining her adventures" (Genette 1980, p.219). As Jonathan Culler points out:

> "... the reader may treat anything anomalous as the effect of the narrator's vision or cast of mind. In the case of first person narration, choices for which the reader can find no other explanation may be read as excesses which display the narrator's individuality and as symptoms of his obsessions. But even when there is no narrator who describes himself we can explain almost any aspect of a text by postulating a narrator whose character the elements in question are designed to reflect or reveal. Thus, Robbe-Grillet's 'La Jalousie' may be recuperated... by postulating an obsessed narrator with paranoiac suspicions so as to explain certain fixations of description; 'Dans La Labyrinthe' can be naturalised by reading it as the speech of a narrator suffering from amnesia. The most incoherent text could be explained by assuming that it is the speech of a delirious narrator."
> (Culler 1975, p.200)

Rumelhart's approach to story structure involves the development of a grammar which, in a similar fashion to Chomsky, assumes a separation of syntax and semantics:

> "The grammar consists of a set of syntactical rules which generate the constituent structure of stories and a corresponding set of semantic interpretation rules which determine the semantic representation of the story."
> (Rumelhart 1975, p.213)

A set of rewrite rules turns a story into the type of tree structure that Chomsky (1957, 1965) uses to represent the syntactic structure of a sentence. Just as a sentence can be rewritten as a noun phrase plus verb phrase, a story can be rewritten as "Setting" plus "Episode"; "Episode" is broken down further into "Event" plus "Reaction" (Rumelhart 1975, pp.213-216). In Thorndyke's elaboration of Rumelhart's story grammar, a story is rewritten as "Setting" plus "Theme" plus "Plot" plus "Resolution" (Thorndyke 1977, p.79). In a similar fashion to Chomsky's representation of deep structure, Rumelhart's semantic interpretation rules represent the logical relations between story constituents. In this rationalistic approach to semantics, logical relations include the temporal ordering of events, the causal relations between events, and the representation of a character's

motivation in terms of the plans and goals that were discussed in the last chapter.

In these attempts to represent story structure by a story grammar, Chomsky's dualism seems to be inescapable. Thorndyke presents the distinction between story syntax and story semantics in terms of structure and content, in a similar fashion to Chomsky's distinction between sentence form and sentence content:

> "The term *structure* refers here to the functional relationships among the components of the plot, independent of any particular set of characters or the specific actions they perform. *Content* refers to the semantics of the individual propositions of the story: the set of characters, specific setting information, and the actions involving the characters."
> (Thorndyke 1977, p.97)

Mandler and Johnson's story grammar (Mandler & Johnson 1977) is based on Rumelhart's (Rumelhart 1975). On the one hand, Mandler and Johnson criticise the dualism of Rumelhart's separation of syntax and semantics. According to Mandler and Johnson, Rumelhart's grammar

> "... was seminal work because of its emphasis on global structures which specify suprasentential relationships and because it suggested useful ways to characterize such higher-order structure. However, our attempts to apply his analyses to new stories frequently failed. The structure described a very narrow range of stories, namely, those with single or embedded episodes. It also depended on a set of dual structures, one containing syntactic relations, the other semantic relations, which are unwieldy to work with and frequently redundant."
> (Mandler & Johnson 1977, pp.113-114)

In a later development of their story grammar, Mandler and Johnson refer to the psycholinguistic research on sentence comprehension which suggests that "it is often possible to go directly to comprehension without calling upon a great deal of syntactic knowledge" (Johnson & Mandler 1980, p.56). In the case

of story comprehension, they emphasise a closer interdependence of syntax and semantics: "a major difference between stories and sentences is that the semantic and syntactic aspects of the former are more intertwined" (Johnson & Mandler 1980, p.57). Yet on the other hand, Mandler and Johnson's grammar has more similarities with Chomsky's than does Rumelhart's. Chomsky's two structures are resurrected through the notion of surface structure and underlying structure (Mandler & Johnson 1977, Mandler 1978, Mandler & DeForest 1979, Johnson & Mandler 1980). While "the surface structure of a story consists of sentences", "the underlying structure of a story can be represented as a tree structure which makes explicit the constituent structure and the relations between constituents" (Mandler & Johnson 1977, p.115). Mandler and Johnson describe a set of rewrite rules that amalgamate Rumelhart's rules governing syntax and semantics (Mandler & Johnson 1977, p.117). In a similar fashion to Rumelhart, the semantics of a story are equated with the logical relations of temporal ordering, causal relations, and the plans and goals that motivate characters.

In Chomsky's (1965) model of sentence comprehension, a set of transformational rules transforms surface structure (syntax) into deep structure (the logical relations expressed in the sentence). Mandler and Johnson's (1977) rewrite rules rewrite the surface structure of a story (its sentences) into the underlying tree structure of logical relations between story constituents. As we mentioned, logical relations include the temporal ordering of events; Mandler and Johnson point out that one example of "the interdependence of semantic and syntactic elements in stories derives from the fact that stories primarily involve statements about events which are causally and/or temporally ordered" (Johnson & Mandler 1980, p.57). However, sometimes the temporal sequence of events is jumbled:

> "... the surface realizations of stories may be more or less ideal. For example, the surface structure may express all of the basic nodes, but the order in which they occur may not match the underlying structure. In this case, the numbers

representing the surface propositions would be out of order in the tree diagram."
(Mandler & Johnson 1977, p.129)

Mandler and Johnson's rewrite rules are not adequate to represent a temporal reordering of events, and this example provides one argument for a set of transformational rules. Chomsky's transformational grammar includes a rule that transforms the passive sentence into an active one (Chomsky 1965, p.105). According to Chomsky's equation of sentence semantics with logical relations, these variants in surface structure have the same deep structure, and both types of sentence have the same meaning. Mandler and Johnson argue in *A Tale of Two Structures* that "there is an obvious need for transformational rules which can describe regular mappings between underlying and surface structures" (Johnson & Mandler 1980, p.70). In a similar fashion to Chomsky, they argue that variants in the surface structure of stories have the same underlying structure and the same meaning:

"The base rules... provide an adequate characterization of many folktales and other stories from the oral tradition. However, it is possible to tell many of these stories in a slightly different way without changing their meaning. Occasionally a constituent which appears in one version of a story is omitted from another, and sometimes a constituent is found in a different location. Since there seem to be relatively few variations of this type, it might be possible to expand the base rules to account for them. However, this procedure would miss the generalization that each version has the same underlying meaning."
(Johnson & Mandler 1980, pp.69-70)

Mandler and Johnson then elaborate on the sort of transformational rules that allow for events to be deleted or reordered on the surface, while preserving the underlying meaning. In a similar discussion elsewhere, Mandler and Johnson appear to be searching for the closest possible mapping of Chomsky's sentence grammar onto their story grammar, and the problem of defining a permissible transformation is equated with the problem of defining a well-formed story:

"Unless we assume that only those stories which do not deviate at all from the proposed underlying structures are well formed, we will have to specify which transformations of the underlying structure are permissible and which are not. If we had an independent definition of a well-formed story, the search for transformational rules would be easier." (Mandler & Johnson 1977, pp.129-130)

A permissible transformation allows for events to be deleted or reordered while preserving a well-formed story. A well-formed story is defined "on the basis of what people can and cannot remember and on the nature of the distortions that occur in memory" (Mandler & Johnson 1977, p.130).

We discuss the results of psychological research into story memory in chapter eight. Here, our concern is the application of Chomsky's linguistics to textual analysis. We have shown how the story grammarians have adopted Chomsky's notions of well-formedness, two structures, rewrite rules, and transformational grammar in their representation of story structure. Mandler and Johnson go further, adopting Chomsky's criterion of descriptive adequacy in their discussion of how to evaluate models of story structure, while modifying the criterion of explanatory adequacy to observational adequacy (Johnson & Mandler 1980, p.77). However, Chomsky's influence is not only pervasive among story grammarians, but is also apparent in attempts to develop text grammars (van Dijk 1972). According to Beaugrande and Dressler, van Dijk was the "major force in this movement" (Beaugrande & Dressler 1981, p.221). Van Dijk (1980) reviews the historical development of text grammars in an introduction to a special issue of *Poetics* devoted to story comprehension. He explains:

"According to the fashion of the period, my own text-grammar should be an account of the native speaker's competence to produce and understand any 'grammatical' discourse of the language. So, the grammar should enumerate all and only texts underlying the possible discourses of a language, together with their structural descriptions. The rather programmatic and not yet very substantial grammatical fragments pertained on the one

> hand to all kinds of coherence phenomena holding between propositions of texts... and on the other hand introduced so-called 'semantic deep structures' of the text-as-whole, *viz. macrostructures.* How such global semantic structures were linked to those of the actual sentences was a problem which could not yet be solved."
> (van Dijk 1980, p.9)

In van Dijk's work on text grammars, Chomsky's two structures initially feature as "macrostructures" and "microstructures" (van Dijk 1972). Later however, van Dijk makes a further distinction between "macrostructures" and "superstructures" (van Dijk 1980, p.12). The reason for this distinction is that macrostructures represent the logical relations of causation and motivation which, as we have seen, the story grammarians attribute to the deep structure of stories (Johnson & Mandler 1980). Van Dijk however, referring to the research into artificial intelligence that we mentioned in the last chapter (eg Schank & Abelson 1977, Black et al 1982), attributes this level of semantics to a general knowledge of the world; this general knowledge is possessed by all readers and writers and influences their real-world interactions (van Dijk 1980, pp.11-16). In modelling story comprehension, Van Dijk therefore suggests an independent grammar of macropropositions that is concerned with "the philosophy and logic of action" (van Dijk 1980, p.13). On the other hand, a narrative grammar that determines the "superstructure" of a narrative discourse is a more specific knowledge that is acquired through reading stories. This sort of grammar might resemble Propp's morphology of the folktale (Propp 1968), for example, while a grammar that deals with the semantics of macropropositions would have closer affinities with Chomsky's transformational grammar.

One problem with text grammars is the problem we have already encountered when discussing Chomsky's goal of defining a finite set of resources that can comprehend an infinite number of sentences. Godel's theorem is as relevant to text grammars as it is to sentence grammars. Beaugrande and Dressler explain the general failure of attempts to develop a text grammar:

> "During the ascendancy of transformational grammar, proposals were advanced for a 'generative poetics': a special grammar designed to 'generate' literary structures via modified rules. However, it gradually became evident that no such grammar could be set up for any large set of texts. The diversity of literature and poetry would lead to an explosion of special rules, some of which, in the worst case, would be required for one single instance. The rules would also generate many undesirable structures not found in any samples. Indeed, the explosion of the grammar would eventually allow the generating of every conceivable structure, so that nothing would have been explained at all." (Beaugrande & Dressler 1981, p.214)

Yet Chomsky's influence on linguistic approaches to textual analysis is still manifest in Beaugrande and Dressler's claim, that "It is probably safe to conclude that virtually all models of texts and text grammars will make some use of the notion of 'transformation', but probably not the same use made in Chomskyan grammar" (Beaugrande & Dressler 1981, p.28).

Story grammars and text grammars both involve an application of Chomsky's sentence grammar to global discourse. However, if Chomsky's sentence grammar is an inadequate theory of sentence comprehension, then is it feasible that an application of Chomsky's notions to global discourse will represent an adequate theory of discourse comprehension? One problem with Chomsky's notions is the lack of psychological support for the separation of syntax and semantics, but a more fundamental one is the relevance of Godel's theorem to the notion of rules and grammars. This problem is perpetuated with the notion of an exhaustive text grammar.

A further fundamental problem with grammars that deal with semantics is the assumption that semantics, like the sentence, can be represented as a structure. Semantics however, unlike syntax, is a question of textual interpretation; semantics does not have the easily identifiable spatial existence possessed by the sentence on a printed page. To represent meaning as a structure requires the kind of simultaneous reading of the text

with which we began this chapter, a reading that takes a synchronic view of structure. From this perspective, meaning can be fixed in terms of a static representation, and can be shared by different texts. As Mandler and Johnson claim, different tellings of a tale have "the same underlying meaning" (Johnson & Mandler 1980, p.70). This view of semantics is not restricted to grammarians who see two structures, but is also maintained by literary critics who see organic wholes. In Frye's anatomy of archetypal structures, for example, "the meaning of a poem, its structure of imagery, is a static pattern" (Frye 1990, p.158). This view of the literary work is the subject of Derrida's observations above (Derrida 1978a); from this point of view, whether the literary work is perceived as a unity or a duality, its entirety is perceived as a static structure.

In his essay on Levi-Strauss' structuralism, Derrida concludes:

> "There are... two interpretations of interpretation, of structure, of sign, of play. The one seeks to decipher, dreams of deciphering a truth or an origin which escapes play and the order of the sign... The other, which is no longer turned toward the origin, affirms play..."
> (Derrida 1978b, p.292)

The perception of meaning as a static entity entails an essentialist view of interpretation. Todorov describes the historical development of this perspective in his *Symbolism and Interpretation,* showing how it stems from the interpretation of religious texts and the preservation of sacred truths (Todorov 1982a). In a similar fashion, some would argue that the purpose of literary criticism is interpretation of the literary text; consequently, the reader must be encouraged to find the true and unique meaning that has been revealed to the critic (Todorov 1982a). The alternative view of interpretation is the playful one endorsed by Jonathan Culler:

> "Many works of literary criticism are interpretations in that they talk about particular works, but their aim may be less to reconstruct the meaning of those works than to explore

the mechanisms or structures by which they function... Just as linguistics does not seek to interpret the sentences of a language but to reconstruct the system of rules that constitutes it and enables it to function, so a good deal of what may be mistakenly seen as overinterpretation... is an attempt to relate a text to the general mechanisms of narrative, of figuration, of ideology, and so on."
(Culler 1992, pp.115-116)

However, while Derrida and Culler argue for two interpretations of interpretation, one can also argue for two interpretations of linguistics. The linguistic approach we have described in this chapter is based on rules and grammars. To establish such a system requires some kind of consensus on semantics:

> "The rationalistic approach to meaning... is founded on the assumption that the meanings of words and of the sentences and phrases made up of them can be characterized independently of the interpretation given by individuals in a situation."
> (Winograd & Flores 1986, p.111)

Comparing the rationalistic notion of meaning with Heidegger's notion of the ubiquity of interpretation, Winograd and Flores point out that "meaning always derives from an interpretation that is rooted in a situation" (Winograd & Flores 1986, p.111). Despite Culler's denial, Chomsky's model of sentence comprehension is based on the interpretation of many exemplary sentences, and an interpretation of what constitutes sentence semantics. In Chomsky's model, the semantics of a sentence is equated with the logical relations expressed in the sentence, and this notion of semantics is adopted by the story grammarians. An alternative interpretation of sentence semantics is discussed below.

Culler consistently refers to linguistics as a unified discipline, while blurring the distinction between structuralism and semiology. Introducing his *On Deconstruction,* he explains the aims of a linguistic approach to textual analysis as follows:

> "The categories and methods of linguistics, whether applied directly to the language of literature or used as the model for a poetics, enable critics to focus not on the meaning of a work and its implications or value but on the structures that produce meaning. Even when linguistics is explicitly enlisted in the service of interpretation, the fundamental orientation of the discipline, which does not devise new interpretations for sentences but attempts to describe the system of norms that determine the form and meaning of linguistic sequences, works to focus attention on structures and to identify meaning and reference not as the source or truth of a work but as the effects of the play of language."
> (Culler 1983, p.21)

Culler describes the difficulty of distinguishing "structuralism" from "post-structuralism" in the case of theorists such as Barthes, whose *S/Z* defies attempts to place it into either category (Culler 1983, p.26). Yet on the other hand, Culler makes a well-defined distinction between these categories by equating structuralism with grammars:

> "In simplest terms, structuralists take linguistics as a model and attempt to develop 'grammars' - systematic inventories of elements and their possibilities of combination - that would account for the form and meaning of literary works; post-structuralists investigate the way in which this project is subverted by the workings of the texts themselves."
> (Culler 1983, p.22)

In his earlier work on linguistic approaches to literature, Culler also equates structuralism with semiology, claiming that "it would not be wrong to suggest that structuralism and semiology are identical" (Culler 1975, p.6). Yet later in the same work, Culler claims that "the lack of a semiological perspective leads Levi-Strauss to concentrate on the structural" (Culler 1975, p.49).

On the one hand then, structuralism is equated with the development of grammars; but on the other hand, structuralism is equated with semiology. It is the lack of differentiation between these different approaches that allows Culler to present linguistics as a unified discipline. Describing the linguistic foundation of a structuralist poetics, he sketches the historical development of

linguistics, and uses the term structuralism to refer to "the work of a restricted group of French theorists" (Culler 1975, p.6). Consequently, Culler can claim that Chomsky's influence on structuralism is minimal: his "generative grammar plays no role in the development of structuralism" (Culler 1975, p.7). Yet Culler also claims that Chomsky's work represents "a methodological statement of exemplary clarity":

> "That is to say, Chomsky's theory of language enables us to see what structural linguists were actually doing, what their practice implied, and how accounts of their discipline were misleading or insufficient. Although within linguistics itself the differences between Chomsky's approach and that of his predecessors are extremely important, at the level of generality which concerns those looking to linguistics for models to apply elsewhere, Chomsky's work can be taken as an explicit statement of the programme implicit in linguistics as a discipline but not hitherto adequately or coherently expressed. References to Chomsky in the following discussion are not therefore meant to indicate points on which he influenced structuralists but only to clarify basic concepts and analytical procedures which comprise the 'linguistic model' that structuralists have adopted."
> (Culler 1975, pp.7-8)

On the one hand then, the difference between Chomsky and other linguists is a matter of detail, and this detail is of interest only to linguists. Yet on the other hand, Chomsky's methods illuminate not only "linguistics as a discipline", but also the use of "the linguistic model" in textual analysis. Culler's endorsement of Chomsky's methods is shown in this work (Culler 1975). Culler adopts Chomsky's notion of "linguistic competence" in a discussion of "literary competence", and the evaluation of a semantic theory is discussed in terms of "operational and descriptive adequacy" (Culler 1975, p.76). In a point of detail, Culler claims that "two versions of the same plot need have no sentences in common, nor need they, perhaps, have any linguistic deep-structures in common" (Culler 1975, p.205). Culler also refers to "Chomsky's claim that attempts to work out discovery procedures are fundamentally misguided"; according to Culler, "a discovery

procedure would be a mechanical method... for actually constructing a grammar, given a corpus of sentences" (Culler 1975, p.21).

Discussing the future perspectives for a structuralist poetics, Culler concludes by placing linguistic approaches to literature into four categories:

> "First there is the problem of whether linguistic methods should be applied directly or indirectly... Second, there is the question of whether linguistics, applied directly or indirectly, provides a 'discovery procedure' or precise method of analysis which leads to correct structural descriptions, or whether it offers only a general framework for semiotic investigation which specifies the nature of its objects, the status of its hypotheses, and its modes of evaluation. If these two sets of alternatives are combined they provide a schematic resume of four different positions." (Culler 1975, p.256)

However, in his discussion of a linguistic foundation, Culler points out the strengths and weaknesses of calling upon binary oppositions as a device for "establishing distinctive classes" (Culler 1975, p.14). The strength and weakness both lie in the fact that binary oppositions "permit one to classify anything" (Culler 1975, p.15). Culler explains that "given two items one can always find some respect in which they differ and hence place them in a relation of binary opposition" (Culler 1975, p.15). Referring to the ubiquity of binary oppositions in literature, he concludes that:

> "...the very flexibility and power of binarism depends on the fact that what it organizes are qualitative distinctions, and if those distinctions are irrelevant to the matter in hand, then binary oppositions can be very misleading, precisely because they present factitious organization. The moral is quite simple: one must resist the temptation to use binary oppositions merely to devise elegant structures. If A is opposed to B and X is opposed to Y then one could, in seeking further unification, set these oppositions together in a four-term homology and say that A is to B as X is to Y (in that the relation is one of opposition in both cases). But the

> formal symmetry of such homologies does not guarantee that they are in any way pertinent..."
> (Culler 1975, pp.15-16)

In this introduction, Culler points out the inadequacy of the four-term homology as an analytical tool. The four-term homology also receives a negative treatment when Culler discusses Greimas' *Semantique Structurale* (Greimas 1966) and Levi-Strauss' analysis of the Oedipus myth (Levi-Strauss 1977). However, the four-term homology receives a positive treatment when Culler discusses a poetics of the lyric and the notion of the organic whole. Culler suggests that the notion of literary texts as organic wholes is misleading: "Their unity is produced not so much by intrinsic features of their parts as by the intent at totality of the interpretive process: the strength of the expectations which lead readers to look for certain forms of organization in a text and to find them" (Culler 1975, p.91). Culler refers to research in the field of artistic perception, and to the Gestalt principles of perceptual grouping, such as continuity and closure (Roth & Frisby 1986, pp.97-106). He argues that similar principles may apply in reading poetry, thus "one must have at least rudimentary notions of what would count as unity":

> "The most basic models would seem to be the binary opposition, the dialectical resolution of a binary opposition, the displacement of an unresolved opposition by a third term, the four-term homology, the series united by a common denominator, and the series with a transcendent or summarizing final term. It is at least a plausible hypothesis that the reader will not feel satisfied with an interpretation unless it organizes a text according to one of these formal models of unity."
> (Culler 1975, p.174)

Returning to Culler's conclusion on linguistic approaches to literature, the moral is quite simple. Culler establishes a four-term homology as a framework for discussing a structuralist poetics. This homology consists of direct versus indirect applications of linguistics, and the presence versus absence of discovery procedures. Are these categories pertinent, or is this homology an

attempt to impose some kind of organic unity on a complex subject in order to write a conclusion?

Culler gives two examples of the direct application of linguistics to literature. The first is Jakobson's distributional analysis of poetry (Jakobson 1973) and the second is Greimas' *Semantique Structurale* (Greimas 1966). In the first case, "Jakobson's basic technique in analysing poems is to divide them into stanzas and show how symmetrical distribution of grammatical items organizes the stanzas into various groupings" (Culler 1975, p.59). Culler points out that "poems contain... structures other than the grammatical" (Culler 1975, p.73), and that Jakobson's emphasis on numerical symmetry "leads to the indiscriminate postulation of structures" (Culler 1975, p.66). In this example then, a direct application of linguistics consists of a grammatical analysis; this analysis is used as "a technique for discovering patterns in a text" (Culler 1975, p.69).

In the second case, Greimas represents semantics as a structure (Greimas 1966). In the first instance, this involves an interpretative process to identify the meaning of a text. Having identified the semantic features of a text, Greimas follows Levi-Strauss in arranging these features as a system of binary oppositions (Culler 1975, p.84). Greimas then faces the problem of how these semantic features are related to syntax. We have already discussed the problem of the relation of syntax to semantics in the case of Chomsky. Chomsky's notion of sentence semantics leaves the problem of comprehending global discourse unresolved. We suggested that, if the semantic elements of a sentence are purely its logical relations, then the semantics of a discourse must be constructed by adding up the logical relations expressed in each sentence. This procedure is adopted by Greimas. In his construction of semantic structure, he establishes the connection between syntax and semantics by "a process of reducing the sentences to a series of subjects and predicates which will be cast in a constant form so that they can be related to one another and, as it were, added up" (Culler 1975, pp.81-82). According to Culler, Greimas assumes that "the meaning of texts is

automatically derivable from the meanings of lexical items" (Culler 1975, p.85). In this case then, the direct application of linguistics consists of a grammatical analysis of syntax. This analysis is combined with an interpretative process that identifies the meaning of a text; semantics is represented as a system of binary oppositions. In his development of a text grammar, Van Dijk follows Greimas in attempts to integrate syntax and semantics (van Dijk 1972).

According to Culler's four-term homology, the first example is also an example of the presence of a discovery procedure, while the second also exemplifies the absence of a discovery procedure. However, in the first case, a discovery procedure is present because this is what Jakobson claims for his method of analysis: Jakobson claims "that linguistics provides a discovery procedure... which will bring to light poetic structures" (Culler 1975, p.256). In the second case, a discovery procedure is absent because of Culler's claim that Greimas fails the test of "operational and descriptive adequacy" (Culler 1975, p.76): the example of Greimas "illustrates that... linguistics does not provide a procedure for the discovery of literary structure" (Culler 1975, p.257). A further mark of Culler's inconsistency is the claim elsewhere that "*both* Jakobson and Greimas start from the assumption that linguistic analysis provides a method for discovering the patterns or meanings of literary texts" (Culler 1975, p.95) (my italics). One cannot avoid the conclusion therefore that Culler's four-term homology is an attempt to impose an artificially contrived unity on a complex subject in order to write a conclusion.

Linguists have pursued a diversity of discovery procedures in order to reach the same goal of constructing a grammar (Crystal 1971), but Culler appears to adopt Chomsky's criticism of discovery procedures as a rhetorical device for establishing the third and fourth terms of his homology. As a rhetorical device, the term "discovery procedure" refers not only to a method of constructing a grammar, but also to a process that results in discovery; Jakobson also uses the term in this metaphorical sense. In the case of Greimas, a discovery procedure is both a method of

constructing a grammar, and a process whose goal is "the discovery of semantic effects" (Culler 1975, p.256); in the case of Jakobson, a discovery procedure is the use of grammatical analysis to reveal poetic structures.

Barthes' analysis of fashion (Barthes 1967) and Todorov's work on a narrative grammar (Todorov 1977a) are both cited by Culler as examples of the indirect application of linguistics. Both are also examples of discovery procedures. Here, Culler defines an indirect application as the metaphorical use of linguistic categories. In the first case, Culler concludes that "the problems encountered by Barthes indicate that this kind of reliance on linguistic models may lead to a failure to determine what one is attempting to explain" (Culler 1975, p.257). On the one hand, Barthes' aim seems to be the construction of a grammar - in this case, a grammar of fashion. Barthes' use of linguistics is therefore metaphorical in the sense that he is applying linguistic categories to a non-linguistic phenomenon. But on the other hand, Barthes appears to use a semiological method of analysis. Elsewhere, Culler defines semiotics, the science of signs, as "the attempt to identify the codes and mechanisms through which meaning is produced in various regions of social life" (Culler 1992, p.116). One of those regions is the fashion advertisements that Barthes analyses in this example. In this case then, Barthes appears to adopt a semiological method of analysis while attempting to construct a grammar. It is Barthes' tendency to combine structuralist and semiological approaches which leads to the difficulty of categorising him; Culler presents this problem in terms of structuralism versus post-structuralism, as we noted above (Culler 1983, p.26).

In his discussion of "literary competence", Culler claims that "literature is a second-order semiotic system which has language as its basis" (Culler 1975, p.114). Barthes defines myth in a similar fashion in his analysis of contemporary mythologies (Barthes 1973); language is a first-order semiological system, while myth is a metalanguage. If literature is also a metalanguage, then any linguistic approach to literature, whether grammatical or semiological, is bound to be metalinguistic (if not metameta-

linguistic), and is bound to use linguistic categories as metaphors. We noted above that traditional grammar provides a lexical taxonomy and a taxonomy of sentence structure. If the sentence is the largest unit of structure "capable of accounting for the range of grammatical classes and structures which turn up in a language" (Crystal 1971, p.201), then any use of grammatical terms to refer to units longer than the sentence is bound to be metaphorical. Todorov uses verb and adjective to refer to textual sequences in his *Grammar of Narrative* (Todorov 1977a). But is Todorov's metaphorical use of grammatical categories any different to Jakobson's metaphorical use of discovery procedures? Todorov's approach to narrative, like Barthes' approach to fashion, is a combination of structuralist construction and semiological analysis.

Culler's final term of the homology is exemplified by Barthes' *S/Z* (Barthes 1990). The fourth position is marked by the metaphorical use of linguistics and the absence of discovery procedures. Here, one uses linguistics "not as a method of analysis but as the general model for semiological investigation" (Culler 1975, p.257). Culler claims that "this is the most appropriate and effective use of the linguistic model, and it has the particular advantage of making linguistics a source of methodological clarity rather than of metaphorical vocabulary" (Culler 1975, p.257). However, we have shown that Culler himself sometimes uses linguistics as a source of metaphor rather than methodological clarity, and the source of methodological clarity that he espouses is also used for rhetorical effect, creating rather than clarifying obfuscation. How is the fourth position marked by the metaphorical use of linguistics and, at the same time, the absence of a metaphorical vocabulary? How is *S/Z* marked by the absence of discovery procedures while it also presents a reading of the text "as an exploration of writing" (Culler 1975, p.260)? And how does one use linguistics as a general model of semiological investigation? Why does Barthes' analysis of a short story by Balzac succeed while his analysis of fashion fails?

These questions cannot be answered by the arguments Culler presents in his *Structuralist Poetics.* Returning to the point of departure for this discussion, the source of the problem lies in Culler's presentation of linguistics as a unified science. Linguistics is not the unified discipline that Culler presents, and one can argue for two interpretations of linguistics, which rely on a distinction between structuralism and semiology. How is it possible to use Chomsky's model of sentence comprehension as a model for semiological investigation? Linguistics does not supply a ready-made package that can be bought off the shelf, transported, opened and immediately applied to literary texts; the sort of methodical meccano that Culler calls "the general model" does not exist. If we dismiss Culler's four-term homology as a rhetorical device, then another way of categorising linguistic approaches to literature is by the kind of linguistics that textual analysis uses as a model. Using this method of analysis, the basic difference between Culler's first three categories and the fourth is the difference between a rationalistic approach to linguistics and a semiological approach. A rationalistic approach is exemplified by Chomsky and the notion of rules and grammars. This route is followed by the story grammarians (Rumelhart 1975, Thorndyke 1977, Mandler & Johnson 1977, Mandler 1978, Johnson & Mandler 1980, Mandler 1982) and by text linguists such as Greimas and van Dijk (Greimas 1966, van Dijk 1972). For an alternative approach, we must turn to Saussure.

6.3 STRUCTURING

Above, we referred to the notion that the literary work, presented in its entirety to the reader, is a static structure. Whether this structure be perceived as a unity or a duality, the temporal aspect of reading must be denied for entirety to become manifest (Derrida 1978a, p.24). In essentialist views of interpretation, the literary work has a unique meaning (Todorov 1982a), and in rationalist views of semantics, meaning can also be represented as a structure (Winograd & Flores 1986). Hough however, discussing the notion of a literary work as an organic whole, affirms that unity is the result of a creative process:

> "The organic unity of a work of literature is not something ready-made; it is not an entire and perfect chrysolite found lying about in nature; it is something achieved."
> (Hough 1969, p.11)

Culler claims that organic unity is a result of the reader's structuring activity (Culler 1975, p.91). In his evaluation of Greimas' structural semantics (Greimas 1966), Culler also points out that "semantic description must provide a representation of the structuring activity of the reader" (Culler 1975, p.92). In the last chapter, we referred to Flower and Hayes' claim that writers don't find meanings but make them (Flower & Hayes 1980b, pp.21-23). So how are unities achieved in writing? How are structures created, and what is the relation between structures that have been identified by a process of textual analysis on the one hand, and structuring activities of the writer on the other?

Witte and Cherry argue that "important insights into writing processes can be gleaned from careful analyses of written products" (Witte & Cherry 1986, p.112). They argue that this proposal is not uncontroversial, because, in American composition studies, there has been a shift of emphasis from analysis of product to investigations of process (Witte & Cherry 1986, pp.113-115), a shift which Flower and Hayes endorse in their model of writing (Hayes & Flower 1980a). According to Witte and Cherry, "Much of the research on writing processes in fact

assumes that processes cannot be inferred from products" (Witte & Cherry 1986, p.114). However, product and process are difficult to separate, as we pointed out in chapter four. In Hayes and Flower's model of writing, the emphasis is on process (Hayes & Flower 1980a); but they use the technique of protocol analysis to identify writing processes, and protocol analysis includes textual analysis. In their linguistic approach to writing, Cooper and Matsuhashi (1983) also recognise that process and product are inseparable. They argue that:

> "The best process studies move back and forth between observations of writing process and examination of the writing produced by the process."
> (Cooper & Matsuhashi 1983, p.6)

This cycle of observation and examination, of shifting attention between process and product, suggests that a linguistic approach to writing represents a hypothesis about structure and structuring - a hypothesis that suggests a relation between structures derived from textual analysis on the one hand, and structuring activities of the writer on the other. However, there are diverse ways of using linguistics to model writing, and this diversity results in different kinds of hypotheses.

Frederiksen introduces a linguistic model of writing with the following claim:

> "The goal of cognitive studies of written discourse is to describe how meaning and language structures are constructed by a writer and interpreted by a reader. Such a description includes a specification of the meaning and language structures, called 'representations', that writers and readers construct and the rules upon which these representations are based. To achieve such a description, cognitive psychologists and researchers in the field of artificial intelligence have constructed models of cognitive representation of language and meaning."
> (Frederiksen 1986, p.227)

Frederiksen's approach to modelling writing is embedded in the rationalistic tradition that we discussed in chapter two. One of the

assumptions in that tradition is that meaning can be represented as a structure. Frederiksen's main concern is the modelling of semantics, and his distinction between representations of language and representations of meaning is crucial to this purpose. He explains that cognitive scientists have hitherto studied semantics by investigating text comprehension. Following Chomsky, "the prevailing psycholinguistic model of discourse comprehension was an interpretive one in which text comprehension was viewed principally as a process of extracting meanings from sentences" (Frederiksen 1986, p.228). Using the terminology of information processing, this type of model is a linear model in which information is processed from the bottom upwards (Greene & Coulson 1995, p.55); that is, the meaning of a discourse is constructed from the meaning of each element in the discourse, beginning with lexical items at the bottom. Winograd and Flores characterise a bottom-up model of discourse comprehension as follows:

> "In a complete rationalistic analysis of meaning, we would be able to explicate the meaning of each utterance by showing how it is built up systematically from smaller elements, each with its own determinate meaning. At the bottom, the smallest elements would denote objects, properties, and relations of interest in the external world." (Winograd & Flores 1986, p.64)

The recognition that context is a factor in discourse comprehension led psychologists to identify a more active role for memory in their models. Memory of previous discourse produces expectations and assumptions which influence comprehension. Psychologists therefore revised their models of comprehension to feature top-down as well as bottom-up processes (Greene & Coulson 1995, p.56). However, psychologists developed two conflicting theories about top-down processes. In text-based theories of comprehension, top-down processes make use of cohesive devices provided by the text (Halliday & Hasan 1976), while in knowledge-based theories, comprehension is "a process of fitting text information into preexisting semantic structures in memory (frames, schemata)" (Frederiksen 1986, p.229). In both cases, comprehension also makes use of a general knowledge of

the world that is represented by the logical relations of causation and temporal ordering. Frederiksen claims that "from experimental work designed to demonstrate the constructive nature of text comprehension emerged the notion of semantic memory representations that are related to but independent of language codes" (Frederiksen 1986, p.228). This notion is similar to van Dijk's proposal for an independent grammar of macro-propositions that is concerned with "the philosophy and logic of action" (van Dijk 1980, p.13). Just as van Dijk distinguishes between macrostructures (the elements in a grammar of logical relations) and superstructures (the elements in a textual grammar, such as a narrative grammar), Frederiksen makes "a major distinction... between semantic structures in memory and linguistic structures" (Frederiksen 1986, p.228).

Frederiksen uses this distinction to describe a "multilevel model of cognitive representation of discourse", a model that incorporates text-based and knowledge-based theories of comprehension:

> "There is now general agreement among cognitive researchers, supported by experimental evidence, that there are multiple levels and types of representations underlying discourse. All major theories distinguish between *conceptual* or *semantic* structures that represent the structures of meaning and knowledge expressed in texts and understood by readers and listeners, and the *textual* language structures used to encode and communicate meanings."
> (Frederiksen 1986, p.230)

There are four levels of representations in Frederiksen's model. Conceptual or semantic representations are divided into two levels. The first consists of high-level frames or schemata; these represent the sort of recurring patterns that are formulated in story grammars and van Dijk's notion of superstructures, for example. The second consists of a system of propositions (similar to van Dijk's macrostructures) that represent the logical relations of causation, temporal ordering, and so on. Textual structures are also divided into two levels. At the bottom level is the sentence, while the second level (similar to van Dijk's microstructures)

consists of cohesive devices that extend beyond the sentence. Frederiksen's main concern is semantic representations, "since research linking semantic to clausal and text-level linguistic structures is less well developed" (Frederiksen 1986, p.231). Discussing the use of semantic networks to model meaning, Frederiksen concludes that "the specification of a representational model would... have to involve specification of rules for forming particular structures defined as a type of semantic network" (Frederiksen 1986, p.234). Frederiksen's model is therefore a rule-based model, and "rules for forming structures are defined by means of a formalism developed in computer science for defining the syntax of programming languages" (Frederiksen 1986, p.234).

Frederiksen's multilevel model is a model of structures in which textual representations are distinguished from semantic representations. In this model, semantic structures are stored in the memory and consist of logical propositions and frames or schemata for recurring patterns or genres. What kind of hypothesis does this model represent? How does such a model represent the structuring activities of readers and writers, and how does a model of comprehension become a model of writing? Frederiksen explains:

> "In cognitive psychology, semantic models were developed as theories of the cognitive representation of texts by readers or writers and not primarily as methods for the analysis of texts... However, models of semantic representation are also the basis for discourse analysis procedures that are used in analyzing texts in experimental research. These analyses provide an important link in testing cognitive models of text representation... "
> (Frederiksen 1986, p.235)

However, semantic models are developed by analysing written language. They depend on an interpretation of semantics as a system of logical relations, and they are the result of applying this interpretation to textual analysis. Frederiksen reverses this order of events by presenting a semantic model as though it were the natural consequence of developing a cognitive theory of

representation (Roth & Frisby 1986), and only applied to textual analysis as an afterthought. The aims of cognitive science coincide with those of artificial intelligence in developing a theory of human cognition that can be formulated in symbolic terms (Winograd & Flores 1986). Consequently, such a theory can be implemented and tested on a computer, and some would argue that the purpose of developing an understanding of discourse comprehension is to design intelligent computer systems. A cognitive theory of representation that deals with discourse comprehension must therefore be tested, and textual analysis is an unavoidable part of this process:

> "In discourse communication, a writer constructs a cognitive representation of meaning and produces a text that expresses this meaning. A reader constructs a cognitive representation on the basis of this text (and other relevant sources of knowledge such as context or prior knowledge)... As cognitive structures cannot be observed directly, they must be inferred from some application of a semantic model to the analysis of text: either that presented to a reader or that produced by a reader or writer."
> (Frederiksen 1986, p.235)

Here, Frederiksen makes an assumption about the process of writing. A writer firstly constructs a cognitive representation of meaning, then produces a text that expresses this meaning. But cognitive representations of meaning have been constructed in the first place by cognitive psychologists, not by writers. As Winograd and Flores comment, "It is the observer who describes an activity as representing something else" (Winograd & Flores 1986, p.99). Just as Phythian confuses the naming activity of the grammarian with that of the sentence producer, Frederiksen confuses the activity of the cognitive psychologist with that of the writer. It is only from the observational stance of someone who is developing a cognitive theory of representation that the writer is constructing a cognitive representation of meaning. Frederiksen's scenario is the inverse of Chomsky's analysis of sentence structure: a writer mentally formulates the logical relations expressed in the semantic structure of a sentence, then transforms this deep structure into surface structure or syntax, and proceeds to write.

In Frederiksen's account, the cognitive structures used by readers are inferred by comparing an experimental reader's recall of a text with a semantic analysis of the text:

> "Thus discourse analysis is a *methodology* used to investigate cognitive theories of representation and processing of text. The models employed, however, are not tested directly but rather by means of experiments that investigate their adequacy as models of cognitive representation. In carrying out such experimental tests, a subject's knowledge structure is inferred from models of text structure."
> (Frederiksen 1986, p.236)

Frederiksen's model of representations is therefore a hypothesis about mental structures. A semantic model of a text is first obtained by textual analysis. This model is then compared with a person's recall of the text in a comprehension experiment, for example. However, the text which a person remembers needs to be translated into a semantic model in order to compare the two. In this type of experiment, the subject of the test is not a person's ability to comprehend, but the adequacy of the semantic model. However, when Frederiksen discusses the applications of this model, another inversion occurs. It is no longer the adequacy of the model that is the subject of an experiment, but a person's ability to comprehend. To explain this inversion, we need to look in more detail at the high-level frame structures that are Frederiksen's main concern.

Schema theory is a theory of memory originally suggested by Bartlett (1932). In Greene's summary, "the basic idea is that human memory consists of high level structures known as schemas, each of which encapsulates our knowledge about everything connected with a particular object or event" (Greene 1986, p.34). In terms of language understanding, schemas "represent the general knowledge which aids the understanding of conversations and texts" (Greene 1986, p.35). Frame is a term originally proposed by Minsky (1977). According to Greene, frames are similar to schemas; frames are "knowledge schemas for

representing different kinds of situations" (Greene 1986, p.35). In Frederiksen's model of representations, the semantic structures at the highest level of the model are frame structures.

Frame structures are defined "by a grammar and a specification of types of entities... that can occupy nodes in the network" (Frederiksen 1986, p.242). Examples of frames include state descriptive frames, which represent "descriptions of various types of states of the world, including attribute structures, classifications, part structures, taxonomies, locative structures, numerical structures, and similarity relations" (Frederiksen 1986, p.243). Process descriptive frames represent "descriptions of processes in the world including causally and conditionally organized systems" (Frederiksen 1986, p.243). Problem frames represent "the structure of problems and procedures for their solution" (Frederiksen 1986, p.243). Conversational frames represent "social interaction structures composed of related turns and conversational acts as they occur in conversational discourse" (Frederiksen 1986, p.243). Finally, Frederiksen describes narrative frames:

> "Narrative frames represent the organization of sets of events in time and space. Narrative frame structures are relevant to the comprehension and production of most fictional texts and informative texts that relate sequences of events... A narrative frame is composed of an event structure and (optionally) one or more scene structures. Event structures represent temporal relations among events, and scene structures represent spatial/locative relations." (Frederiksen 1986, p.243)

Frederiksen's grammar of events differs from generalisations about the order of events in stories, such as Propp's *Morphology of the Folktale* (Propp 1968), in that Frederiksen's events take place in the real world. The object of Propp's study is a collection of Russian folktales, and his analysis leads to generalisations about the kind of events and their sequential ordering in this type of story. Frederiksen's grammar is an abstract one which refers to the temporal ordering of events in the real world. This rationalistic view of events leads to the

inevitable conclusion that there is some ideal order of real-world events to which the label "true" can be attached, while the temporal distortions that occur in the world of fiction can be labelled "false". As Winograd and Flores comment:

> "The rationalistic tradition regards language as a system of symbols that are composed into patterns that stand for things in the world. Sentences can represent the world truly or falsely, coherently or incoherently, but their ultimate grounding is in their *correspondence* with the states of affairs they represent."
> (Winograd & Flores 1986, p.17)

Discussing the applications of frame grammars, Frederiksen describes their use "as tools to study children's comprehension and story production" (Frederiksen 1986, p.252). In these experiments, the grammars are used to measure comprehension. The first step is to calculate the number of textual propositions that a person can remember after reading a text. Subsequently:

> "By expressing measures of recall and inference for propositions associated with particular frame structures as percentages, it is possible to measure the conditional probability of recalling a proposition given that it reflects a particular frame structure. If frame structures are being generated by a reader to process text propositions selectively, these probabilities should vary as a function of frame structure, reflecting the processing of text propositions in terms of frame structures. Furthermore, if an experimental text reflects more than one frame structure, then we can investigate subjects' comprehension of the text in terms of one frame structure versus another."
> (Frederiksen 1986, pp.252-253)

In Frederiksen's experiments on comprehension, children are given texts that reflect a mixture of frames, such as conversational, problem and narrative frames. The results show that "conversational frames are relatively well understood" by the children in these experiments, whereas "problem frame structures are much more difficult" (Frederiksen 1986, p.253). Narrative frames are also well comprehended.

In these experiments then, Frederiksen is using the frame grammars of his model to "investigate comprehension abilities" (Frederiksen 1986, p.254). Yet Frederiksen reverses this procedure to draw the conclusion that these experiments also validate the grammars:

> "These results support the view that children understand these texts by applying rules associated with particular kinds of semantic frame structure, and that they differ in their facility with or knowledge of rules of different types of frame structures."
> (Frederiksen 1986, p.254)

On the one hand then, the grammar is used to measure comprehension abilities. From this perspective, the subject of the experiment is a person's ability to comprehend, not the adequacy of the model. But on the other hand, the ability to comprehend represents a validation of the grammar. From this perspective, the subject of the experiment is the adequacy of the model, not a person's ability to comprehend. In other words, what appeared to be a constant at the design stage of the experiment turns into a variable when the results are discussed, and what appeared to be a variable turns into a constant. Frederiksen (1986, p.254) also concludes that "children differ in how they understand the same text"; for example, the same text may be interpreted in terms of a narrative frame or a problem frame. His conclusions show that experimental results can also be interpreted in different ways, and that an alternative interpretation of experimental variables can also turn a narrative into a problem.

Frederiksen draws a similar conclusion when discussing the use of frame grammars to study children's oral story production in English and French. In this experiment, "children viewed a sequence of pictures depicting a series of related events, and afterwards were asked to tell a story to accompany the pictures as they viewed them a second time" (Frederiksen 1986, p.255). Some children were asked to produce a conversational structure, while others were asked to produce a narrative account. The resulting stories were then analysed in terms of frame structures, and "the

results indicated that children were able to control their production of narrative and conversational structures", but were more successful in producing narrative than conversational frames (Frederiksen 1986, p.255). The conclusions that one can make from these results would seem to be, firstly, that children are able to respond to instructions, secondly, that children can tell stories by using their imagination when looking at pictures, and thirdly, that children can make some kind of distinction between conversation and narrative. However, once again Frederiksen is able to make the significant leap and claim that:

> "Thus, we have evidence that children use specific frame-production rules, and that these rules are language independent (as they should be if they reflect semantic representations)... The results we have obtained thus far in our production studies are consistent with the rule-based model of text production outlined earlier."
> (Frederiksen 1986, pp.255-256)

We have therefore yet to answer the two questions raised above. Firstly, how does a model of structures represent the structuring activities of readers and writers, and secondly, how does a model of comprehension become a model of writing? To answer these questions, we have to exercise some top-down processing in comprehending Frederiksen's model by placing it in a context; that is, the context of the plans and goals of cognitive science and artificial intelligence (AI). The aim of AI research into language comprehension is to design computer systems that can understand "natural language"; that is human language that is unmediated by any encoding into the symbolism of programming languages. Initial attempts to develop AI focused on computer vision in the 1940's, and AI research into this area is generally more developed than research into natural language understanding (Charniak & McDermott 1985). AI systems that are designed to simulate human vision have adopted Marr's modular approach (Marr 1982), in which vision requires "a sequence of representations, each one derived from predecessors by an appropriate set of processes" (Roth & Frisby 1986, p.141):

"Each representation can be thought of as being delivered by a 'vision module' specified in terms of its input representation (the starting information), an output representation (the derived information which acts as input for another module), and the solution to one or more computational problems (description of a method for deriving the output representation from the input representation)."
(Roth & Frisby 1986, p.141)

The first stage of Marr's model involves drawing a primal sketch, a two-dimensional description of light intensities in the input image. In Marr's approach, vision is a process of extracting information from scenes. However, the purpose of designing a system of computer vision is to enable machines to interpret visual information. Cognitive research into perception has highlighted the role of top-down processes in pattern recognition (Roth & Frisby 1986, pp.106-115); top-down processes must occur at some stage so that information can be interpreted. The problem in designing computer vision is identifying the stage where such processing occurs. At what stage of the system is prior knowledge used to make inferences about incoming data? Scrivener describes a knowledge-based system of picture interpretation that is based on Marr's modular approach but also uses the results of cognitive research into human perception (Scrivener 1989). We have discussed the low level algorithms of this system elsewhere (Bloor 1990), and the conclusions to that discussion suggest that top-down processing occurs at the earliest stage in the system.

AI models of language understanding, as exemplified by Frederiksen's model of comprehension, have similar features to AI models of perception. In both cases, a model is a hierarchy of representations. In both cases, the computational problem is to define the processes that transform one sort of representation into another sort of representation on the next level of the hierarchy. A further problem in both cases is identifying the stage where prior knowledge is used to make inferences about incoming data.

In a model that is based on representations or structures, structuring is the upward or downward movement between levels

of a hierarchy, a movement that transforms one sort of representation into another. In the rationalistic tradition exemplified by AI and cognitive science, the notion of representations is essential to computer modelling. This notion is but one aspect of the tradition that is criticised by Heidegger; as Winograd and Flores comment, "human cognition includes the use of representations, but is not based on representation" (Winograd & Flores 1986, p.99). Whether the purpose is to design a computational system of language understanding or one of picture interpretation, the first task is to identify the kinds of representations in the system. The next task is to establish the processes that will transform one sort of representation into another. Justification for the model is based on the validity of the representations, not on the validity of the transforming process; the latter is viewed as "the computational problem" (Roth & Frisby 1986, p.141). From this perspective on modelling, the question whether or not the transforming process represents some kind of human activity becomes irrelevant. What is more important is whether the process is successful in transforming the designated input into the required output.

When the final output is intended to represent recognition or understanding, a computational system makes the necessary assumption that intangibles such as intelligence and understanding can be represented in symbolic form. In Frederiksen's model, the hierarchy of representations is composed of two levels of semantic structures (frames and propositions), and two levels of textual structures (cohesive devices and syntax). Frame grammars are used as a measure of comprehension, so that understanding is represented by the semantic structures at the top of the hierarchy. In this model however, a grammar not only represents the structure of texts and meanings, but the structuring activity of readers and writers. As we mentioned above, grammars are an appropriate computational mechanism for representing and transforming written language (Bornat 1979). However, Frederiksen claims that humans use such devices when thinking; that is, in cognitive processes associated with text production and comprehension. When discussing methodology,

Frederiksen points out that "as cognitive structures cannot be observed directly, they must be inferred from some application of a semantic model to the analysis of text" (Frederiksen 1986, p.235). A grammar cannot be observed directly in structuring activities, and the claim that humans use them is an inference based on the observation that an input representation (a text) and the output representation (a remembered version of the text) can both be mapped onto the grammar.

As we mentioned above, Frederiksen's main concern is semantic representations; he notes that "research linking semantic to clausal and text-level linguistic structures is less well developed" (Frederiksen 1986, p.231). Van Dijk makes a similar comment when discussing macrostructures and the development of a text grammar: "How such global semantic structures were linked to those of the actual sentences was a problem which could not yet be solved" (van Dijk 1980, p.9). In terms of designing a system of natural language understanding, the computational problem is to define the processes that will transform sentences and cohesive devices into the semantic structures on the upper levels of the model. Viewed in these terms, the problem is to find appropriate maps between structures, maps that will convert low-level structures into high-level structures or vice versa. Reading is seen as an activity that involves an upward movement from sentences to semantic structures (comprehension), and the problem is identifying how this bottom-up process (extracting meaning from sentences) is related to top-down processing (making inferences on the basis of prior knowledge). A model of comprehension becomes a model of writing by reversing the direction of movement between structures. Writing is seen as a downward movement from semantic structures to sentences, and the problem is identifying how this downward movement (translating semantics into syntax) is combined with bottom-up processes (manipulating syntax to make meaning).

In the last chapter we explored some of the problems associated with notions of plans and planning; these include the use of the term plan to refer to mental as well as external

representations. We deferred discussion of a further problem to this chapter, and that was the distinction between cognitive and linguistic planning. The distinction between semantic structures and textual structures which we find in Frederiksen and van Dijk takes us back to that distinction:

> "Writing texts involves different levels of planning: cognitive planning (activation and organization/linearization of the content); linguistic planning (linguistic translations)."
> (Passerault & Coquin 1994, p.139)

Here, Passerault and Coquin suggest that linguistic planning is equivalent to the Hayes and Flower process of translating (Hayes & Flower 1980a, p.15). In the Hayes and Flower model of writing, the generating process is concerned with finding an appropriate semantic representation, which is stored in memory, while the translating process translates this semantic representation into syntax. We criticised the model for assuming a linear process of translating semantic representations into syntax, and concluded that a data processing model imposes relations of sequentiality, resulting in a logical sequence of planning, drafting and revising. There are two reasons why the distinction between cognitive and linguistic planning appears to be justified, and the first takes us back to a sequential model of writing.

The argument that planning operates at different levels refers to text structure. For example:

> "Text structures occur at different levels, with longer texts having more levels. For simplicity, we will assume that there are just four levels: the text level, the paragraph level, the sentence level (syntax), and the word level (spelling)."
> (Collins & Gentner 1980, p.59)

In a similar fashion to Flower and Hayes, Collins and Gentner argue that writing is "a process of generating and editing text within a variety of constraints" (Collins & Gentner 1980, p.52). They prescribe a sequential model of writing - the model of "Plan, Draft and Revise" - as a method of handling these constraints. Consequently, at the first stage "it is important to separate idea

production from text production" (Collins & Gentner 1980, p.53), while "the next stage is to impose text structures on the ideas" (Collins & Gentner 1980, p.59). To impose text structures, a writer must follow the sequence of global planning, paragraph planning, sentence planning and word planning. In a similar fashion, Cooper and Matsuhashi argue that planning is a hierarchical activity:

> "...the crucial plans are *superordinate* to other plans, are further up in a hierarchy. The small-scale sequential plans are useless unless they are under the control of a higher plan..."
> (Cooper & Matsuhashi 1983, p.9)

As we discussed in the last chapter, the problem here is whether the higher plan refers to a writer's motivation and goals of achievement, or to some kind of representation of semantic structure, such as van Dijk's macrostructures or Frederiksen's frame grammars.

Firstly then, the argument that planning operates at different levels refers to text structure. This argument relies on the distinction between semantic structures and textual structures, a distinction made by text linguists such as van Dijk and Frederiksen. Using this taxonomy of representations, psychologists distinguish between cognitive and linguistic planning. Cognitive planning is therefore concerned with semantic structures or representations, while linguistic planning is concerned with textual units identified by linguistic analysis, such as paragraphs, sentences and words. Levels of planning are therefore tied to levels of text structure, beginning with global discourse or semantic plans at the top of the hierarchy, and moving down through paragraphs and sentences until we reach lexical planning at the bottom of the hierarchy.

The distinction between cognitive planning and linguistic planning, and the distinction between semantic structures and textual structures, both reflect the influence of Chomsky's transformational grammar. Above, we discussed Chomsky's influence on the development of story grammars, and we also

noted the use of transformations in van Dijk's text grammar. Likewise, Frederiksen's model of discourse comprehension appears to be the result of applying Chomsky's model of sentence comprehension to a complete text:

> "We have also analyzed the topical structure of the children's stories, examining the correspondences between topical structure (an aspect of 'text surface structure') and frame structure (an aspect of 'deep semantic structure')."
> (Frederiksen 1986, pp.255-256)

As we mentioned above, in Chomsky's (1965) model of sentence comprehension, syntax and semantics are separate components. The semantic structure of a sentence is composed of the logical relations expressed in the sentence, and a transformational rule transforms syntactic structure (surface structure) into semantic structure (deep structure). In Frederiksen's multilevel model of text comprehension and text production, semantic structures and textual structures are also separate features, and semantic structures are also composed of logical relations. The objective of Frederiksen's research is to find the appropriate rules that will transform semantic representations into a textual surface structure.

In a multilevel model of structures, a model of comprehension becomes a model of writing by reversing the direction of movement between representations. In Chomsky's model of sentence comprehension, syntactic structure is transformed into a semantic representation, and in Hayes and Flower's notion of translating, this process is reversed:

> "The function of the TRANSLATING process is to take material from memory under the guidance of the writing plan and to transform it into acceptable written English sentences."
> (Hayes & Flower 1980a, p.15)

From a planning perspective, semantic structures are the deep structures of a future text and the result of cognitive planning, while syntax is the textual surface structure which results from

linguistic planning. Finally, while the distinction between cognitive planning and linguistic planning reflects Chomsky's distinction between deep structure and surface structure, Flower and Hayes' notion of a plan "To Say" or a plan of contents (Flower & Hayes 1980a, p.45) reflects Chomsky's equation of deep structure with content and surface structure with form:

> "... one major function of the transformational rules is to convert an abstract deep structure that expresses the content of a sentence into a fairly concrete surface structure that indicates its form."
> (Chomsky 1965, p.136)

In this context, a cognitive plan is a plan of content, while a linguistic plan is a plan of form.

There is a second reason why a distinction between cognitive and linguistic planning appears to be justified, and that is the different kinds of textual representations that a writer produces, such as notes and sentences. In this context, we might distinguish cognitive planning from linguistic planning by claiming that the first activity results in notes while the second results in finished sentences or syntax. However, this distinction between notes and syntax suggests the notion of syntactic planning, rather than linguistic planning. Writing is a linguistic activity, so that some kind of linguistic planning is always occurring in writing; whether writing notes or sentences, a writer must retrieve lexical items from memory.

We concluded the last chapter with the observation that the spontaneous prose generated by the strategy of "Draft and Revise" is no different to the notes generated by the strategy of "Plan, Draft and Revise"; in both cases, a writer pursues a cycle of thinking, writing and reading according to the basic model of writing in figure 5. In Sharples and Pemberton's taxonomy of text items (Sharples & Pemberton 1992, p.327), the category of notes includes an entire text. They make the distinction, not between notes and sentences, but between "instantiated" and "un-instantiated" text items; from this perspective, "uninstantiated"

text items serve as "idea-labels" that mark a place where text is still to be created (Sharples & Pemberton 1992, p.327). In terms of writing strategies however, there is a difference between generating notes or spontaneous prose and the kind of syntactic manipulation that Williamson and Pence observe in students writing with a computer (Williamson & Pence 1989). From the perspective of writing strategies, some "instantiated" text items might also serve as "idea-labels" - in this case, marking a place where text is still to be manipulated into finished sentences. Cooper and Matsuhashi (1983) also distinguish between global discourse plans and sentence plans, giving an account of sentence planning that we discuss below.

We also concluded the last chapter by defining cognitive planning as textual structuring, a mental activity of making meaning. Syntactic planning, or syntactic structuring, must be part of this activity of making meaning. In Chomsky's approach to sentence comprehension, the object of study is the isolated sentence, so that the meaning of a string of sentences is the sum of the logical relations expressed in each sentence. We have mentioned the occurrence of sentences in some kind of context or discourse, such as a work of fiction, and the use of context to make inferences about meaning. In a model of comprehension that represents the structuring activity of the reader as a movement between structures, the use of prior knowledge to make inferences would be labelled a top-down process, while the extraction of meaning from sentences a bottom-up process. Using this terminology, the writing strategy of "Plan, Draft, and Revise" is a kind of top-down processing, in which a writer starts with some kind of mental representation of semantics and works downwards to create sentence structure, while the syntactic manipulation of the recursive reviser is a kind of bottom-up processing, in which a writer plays with syntax to create a mental representation of meaning. This characterisation of writing behaviour assumes a hierarchical model of plans or structures, with syntactic structures on the bottom of the hierarchy and semantic structures on the top. In this type of model, the process of writing is represented as a series of movements between

different levels of a hierarchy of representations, structures, or plans.

In the last chapter however, we described a basic model of writing that represents writing as a cycle of activities, a cycle of thinking, writing, and reading. We have yet to identify what kind of thinking processes or structuring activities are involved in fiction writing. The linguistic approaches to modelling writing discussed in this chapter have all been concerned with the identification of structures. We have referred to the consensus among linguists that "the sentence is the maximal unit of grammatical analysis" (Crystal 1971, p.201). While the sentence is a structure that is defined by its existence as an external representation, semantic structures are defined by linguists as a result of textual analysis. Can we use texts to identify structuring activities rather than structures? We have identified syntactic structuring as one of these activities, but this is based on an identification of the sentence as a basic structure. Sentences form part of a larger discourse, such as a short story or novel, and this consideration leads to the question, what is the relation between syntax and semantics in the context of fiction writing? To answer these questions, we need to investigate two further applications of linguistics to the study of writing.

Introducing their linguistic approach to writing, Witte and Cherry describe "two lines of research" into written products (Witte & Cherry 1986, p.115). The first line is marked by studies of syntactic features, which have tended to follow Chomsky's model of transformational grammar, while the second is marked by studies of "features that reach beyond sentence boundaries" (Witte & Cherry 1986, p.115). According to Witte and Cherry, the first line of study has provided "very little insight into the processes of producing written texts" (Witte & Cherry 1986, p.116). Referring to research into writing processes, such as the work of Flower and Hayes, they conclude that "more of a writer's conscious attention is devoted to creating semantic relationships across the boundaries of sentences than is devoted to mapping meaning onto particular syntactic forms" (Witte & Cherry 1986,

p.117). The second line of study "has looked beyond the sentence to larger units of discourse" (Witte & Cherry 1986, p.117), and this line of study is marked by the assumption that thinking processes can be inferred from written products:

> "Informing many of the studies that look beyond the level of the sentence in their examinations of written products is the sometimes explicit but usually implicit assumption that suprasentential structural patterns in written texts reflect thinking processes of the mind that produced the text." (Witte & Cherry 1986, p.119)

Texts can therefore be used to identify structuring activities or thinking processes, rather than structures. However, Witte and Cherry's method of inferring process from product, and the structuring activity which they infer, both take us back to Frederiksen's model of writing.

Witte and Cherry set out to investigate a hypothesis. Discussing Hayes and Flower's model of writing and their notion of planning (Hayes & Flower 1980a, Flower & Hayes 1980a, Flower & Hayes 1981), they conclude that "both their cognitive process model of composing and their conceptualization of planning lacks a certain specificity" (Witte & Cherry 1986, p.124). To add this specificity, they discuss recent work by Bracewell, Frederiksen, and Frederiksen (1982), which "helps add specificity to the Flower and Hayes theoretical model by hypothesizing certain relationships among planning, translating, and text" (Witte & Cherry 1986, p.124). According to the hypothesis of Bracewell and colleagues (Bracewell et al 1982), the operation that Hayes and Flower label translating is influenced by framing processes. Framing is the process of creating a framework or context in which sentences can be interpreted. The process of writing sometimes involves discovering a framework through translating, and in this case, the text already written may need to be revised in order to produce a coherent text. In other words, a frame appears to be similar to the plan of a text that writers sometimes discover through the process of writing, as we mentioned in the last chapter.

We have also seen how Frederiksen uses the notion of frames as semantic structures in his multilevel model of text production and comprehension. According to the hypothesis of Bracewell and colleagues, translating processes provide the link between semantic and textual representations, or, to be more specific, between conceptual frames and sentence topics. Witte and Cherry's hypothesis is that framing processes, and hence conceptual frames, can be inferred by the analysis of sentence topics.

According to Witte and Cherry, "the concept of topic is a useful and valid one for discussing individual sentences within a discourse, semantic relationships among sentences in a discourse, and whole discourses" (Witte & Cherry 1986, p.127). However, Witte and Cherry define a topic in terms of the sentence: the topic is usually the grammatical subject of the sentence. In a similar fashion to Phythian's definition of the grammatical subject (Phythian 1980, p.5), Witte and Cherry explain that the topic names "what the sentence is about" (Witte & Cherry 1986, p.128). Thus the topic is the name of the sentence, and, usually, its grammatical subject. On the unusual occasions when the topic is not the grammatical subject, then identifying the topic is a question of interpretation. Witte and Cherry look at "patterns of sentence topics in texts", and use these patterns to infer framing processes (Witte & Cherry 1986, p.130). This analysis involves three stages. Firstly, they identify the topic of each sentence and secondly, allocate the topics to a category of noun or noun-phrase. Thirdly, the number of occurrences of each category is calculated, and the framing process is identified by the most frequent category that occurs in the text.

Witte and Cherry give the following example. Students were given a writing task in which they were asked "to describe to an acquaintance a place or landmark that was near their home or that they had visited while on vacation or on a day trip" (Witte & Cherry 1986, p.130). Analysing the results, Witte and Cherry identify four "framing strategies": narrative framing, descriptive

framing, sequence framing, and locative framing (Witte & Cherry 1986, pp.131-135). In the case of narrative framing, sentence topics are dominated by the first-person pronoun, while in the case of descriptive framing, sentence topics are dominated by the names of objects. Locative framing is a variant of descriptive framing in which topic and comment change places. Thus, 'A piano is in the living room' is an example of descriptive framing, while 'In the living room is a piano' is an example of locative framing. In the case of sequence framing, sentence topics are dominated by the second-person pronoun. Sequence framing is therefore a variant of narrative framing, with a change of subject.

However, sequence framing is also marked by the use of the present tense. While narrative framing is past tense narration, sequence framing is present tense narration. The choice of tense appears to be determined by a student's interpretation of the writing task. Sequence, locative, and descriptive framing all appear to be responses to the first alternative of describing a nearby place and are written in the present tense. On the other hand, narrative framing seems to be a response to the second alternative of describing a place visited during vacation and is written in the past tense.

One problem with Witte and Cherry's method of inferring process from product is therefore that, to give an adequate explanation of differences in framing processes, we need to refer to verbs as well as nouns. Witte and Cherry assume that sentence topics are a sufficient basis to give an account of the semantic role of sentences. A further problem is that, in order to illustrate locative framing, Witte and Cherry use the flexibility of their definition of sentence topic; this seems to be the unusual occasion when the topic is not a grammatical subject but a preposition such as "above", "below" or "beyond". Both problems show that framing processes cannot be inferred by simply making a list of sentence topics or sentence names.

Underlying the assumption that this is possible is an assumption concerning the structuring activity that is inferred,

and underlying Witte and Cherry's notion of a framing strategy is Frederiksen's notion of frames. Despite their observation that "more of a writer's conscious attention is devoted to creating semantic relationships across the boundaries of sentences than is devoted to mapping meaning onto particular syntactic forms" (Witte & Cherry 1986, p.117), Witte and Cherry are more concerned with the latter process. They assume the existence of a direct mapping between sentence topics and frames. Whereas Frederiksen is more concerned with frame grammars or high-level representations, Witte and Cherry's objective is to identify types of frames by analysing low-level representations, specifically, sentence topics. Rather than a test of Frederiksen's model, Witte and Cherry's investigation represents a method of creating it, a method of establishing categories of frames. The underlying assumption is that the structuring activity of the writer is a reverse process, choosing sentence topics on the basis of a chosen frame. The notion of structuring syntax is therefore assimilated by the notion of "topicalization".

Topicalization refers to a problem identified by Flower and Hayes - that of "finding a focus" when beginning a writing task. Witte and Cherry claim that:

> "... 'focus' in Flower and Hayes's sense of the term may be related to choices writers make about 'topics' at both the level of the discourse and at the level of the sentence. It seems reasonable to assume that the difficulties writers experience in 'finding a focus'... would be reflected in discernible patterns of sentence topics in texts and that these patterns would help us identify relationships between written products and writing processes."
> (Witte & Cherry 1986, p.130)

According to Witte and Cherry, the writer's problem of finding a focus is a problem of finding a topic. However, this problem is not only one of finding a discourse topic, but of finding a topic for each sentence. But, if the topic of a discourse is reflected in each sentence topic, as Witte and Cherry suggest, then the discourse topic must be equivalent to the frame. Topicalization is indeed seen as "connected to framing processes during text production",

and Witte and Cherry assume "that the four patterns of topical focus reveal different framing strategies that writers can use in composing descriptive or informative discourse" (Witte & Cherry 1986, p.130).

However, the topic of a discourse is not equivalent to Frederiksen's notion of a frame; neither is it reflected in each sentence topic. As we have mentioned, a frame is a high-level representation of semantic structure, and each frame is represented by a grammar. Witte and Cherry's goal is to create mappings from sentences to frames via sentence topics. In assuming a one-to-one mapping between sentence and frame, Witte and Cherry's object of study is still the isolated sentence, and their prime concern is its name. The map that connects high-level and low-level structures is a correspondence between nouns. The priority that they attach to sentence topics is a reflection of traditional grammar's binary division of the sentence into grammatical subject and predicate, and the notion that the grammatical subject or topic is the name of the sentence. This binary division of the sentence and priority given to the noun is also found in Chomsky's analysis of sentence structure and his notion that active and passive forms of the verb have the same meaning.

In Witte and Cherry's account of sentence semantics, semantic relationships that cross sentence boundaries are only created when topics can be mapped onto the same frame. This is achieved by a flexible interpretation of sentence topic, and the numerical method of adding up the topics of each sentence and calculating the most frequent occurrence. A one-to-one map of frame onto sentence suggests that a text is a string of sentences. If that is the case, then Phythian's psychological explanation of sentence topics suggests that writing is a cycle of naming and thinking, a schizophrenic view of writing that we questioned above. To infer structuring activities from Witte and Cherry's findings we need to re-interpret their evidence by considering verbs as well as nouns. We can make a similar distinction between narrating and describing by looking at the verbs in a string of

sentences. The result is a different account of these activities, but this is an argument that is developed in the next chapter.

In Witte and Cherry's account, the relation between syntax and semantics is a one-to-one map between sentence topic and frame. Above, we noted Culler's criticism of Jakobson's numerical analysis of poetry (Jakobson 1973); this analysis is used as "a technique for discovering patterns in a text" (Culler 1975, p.69). Culler claims that "the discovery of formal structures is an infinite process and must, if it is to be fruitful, be grounded on a theory of how the literary text functions" (Culler 1975, p.109). He adds that "a work has a structure only in terms of a theory which specifies the ways in which it functions, and to formulate that theory is the task of poetics" (Culler 1975, p.109). A *functional* approach to textual analysis can be used to look at entire texts, chapters, paragraphs, or sentences. Discussing the boundaries between syntax and semantics, Chomsky appears to recognise the need for such an approach when he remarks: "it seems that beyond the notions of surface structure (such as 'grammatical subject') and deep structure (such as 'logical subject'), there is some still more abstract notion of 'semantic function' still unexplained" (Chomsky 1965, p.163).

An alternative explanation of the relation between syntax and semantics is given by functional sentence perspective. This is the approach adopted by Cooper and Matsuhashi (1983) in their discussion of sentence semantics and sentence planning. Functional sentence perspective looks at the semantic role of sentences. From this perspective, the semantics of a sentence is represented by the function of the sentence in extended discourse, not by the logical relations expressed in the sentence. Cooper and Matsuhashi identify various semantic roles which are grouped into the five categories of "generalizing, rhetorical, sequencing, relationship and development roles" (Cooper & Matsuhashi 1983, p.16). They note that "the discourse type and the writer's corresponding schema will constrain, if not fully determine, the writer's choice of the appropriate semantic roles for the next sentence" (Cooper & Matsuhashi 1983, p.19).

The problem is, how does one classify text types? Cooper and Matsuhashi classify text or discourse types according to their "language" (Cooper & Matsuhashi 1983, p.14), which can be "expressive" (exemplified by notes, diaries or personal letters), "poetic" (this category is not restricted to poems but includes short stories) and "transactional" (in which a writer is informing, persuading or instructing). However, there is a disparity here between a functional approach to sentence semantics, and a method of classifying text types according to their language. This disparity gives rise to the problem of explaining how a specific text type determines sentence semantics. The difficulty of classifying text types is discussed by Beaugrande and Dressler, who report that a colloquium held in 1972 failed to reach any agreement on the subject:

> "Attempts to apply or convert traditional linguistic methods failed to meet the special needs of a typology of texts. We might count the proportions of nouns, verbs, etc or measure the length and complexity of sentences... without really defining the type... Statistical linguistic analysis of this kind ignores the functions of texts in communication and the pursuit of human goals."
> (Beaugrande & Dressler 1981, p.183)

The functional approach that Cooper and Matsuhashi use to identify the semantic role of sentences is one method suggested by Beaugrande and Dressler to identify text types. From this functional perspective, "descriptive texts would be those utilized to enrich knowledge spaces whose control centres are objects or situations", while "narrative texts, in contrast, would be those utilized to arrange actions and events in a particular sequential order" (Beaugrande & Dressler 1981, p.184). Another type of text is the argumentative text, which is "utilized to promote the acceptance or evaluation of certain beliefs or ideas as true vs. false, or positive vs. negative" (Beaugrande & Dressler 1981, p.184). Beaugrande and Dressler point out that "in many texts, we could find a mixture of the descriptive, narrative, and argumentative functions", and they identify these three functions in the American *Declaration of Independence* (Beaugrande & Dressler

1981, p.184). However, as the literary text also contains "various constellations of description, narration and argumentation", these categories are inadequate to identify the literary text as a distinct entity (Beaugrande & Dressler 1981, p.185). To solve this problem, Beaugrande and Dressler define the literary text as a text "whose world stands in a principled *alternativity* relationship to the accepted version of the 'real world'" (Beaugrande & Dressler 1981, p.185). However, with this definition we enter the realm of fiction as non-truth and the problems of definition that we discuss in the next chapter.

With Beaugrande and Dressler's functional approach to text types, there is an obvious connection between the textual functions of narration, description, and argumentation on the one hand, and sentence function on the other. Beaugrande and Dressler's textual functions of narration, description and argumentation are also found in Cooper and Matsuhashi's taxonomy of sentence roles. Sequencing roles include the role of narrating, while development roles include the role of describing:

> "Narrate: the Narrate role has the function in discourse of naming an event or a series of events in a time sequence...
> ...Describe: the Describe role seems to provide one or more details of an *object* or *person* in order to assist the reader in seeing the object precisely or understanding it fully."
> (Cooper & Matsuhashi 1983, pp.17-18)

All the linguistic approaches to writing that we have considered in this chapter would agree that narrating and describing are two activities which occupy fiction writers. From Frederiksen's perspective of high-level frames, a narrative frame is composed of event structures and scene structures. From a similar perspective of framing processes, Witte and Cherry identify narrative and descriptive framing. Beaugrande and Dressler identify the textual functions of narration, description, and argumentation, and Cooper and Matsuhashi identify these functions in sentence roles.

In all four cases however, the notions of narration and description are embedded in the rationalistic tradition.

Frederiksen's narrative frame is a grammar of events that take place in the real world. Similarly, narration is primarily concerned with a particular ordering of events (Beaugrande & Dressler 1981, p.184), or a series of events in a temporal sequence (Cooper & Matsuhashi 1983, p.17). Description serves to inform, to enrich knowledge spaces (Beaugrande & Dressler 1981, p.184), or to provide details that enable understanding (Cooper & Matsuhashi 1983, p.18). In the next chapter, we argue that fiction writing does not involve the sort of factual reporting that is suggested by these notions of narration and description. A rationalistic definition of narration and description gives rise to Beaugrande and Dressler's problem of defining a literary text; their solution is to refer to notions of truth and non-truth in order to distinguish real and fictional worlds.

From the perspective of writing fiction, the problem with Cooper and Matsuhashi's definitions of sentence roles is that, while the two functions of narration and description have a role each, the other thirteen roles are an amplification of the argumentative function. This suggests that the basis of their taxonomy is primarily an analysis of argumentative texts. On the other hand, the sentence roles are presented as a universal taxonomy that applies to all text types, and three of the thirteen roles are given a supplementary definition that accounts for their occurrence in narrative texts. Yet the lack of any consensus on how to define text types suggests that a universal taxonomy is not possible. On the one hand, a functional definition of text types looks at the dominant sentence roles such as argumentation or narration; on the other hand, a universal taxonomy of sentence roles assumes a definition of text types to account for variants. In other words, sentence roles are defined according to text type, but text types are defined according to sentence roles. To escape this hermeneutic circle, we may have to resort to the notion that a literary or a fictional text contains not only argumentation, narration, and description, but some extra ingredient, such as Beaugrande and Dressler's "principled *alternativity* relationship to the accepted version of the 'real world'" (Beaugrande & Dressler 1981, p.185).

A prime concern with argumentation partly explains the rationalistic view of narration and description that we mentioned above. In the context of argumentative texts, Cooper and Matsuhashi note the use of narration to substantiate an argument or an explanation. A similar notion of narrative as evidence or testimony is exemplified in Edgar Allan Poe's tale, *The Narrative of Arthur Gordon Pym:*

> "Even though Narrate is placed here with Sequence roles, it often plays an important part in persuasive and explanatory writing along with other Development roles. Like these latter roles - Exemplify, Define, Describe - Narrate can produce a short narrative incident which is being presented as an example in an argument or an illustration in an explanation."
> (Cooper & Matsuhashi 1983, p.17)

Cooper and Matsuhashi also point out that "certain forms of discourse" such as "expressive, personal-experience narrative, biography, history, journal, reportage" may consist largely of sentences whose function is narration, and in these cases, "Narrate may be interrupted occasionally by only one other role - Evaluate" (Cooper & Matsuhashi 1983, p.17). The role of evaluation is one of the three roles that have a supplementary definition to account for their occurrence in narrative texts. In argumentation, the role of evaluation is to judge or reflect on previous assertions, while in narration, it is events that are evaluated:

> "Evaluate plays an important role in narrative, where it may occur at any point that the writer steps aside to comment or reflect on, or evaluate, the action. In narrative it is recognised as a definite break in the narrative line, usually with a shift in verb tenses."
> (Cooper & Matsuhashi 1983, p.17)

The other roles that are given supplementary definitions are "State" and "Qualify":

> "State: the State role is the role of generalization or theme or thesis. It asserts the controlling and central idea of the

> discourse. The State role will usually appear in the first few sentences of explanatory or persuasive discourse... In expressive or personal-narrative writing the State role may be used to cover what Labov... calls the Abstraction role. State nearly always occurs at a high level of abstraction in the discourse."
> (Cooper & Matsuhashi 1983, p.16)

This definition of "State" provides an alternative explanation of the relation between syntax and the topic of a discourse. In Witte and Cherry's analysis, a discourse topic is equivalent to a frame and is mapped onto each sentence topic. In this functional view, a discourse topic is mapped onto a sentence topic when the topic or theme is named; subsequent sentences involve a discussion or elaboration of the theme. This is the first paragraph of Milan Kundera's novel *The Unbearable Lightness of Being:*

> "The idea of eternal return is a mysterious one, and Nietzsche has often perplexed other philosophers with it: to think that everything recurs as we once experienced it, and that the recurrence itself recurs ad infinitum! What does this mad myth signify?"
> (Kundera 1985, p.3)

Kundera's first sentence is an example of Cooper and Matsuhashi's "State" role. The first two chapters of Kundera's novel are concerned with "the idea of eternal return", an idea that is named in the first sentence. The topic of the first sentence is also the topic of discourse for the next two chapters, and the ensuing discussion also introduces the title of the novel.

The "State" role is associated with the "Qualify" role:

> "Qualify: the Qualify role functions generally to restrict the meaning of an earlier assertion. In narrative writing Qualify functions to narrow and focus an opening State role establishing the occasion for the narrative. In this way Qualify may be used to cover what Labov... calls the Orientation role in narrative."
> (Cooper & Matsuhashi 1983, p.17)

In argumentative texts, "State" and "Qualify" are both concerned with abstraction. However, the definition of "Qualify" is qualified to account for its occurrence in narrative texts, and in this context, "Qualify" appears to be similar to "Setting" in Rumelhart's story grammar (Rumelhart 1975, pp.213-216). Both roles can be illustrated by Kundera's novel. The second paragraph begins:

> "Putting it negatively, the myth of eternal return states that a life which disappears once and for all, which does not return, is like a shadow..."
> (Kundera 1985, p.3)

The second paragraph qualifies the assertions or the abstract "State" of the first paragraph, while the orientational "Qualify" begins the third chapter:

> "I have been thinking about Tomas for many years. But only in the light of these reflections did I see him clearly. I saw him standing at the window of his flat and looking across the courtyard at the opposite walls, not knowing what to do."
> (Kundera 1985, p.6)

We have now discussed two different accounts of how writers create semantic relationships that cross sentence boundaries. In Witte and Cherry's account, the relation between syntax and semantics is a one-to-one correspondence between sentence topic and frame; the choice of frame determines the choice of sentence topic. In Cooper and Matsuhashi's account, the type of discourse determines the choice of appropriate semantic roles for sentences. Functional sentence perspective suggests that the relation between syntax and semantics is dependent on the type of text a writer is producing. The creation of argumentative texts involves discursive thinking, a thinking activity that is dependent on language. Argumentation also involves the application of logic to some kind of problem, and the representation of this process in writing. To claim that cognitive planning includes the "linearization of content" (Passerault & Coquin 1994, p.139), while linguistic planning is equivalent to the operation that Hayes and Flower call "translating" (Hayes & Flower 1980a, p.15), is to

suggest the separation of syntax and semantics represented by the model of "Plan, Draft, and Revise". While the cognitive planning of argumentative texts includes a process of linearisation, this process involves the manipulation of form as well as content - and the manipulation of syntax can result in semantic exploration.

The strategy of manipulating syntax to create meaning was noted in chapter three, where we discussed the writing behaviour of students who compose with a computer. The relation between logic and grammar is also a topic of discussion in Frye's *Anatomy of Criticism* (Frye 1990). Frye argues, on the one hand, that logic cannot be reduced to grammar. However, Frye also notes that the effect of manipulating grammar is to change semantics:

> "Logic grows out of grammar, the unconscious or potential logic inherent in language, and we often find that the containing forms of conceptual thought are of grammatical origin, the stock example being the subject and predicate of Aristotelian logic...
> ... Logic may have grown out of grammar, but to grow out of something is in part to outgrow it. For grammar may also be a hampering force in the development of logic, and a major source of logical confusions and pseudo-problems. These confusions extend much further than even the enormous brood of fallacies spawned by paronomasia, which is, like so many of our phenomena, a structural principle in literature and an obstacle in discursive writing. For instance, many long arguments may be annihilated by a grammatical change from definite articles and statements of identity to indefinite articles and active verbs. To say, "Reason is *a* function of the mind", is unlikely to lead to dispute; to say "reason is *the* function of the mind" involves one in a pointless struggle for the exclusive possession of an essence."
> (Frye 1990, p.332)

The relation between logic and grammar, and the observations on writing behaviour, both suggest that syntactic planning or syntactic structuring assists discursive thinking and argumentation. As we mentioned above, Cooper and Matsuhashi's taxonomy of sentence roles includes two for narration and

description, and thirteen for argumentation. If their taxonomy applies to all text types, then choosing the semantic role of sentences - or the process of syntactic structuring - will demand more attention when a writer is creating an argumentative text.

6.4 STRUCTURE AND STRUCTURING

In his review of linguistic approaches to literature, Culler concludes by defining the role of a structuralist poetics as "the theory of the practice of reading" (Culler 1975, p.259). A "theory of reading" is exemplified by Levi-Strauss' account of myth (Levi-Strauss 1986), which Culler describes as a hypothesis: "one should consider his proposals concerning the reading of myth as hypotheses about semiotic operations that may be performed intuitively in the reading of literature" (Culler 1975, p.51). According to Culler, it is easier to make hypotheses about the process of reading than the process of writing, partly because "the meanings readers give to literary works and the effects they experience are much more open to observation"; thus "hypotheses about the conventions and operations which produce these effects can therefore be tested" (Culler 1975, p.117). Culler proposes Chomsky's transformational grammar as the basis for a model of "literary competence" and a method of testing hypotheses about reading; but as we concluded above, how Chomsky's grammar can be used to test hypotheses about semiotic operations remains a mystery.

Culler's view on the process of writing merely confirms that writing is a mystery, as we discussed in chapter three; another reason for his assertion is that "the statements authors make about the process of composition are notoriously problematic" (Culler 1975, p.117). An attempt to model writing using the statements of authors is bound to be problematic, but despite Culler's pessimism, researchers have used the results of textual analysis as the basis for a model of writing. However, as we have shown in this chapter, linguistic approaches to modelling writing are dominated by the influence of Chomsky's transformational

grammar, while modelling cognitive processes from the perspective of cognitive science is dominated by a concern with representations. Both approaches to modelling are embedded in the rationalistic tradition that we discussed in chapter two.

There are seven aspects to Chomsky's influence on the methodology of using linguistics to model writing. The first is the use of rules and grammars to represent structure and structuring, while the second is the claim that such grammars have a universal validity. The third is the justification of grammars by the distinction between competence and performance, and the fourth is the evaluation of models by Chomsky's criteria of descriptive and explanatory adequacy, or by some version of these criteria. The fifth is a dualistic assumption that is inherited from the rationalistic tradition; this assumption concerns the relation between thinking and language, and is explained in the next chapter. This dualism underlies the sixth aspect, which is the separation of syntax and semantics, while the seventh is an interpretation of semantics in terms of logical relations.

Cognitive science is so concerned with representations because one of its aims is to design computer systems that simulate human information processing. AI approaches to modelling language comprehension are shaped by the goal of designing machines that can understand natural language. Frederiksen's (1986) approach to modelling writing is from this perspective. His model is a hypothesis about mental representations or structures, structures that are derived from linguistic analysis. Frames are high-level semantic structures that are represented by rules and grammars. Making a similar claim to Chomsky's for the universal validity of his grammar, Frederiksen plans "to test the hypothesis that the rules subjects use in comprehending expository texts are independent of specific content, providing important evidence for the generality of frame production rules" (Frederiksen 1986, p.255). This multi-level model of discourse comprehension and production consists of four layers, with semantic structures on the top, and syntax on the bottom. In this type of model, structuring is a movement between

levels of structure; comprehension is an upwards movement, while production is a downwards movement.[2] Witte and Cherry also use the notion of frames to explain production processes (Witte & Cherry 1986). Their topic analysis is also based on the traditional grammatical division of the sentence into subject and predicate, or topic and comment. Claiming that high-level frames are mapped onto each sentence topic, Witte and Cherry use topic analysis to characterise the framing strategies of descriptive and narrative framing.

Although the separation of syntax and semantics has been questioned by psycholinguists, this aspect of Chomsky's influence is a feature of linguistic models of writing, in which writing is represented as a movement between levels of a structural or representational hierarchy. In their criticism of the rationalistic tradition, Winograd and Flores refer to Heidegger's question whether representations are necessary for human cognition:

> "It is the observer who describes an activity as representing something else. Human cognition includes the use of representations, but is not based on representation."
> (Winograd & Flores 1986, p.99)

Does meaning have a structure? Trees and networks are used in computer science to represent logical relations. Trees are also used by Chomsky to represent syntactic structure, and we have explained the significance of Chomsky's analysis for compiler writing and computer programming. Story grammarians have also used trees to represent the semantics of stories. However, this entails a rationalistic view of semantics, in which meaning is limited to the sort of logical relations expressed in Chomsky's notion of deep structure. We have noted that the sentence is generally seen by linguists as the principal structure of written language; it is finite in length, has a well defined spatial boundary marked by the full stop, and is easily identified on a printed page.

---

[2] In Beaugrande and Dressler's application of information theory to text linguistics, "production" and "reception" are also reversible processes, in which receivers extract from a surface text the underlying concepts, ideas and plans encoded by the senders (Beaugrande & Dressler 1981, pp.42-43).

In comparison, meaning is a question of textual interpretation, and, in Culler's playful interpretation of interpretation, semantic representations are in the eyes of the beholder. While Culler claims that "linguistics does not provide a method for the interpretation of literary works" (Culler 1975, p.109), the linguistic models of writing discussed above provide a method for interpreting the meaning of a text in terms of logical relations.

We commented above that Cooper and Matsuhashi's cycle of process observation and product examination (Cooper & Matsuhashi 1983, p.6) suggests that a linguistic approach to writing represents a hypothesis about structure and structuring - a hypothesis that suggests a relation between structures derived from textual analysis on the one hand, and structuring activities of the writer on the other. We also made the comment that there are diverse ways of using linguistics to model writing, and therefore different kinds of hypotheses. Having used linguistic analysis to identify levels of structures, Frederiksen hypothesises that structuring activities involve the application of grammars to move from one level to another. Chomsky justifies grammars by making the distinction between competence and performance (Chomsky 1965); thus humans use grammars, but are unaware that they do so. Frederiksen claims to have found evidence that humans use frame grammars, but these claims are based on questionable inferences. Witte and Cherry's hypothesis is that structuring activities involve choosing an appropriate frame and subsequently choosing a sentence topic; frames can be inferred by the reverse process of analysing sentence topics and allocating them to appropriate categories. In both types of hypothesis, categories of frames or structures are constructed by the observer using linguistic analysis, and, as Winograd and Flores point out, these representational categories do not necessarily identify the structuring activities or thinking processes of writers.

Culler uses criteria derived from Chomsky in an attempt to evaluate Greimas' structural semantics (Greimas 1966), claiming that the ultimate test of a semantic theory is a computational test:

> "A semantic theory must aim at both operational and descriptive adequacy; that is to say, it must use concepts which can be defined in terms of empirical techniques or operations and it must account for intuitively attested facts about meaning. A theory of description is operationally adequate only if it is sufficiently explicit for different linguists using its apparatus to reach the same results or, more precisely, for a computer to be programmed to use its techniques in producing descriptions."
> (Culler 1975, p.76)

Greimas' hypothesis, like van Dijk's work on text grammars and Frederiksen's model of discourse comprehension, is another hypothesis about semantic representations. Culler's ultimate test of this type of hypothesis is whether machines can be programmed to comprehend discourse. As we mentioned above, the first stage of designing AI systems, such as a system of natural language understanding, is to identify the representations that the system will handle. The computational problem is then to identify the processes that will transform an input representation into the required output representation. Grammars are an appropriate computational mechanism for transforming linguistic representations, and it is an irrelevant question whether this mechanism simulates human activity. With the kind of hypothesis represented by this type of system, the purpose of a computational test is to find out whether the grammar can produce the required output.

If our purpose is to design systems that will assist writers in their structuring activities or thinking processes, then one of our tasks is to identify those activities. Can we use textual analysis to infer structuring activities rather than structures? Witte and Cherry give an affirmative answer:

> "In short, a fair amount of the research on writing that focuses on extended written texts sees formal properties, particularly semantic properties, of texts as reflections of the thinking processes that produced them."
> (Witte & Cherry 1986, p.120)

However, Witte and Cherry's hypothesis is still concerned with maps between representations; in this case, frames and sentence topics.

An alternative view of structuring activity is given by Cooper and Matsuhashi's functional sentence perspective. Using Beaugrande and Dressler's taxonomy of text types, we concluded that syntactic structuring or sentence planning is influenced by the type of text a writer is producing, and that sentence planning is more of a problem for writers when writing argumentative texts, compared with writing narrative or descriptive texts. We also referred to the observations on writing behaviour in chapter three, noting that syntactic manipulation can assist argumentation and the process of making meanings. Syntactic planning is therefore one aspect of cognitive planning or textual structuring, rather than the distinct activity suggested by the notion of linguistic planning. The distinction between cognitive planning and linguistic planning assumes the separation of syntax and semantics, and a hierarchical model of writing based on notions of text structure.

This argument should be further clarified in the next chapter, where we discuss Saussure's approach to linguistics. As we have seen, the representational models of writing discussed in this chapter are dominated by Chomsky's transformational grammar. In this type of model, a model of comprehension becomes a model of writing by reversing the direction of movement between levels of structure. Is it possible to construct an alternative model of writing by adopting an alternative approach to linguistics - that is, by adopting a semiological view of language? This is the question that we pursue in the forthcoming chapters. Culler defines semiotics, the science of signs, as "the attempt to identify the codes and mechanisms through which meaning is produced in various regions of social life" (Culler 1992, p.116). A semiotic model of fiction writing, therefore, would have to identify the codes whereby meaning is produced in fictional texts. Culler's goal for a structuralist poetics is to develop a semiotic theory of reading, and as theories of reading are more

developed than theories of writing, to establish this type of model would necessitate a look at alternative models of reading, such as that provided by Barthes (1990) in *S/Z*. We discuss Barthes' account in chapter nine. Firstly however, we need to discuss Saussure's approach to linguistics.

6.5 CONCLUSION

In this chapter we have looked at the ways in which linguistics is used to model writing. In the first part, we discussed the problem of identifying structures in written language. We showed how Chomsky's transformational grammar has influenced not only the development of story grammars and text grammars, but also Culler's (1975) discussion of linguistic approaches to literature. We concluded this discussion of structure by making a distinction between semiological and structural analyses of written language.

In the second part of the chapter, we looked at explanations of how the structures identified by textual analysis figure in the structuring activities of writers. One explanation is given by Frederiksen (1986), and we showed how his model of discourse comprehension and production is influenced once again by Chomsky's transformational grammar. A further influence of Chomsky lies in the distinction between cognitive and linguistic planning, a distinction that features in current writing research (eg Passerault & Coquin 1994, p.139). We argued that the notion of linguistic planning be replaced by that of syntactic planning, and that syntactic planning is an aspect of cognitive planning. In the course of this argument, we discussed two explanations of how syntax figures in the structuring activities of writers, comparing Witte and Cherry's (1986) account of sentence semantics with Cooper and Matsuhashi's (1983) functional sentence perspective. In conclusion, we summarised the ways in which Chomsky's ideas have influenced linguistic approaches to modelling writing, and identified some problems with the approaches discussed in this chapter.

We concluded the last chapter by describing a basic model of writing that represents writing as a cycle of activities, rather than a movement between structures. We pointed out that to develop the basic model into a model of fiction writing, we needed to identify the kinds of thinking activities that produce fictional texts. What constitutes cognitive planning or textual structuring in the case of fiction writing? The conclusion to this chapter is that thinking activities in fiction writing are somehow concerned with narrating, describing, and arguing, and that syntactic planning is one of these activities. To identify further thinking processes in fiction writing, we shall have to adopt an alternative approach to linguistics, and consider narration and description in more detail.

CHAPTER SEVEN:

NARRATION AND DESCRIPTION IN FICTION WRITING

7.1 INTRODUCTION

In the last chapter, we concluded that thinking activities in fiction writing are somehow concerned with narrating, describing, and arguing, and that syntactic planning is one of these activities. In this chapter we discuss narration and description in more detail, and identify further thinking activities in fiction writing.

We begin by discussing Saussure's view of linguistics. His view of language as a system of sequential and associative relations is supported by Jakobson, who discusses similarity and contiguity disorders in speech impairment, and poles of metaphor and metonymy in literature. We find similarity and contiguity disorders in definitions of narrative. These include the notion of a minimal narrative, and we compare Genette's ideas with those of Todorov. We argue that although a narrative can be treated as the expansion of a verb, verbs can signify scenes as well as events, and we argue that iterative narration is a form of description.

In cognitive terms, events are verbal representations, while scenes are visual representations; we discuss a model of short-term memory developed by cognitive psychologists that features this distinction. Comparing this model with Jakobson's observations on metaphor and metonymy, we identify *events*, *scenes*, and *syntax* as distinct objects of thought in fiction writing - the objects of *remembering* and *imagining*. In the course of this discussion, we refer to accounts of magical or primitive thought, and argue that magical thought is evident in fiction writing. Fiction writers are not obliged to follow rationalistic orderings of events; in fiction writing, the imagination is restrained not by reason, but by the sequential and associative relations of long-term memory.

In the final part of this chapter, we discuss Genette's analysis of narrative discourse. In his discussion of perspective or "point-of-view", Genette uses the term "focus" to classify narrative texts. Using his analysis and the accounts of fiction writers on their characters, we identify the process of *focusing the imagination* in fiction writing. Focusing the imagination is a

process in which a writer imagines she is someone else, and we show how this process also applies to *events*, *scenes*, and *syntax*.

7.2 METAPHOR, METONYMY, AND A MINIMAL NARRATIVE

Discussing the anecdotes of professional fiction writers in chapter three, we turned to Freud for an explanation of the "mystery of writing". Consequently, we asked how one can model a process that is tied to the unconscious and tied to the imagination, given that the former is inaccessible and the latter is the unique property of individuals. Jacques Lacan's oft-quoted assertion gives us a clue:

> "The unconscious is constituted by the effects of speech on the subject, it is the dimension in which the subject is determined in the development of the effects of speech, consequently the unconscious is structured like a language."
> (Lacan 1979, p.149)

If the unconscious is structured like a language, then modelling unconscious processes must be like modelling a language. But how is a language structured?

In Saussure's view, a language is a social institution; some of its features are shared with other social institutions, while some are unique:

> "A language is a system of signs expressing ideas, and hence comparable to writing, the deaf-and-dumb alphabet, symbolic rites, forms of politeness, military signals, and so on. It is simply the most important of such systems. It is therefore possible to conceive of a science which studies the role of signs as part of social life. It would form part of social psychology, and hence of general psychology. We shall call it semiology... Linguistics is only one branch of this general science."
> (Saussure 1983, pp.15-16)

What distinguishes Saussure's view of language from Chomsky's approach in *Aspects of the Theory of Syntax* is firstly the notion

that language is a social institution. For Saussure, "the sign must be studied as a social phenomenon" (Saussure 1983, p.16). For Chomsky however, "the structure of particular languages may very well be determined by factors over which the individual has no conscious control and concerning which society may have little choice or freedom" (Chomsky 1965, p.59). Discussing a child's acquisition of language, Chomsky refers to Plato's *Meno* and the notion that ideas and knowledge are innate rather than acquired:

> "On the basis of the best information now available, it seems reasonable to suppose that a child cannot help constructing a particular sort of transformational grammar to account for the data presented to him, any more than he can control his perception of solid objects or his attention to line and angle. Thus it may well be that the general features of language structure reflect, not so much the course of one's experience, but rather the general character of one's capacity to acquire knowledge - in the traditional sense, one's innate ideas and innate principles."
> (Chomsky 1965, p.59)

There is another significant feature which distinguishes Saussure's approach from Chomsky's. According to Saussure, one reason why semiology is not recognised as an autonomous science is the traditional view of language as a nomenclature: "a list of terms corresponding to a list of things" (Saussure 1983, p.65). One objection to this conception is its assumption that ideas already exist independently of words. In Chomsky's rationalist approach to language, there are two objects of thought: "the idea, which is in the mind, and the thing which is represented by it" (Chomsky 1965, pp.199-200). He justifies the notion of two structures by referring to these "two senses of having an idea", a distinction which features in seventeenth century rationalist philosophy (Chomsky 1965, p.200). In Saussure's view, ideas do not have an existence independent of words:

> "Psychologically, setting aside its expression in words, our thought is simply a vague, shapeless mass. Philosophers and linguists have always agreed that were it not for signs, we should be incapable of differentiating any two ideas in a clear and constant way. In itself, thought is like a swirling

> cloud, where no shape is intrinsically determinate. No ideas are established in advance, and nothing is distinct, before the introduction of linguistic structure."
> (Saussure 1983, p.110)

In Chomsky's theory of two structures, syntactic structure is the result of a transformation, the transformation of a semantic structure that represents logical relations on the one hand and some kind of innate idea on the other. In Saussure's account of the linguistic sign, "a linguistic sign is not a link between a thing and a name, but between a concept and a sound pattern" (Saussure 1983, p.66). In Barthes' terminology, a concept is the signified, and a sound pattern is the signifier (Barthes 1973, p.112). These two elements of the sign "are intimately linked and each triggers the other"; thus the linguistic sign is a "two-sided psychological entity" (Saussure 1983, p.66). Chomsky's dualistic view of linguistic structure reflects the notion that there are two objects of thought; in Saussure's view, there is only one object, and the linguistic sign is one entity with two aspects.

One feature of the linguistic sign is that the signifier or sound pattern exists in time: "the linguistic signal, being auditory in nature, has a temporal aspect, and hence certain temporal characteristics" (Saussure 1983, p.69). The first is that it occupies a temporal space, and the second is that this space is measured in just one dimension: "it is a line" (Saussure 1983, pp.69-70). In Chomsky's analysis of syntax, the sentence exists only in space, and lacks a temporal dimension. Chomsky's object of study is finite in length, with a well defined spatial boundary marked by the full stop.

According to Saussure, language is a system of sequential and associative relations. These two kinds of relations "correspond to two different forms of mental activity" (Saussure 1983, p.121). The linguistic signifier has a temporal dimension; similarly, "linearity precludes the possibility of uttering two words simultaneously" (Saussure 1983, p.121) and words have to be arranged in spoken sequence or syntagma. Syntax is therefore an aspect of sequential relations: "All syntagmatic facts are not to be

classed as syntax, but all syntactic facts belong to syntagmatics" (Saussure 1983, p.135). The second kind of relation is associative:

> "Outside the context of discourse, words having something in common are associated together in the memory... This kind of connexion between words is of quite a different order. It is not based on linear sequence. It is a connexion in the brain. Such connexions are part of that accumulated store which is the form the language takes in an individual's brain."
> (Saussure 1983, pp.121-122)

Saussure's view of language marks a distinct break from the structural methods of traditional grammar. Discussing the traditional division of grammar into morphology and syntax, Saussure argues that morphology "cannot constitute a discipline distinct from syntax" (Saussure 1983, p.134). On the other hand, he asks:

> "... is it reasonable to exclude lexicology from grammar? At first sight, words as listed in the dictionary do not seem to lend themselves to grammatical analysis. For grammar is usually limited to studying relations between units. But it soon becomes apparent that many of these relations may be expressed by words just as well as by grammatical devices."
> (Saussure 1983, p.134)

Giving examples from Latin, Russian, Greek, French and German, he concludes that "from a functional point of view, lexicological and syntactic devices overlap" (Saussure 1983, p.134). A more rational division of grammar will be achieved by referring to a theory of syntagmas and a theory of associations, and so organising "the whole subject matter of grammar on its two natural axes" (Saussure 1983, p.135).

Following Saussure, Jakobson also takes the view of language as a system of sequential and associative relations. In his discussion of the problem of aphasia or speech impairment, he identifies two extreme types of aphasia which he labels "contiguity disorder" and "similarity disorder" (Jakobson 1987). In the case of contiguity disorder, the path of sequential relations is

blocked, word order is chaotic, and the extent and variety of sentences is drastically diminished. In the case of similarity disorder, the path of associative relations is blocked, and speech is context bound; for example, the phrase "it is raining" can only be produced when it is raining. Jakobson concludes that, although "the varieties of aphasia are numerous and diverse", they all range between these two polar types (Jakobson 1987, p.109). He characterises the two extremes in terms of metaphor and metonymy:

> "Metaphor is alien to the similarity disorder, and metonymy to the contiguity disorder."
> (Jakobson 1987, p.109)

Jakobson uses the results of this analysis to make observations on thinking in general and literature in particular. Firstly, he describes an experiment that uses the psychoanalytic technique of free association. In this experiment, humans are asked to reply spontaneously to a word stimulus given by the experimenter, such as the noun "hut". Jakobson concludes that responses generally follow the paths of associative or sequential relations. Someone who follows the first path will give a substitutive response, such as "den" or "thatch", while someone who follows the second will give a complementary or predicative response, such as "burnt out" or "is a poor little house". In addition, the responses are either metaphorically or metonymically associated with the stimulus. Following the path of associative relations, a metaphoric response, such as "den", is "semantically similar" to the stimulus, while a metonymic response, such as "thatch", is "semantically contiguous" (Jakobson 1987, p.110).

The problem with Jakobson's notion of "semantic contiguity" is the assumption that semantics, like syntax, has a spatial existence. In the last chapter, we referred to Derrida's comments on spatial metaphor and questioned the notion that semantics can be represented as a structure. Here, Jakobson classifies signifiers by locating the signified in semantic space. In classical rhetoric, metonymy signifies a change of name, and names refer to objects

or persons in the physical world (Aristotle 1965, Longinus 1965). Metonymy is a rhetorical device in which two objects or persons are spatially connected, and the name of one is substituted for the name of the other. Hawkes gives the examples of "The White House" for the American President and "The Crown" for the Queen (Hawkes 1989, p.4). Jakobson's analysis suggests that, in terms of human perception, physical objects can be remembered metaphorically by their visual attributes such as size, shape and colour, or metonymically by the temporal-spatial context in which they were seen. In the case of signifiers that are semantically similar, "hut" and "den" are related visually but not necessarily temporally or spatially, while in the case of semantic contiguity, "hut" and "thatch" have a spatial and a possible temporal correspondence. We return to these aspects of memory below.

Following the path of sequential relations, responses also diverge into metaphor and metonymy. In a similar fashion, Jakobson points out that a metaphoric response, such as "is a poor little house", is "semantically similar" to the stimulus, while a metonymic response, such as "burnt out", is "semantically contiguous" (Jakobson 1987, p.110). Here, however, semantic similarity is not like the previous case of visual correspondence, but takes the form of a reply to the question, "What is a hut?" In this case, the noun "hut" seems to be interpreted as the subject for a sentence, and the predicate is supplied by the response. In the metonymic example, semantic contiguity is not like the previous case of a general spatial correspondence, but takes the form of a verb which creates a narrative context, suggesting a temporal-spatial correspondence with a specific "burnt out" hut.

According to Jakobson's summary of the responses in this experiment, there are two types of connection, metaphoric and metonymic, and two aspects of each: syntactic and semantic. A metaphoric connection involves semantic similarity with syntactic similarity or contiguity; a metonymic connection involves semantic contiguity, again with syntactic similarity or contiguity. If we attempt an alternative summary from the perspective of associative and sequential relations, there are also two types of

connection, in this case associative and sequential, and two aspects of each: metaphoric and metonymic. In the associative case, a noun is a prompt for a noun, and the connection is visual similarity (metaphor) or spatial proximity (metonymy). In the sequential case, a noun is a prompt for a verb, which is either "to be" (metaphor), or the signifier of an event (metonymy).

Jakobson speculates on metaphor and metonymy in the development of discourse:

> "The development of a discourse may take place along two different semantic lines: one topic may lead to another either through their similarity or through their contiguity. The metaphoric way would be the most appropriate term for the first case and the metonymic way for the second, since they find their most condensed expression in metaphor and metonymy respectively."
> (Jakobson 1987, pp.109-110)

Discussing metaphor and metonymy in literature and visual art, Jakobson concludes that "a competition between both devices, metonymic and metaphoric, is manifest in any symbolic process, be it intrapersonal or social" (Jakobson 1987, p.113). Metaphoric and metonymic devices are found in Frazer's analysis of magic (Frazer 1993) and Freud's analysis of dreams (Freud 1976a); we return to these examples below. In the case of literature, Jakobson describes metonymic and metaphoric poles. At the metonymic pole are fictional works in which events dominate and description "follows the path of contiguous relationships", such as Tolstoy's *War and Peace* (Jakobson 1987, p.111). Jakobson points to the dominance of metonymy in Russian heroic epics and late nineteenth century realism. At the metaphoric pole, description is dominant and events are connected by verbal or visual association rather than sequence. Metaphoric constructions dominate Russian lyrical songs and the literary schools of romanticism and symbolism.

Can we apply Jakobson's analysis to modelling fiction writing? In chapter three, we discussed the idea that poles of writing behaviour represent pathological cases while, for the

majority, writing is a cycle of engagement and reflection (Sharples 1993). Here, if we argue by analogy, then poles of metaphor and metonymy in fiction writing would represent the extreme cases, similar to the contiguity and similarity disorders in the studies of aphasia. For the majority of fiction writers, writing would be a cycle of metaphor and metonymy. But what might this cycle involve?

Above, we summarised the results of the free association experiment from the perspective of associative and sequential relations. In the case of sequential relations, a noun is a prompt to a verb, either the verb "to be" or the signifier of an event. A narrative also requires a verb. Discussing the notion of a minimal narrative, Genette uses "a kind of linguistic metaphor that should certainly not be taken too literally" (Genette 1980, p.30):

> "Since any narrative... is a linguistic production undertaking to tell of one or several events, it is perhaps legitimate to treat it as the development - monstrous, if you will - given to a *verbal* form, in the grammatical sense of the term: the expansion of a verb. *I walk, Pierre has come* are for me minimal forms of narrative..."
> (Genette 1980, p.30)

The problem with terms such as "fiction", "narrative", and "story", is that attempts to define them are not only themselves prone to similarity disorder, but are also culturally determined by the rationalistic tradition that we discussed in chapter two. The following definition of a typical story is a typical example:

> "A coherent story differs from a set of isolated sentences in that it has a unifying context, a recognizable temporal sequence of events, and a fixed set of actors or topics. A typical story presents events in an orderly manner, supplying (either explicitly or implicitly) motivations for the characters, causes and consequences of the events, and cues to the temporal sequence in which the events occur. The extent to which these conventions are preserved in a text determines how comprehensible the text is."
> (Thorndyke & Yekovich 1980, p.32)

Another aspect of the rationalistic tradition is the notion of narrative as testimony, evidence, or factual reportage, a notion that is found in Aristotle's *Rhetoric* in the context of oratorical persuasion and proof. This notion is also found in the tales of Edgar Allan Poe, such as the *Narrative of Arthur Gordon Pym.* Narrative is to be contrasted with fiction, which, as Poe's prefatory note to this tale points out, is simply not true, perhaps a product of fantasy and the imagination. In comparison, both terms are used to describe Rimmon-Kenan's book *Narrative Fiction,* but her distinction between fictional and non-fictional events suggests that *Fictional Narrative* might have been a more appropriate title (Rimmon-Kenan 1989, pp.2-3).

The terms "story" and "storytelling" are often used to refer to the oral tradition, as exemplified by the tales and fables used by researchers into story memory (Rumelhart 1975, Thorndyke 1977; Mandler & Johnson 1977). However, Genette uses the term "story" for the "signified or narrative content", while "narrative" refers to the "signifier, statement, discourse or narrative text itself" (Genette 1980, p.27). From this distinction arises the notion that some ideal temporal ordering of events can be reconstituted by the reader from the text (Genette 1980, p.35), or is in the mind of the writer before the process of writing has begun (Genette 1980, p.244), a notion to which we return below. This ideal order of events is the story, and this definition of a story is also used by Rimmon-Kenan (Rimmon-Kenan 1989, p.3).

Although Genette treats a narrative as the expansion of a verb, the verb is determined by the other equation of a story with events. The idea that a narrative is the expansion of a verb is perhaps not as monstrous as the idea that a verb can only signify events. A cycle of metaphor and metonymy suggests that the fictional work is at least a combination of events and scenes, and that fiction writing is a cycle of narrating and describing; in Beaugrande and Dressler's discussion of text types, literary texts "contain various constellations of description, narration, and argumentation" (Beaugrande & Dressler 1981, p.185). In Genette's account of narrative discourse, the event is the main feature.

Using the distinction between story and narrative, Genette identifies four types of narrative movement: pause, scene, summary, and ellipsis (Genette 1980, p.94). In the latter case, events in the story are simply omitted from the narrative, while in the case of summary, the tempo of the narrative is faster than the story. However, Genette defines a scene as detailed narrative, so that in this case there is an "equality of time between narrative and story" (Genette 1980, p.94), exemplified by the direct reporting of conversation, while a pause is a pause for description, in which there is no report of the story's events in the narrative.

In our use of the term, a "scene" refers to the visual representation that a writer has in mind when describing, or a reader constructs when reading a descriptive text. In this sense, the scene plays a minor role in Genette's narrative discourse; a scene is a pause or a gap between events. Elsewhere, Genette claims that "narrative recognizes only events or speeches (which are a particular type of event...)" (Genette 1988, p.61), so that speech is both an event and a "scene", in Genette's sense of the term. So, in Genette's view, a narrative recognises events only.

A metonymic view of fiction, narrative or story is commonly found in literary criticism (Forster 1962, Liddell 1965), and dominates attempts to develop a story grammar (Rumelhart 1975, Thorndyke 1977, Mandler & Johnson 1977, Mandler 1978, Johnson & Mandler 1980). In Rumelhart's schema for stories, "Event is the most general category of our entire grammar" (Rumelhart 1975, p.215). In Liddell's apology for the moral value of the novel, fiction is "the delineation of character in action" (Liddell 1965, p.110), and in descriptive writing, "a novelist is not getting on with his story" (Liddell 1965, p.111). As an example of metonymic extremity, Liddell advocates some kind of aesthetic terrorism usually reserved for the fine art masterpiece: "It is time for an attack to be made upon the pictorial element in literature" (Liddell 1965, p.110). This criticism is not aimed at rhetorical theory, an area where the study of metaphor has dominated the study of metonymy (Jakobson 1987, p.114), but at fiction writers.

Despite such threats, it is tempting to rewrite Genette's claim and argue that fiction writers recognise only events and scenes. In that case, we also need to rewrite Genette's minimal narrative:

> "For me, as soon as there is an action or an event, even a single one, there is a story because there is a transformation, a transition from an earlier state to a later and resultant state. 'I walk' implies (and is contrasted to) a state of departure and a state of arrival. That is a whole story..."
> (Genette 1988, p.19)

From French into English, "Je marche" can be translated as "I walk" or "I am walking". In Genette's minimal narrative, "I walk" is an event that implies departure and arrival, and a story is a transformation from an earlier state to a later state. However, this notion of transformation assumes a linear notion of time - time as a measurable straight line. Mythologists and anthropologists have described an alternative view of time as a cycle, a view held by non-literate societies (Harrison 1963, Levi-Strauss 1972). Dseagu argues that "time, as far as the traditional African is concerned, is not a linear progression but rather a circular progression", and that this view of time finds expression in several African novels (Dseagu 1992, p.601). In his analysis of a story by Poe, Barthes points out that chronological references such as "three years later" are terms that form a cultural code:

> "...the chronological code: 'dating', which seems natural and objective to us today, is in fact a highly cultural practice - which is to be expected since it implies a certain ideology of time ('historical' time is not the same as 'mythical' time); the set of chronological reference points thus constitute a strong cultural code (a historical way of cutting up time for purposes of dramatisation, of scientific appearance, of reality-effect)..."
> (Barthes 1981, p.155)

According to Frye's theory of myth, narrative also involves movement, but here "the fundamental form of process is cyclical movement" (Frye 1990, p.158). Selmer Bringsjord (1991) also discusses the notion of the plot as a circular movement, in which an initial situation of stability is followed by a conflict; there

follows a resolution of conflict and thus a return to a stable situation. He has developed a computational method of writing stories based on this notion of the plot, which he ascribes to Aristotle, and is using this method to write his second novel, *Eternal Return* (Bringsjord 1991, p.31). In *Finnegans Wake,* the final words loop back to the beginning of the novel, and in T S Eliot's *Four Quartets,* the state of departure is also a state of arrival:

> "Time past and time future
> What might have been and what has been
> Point to one end, which is always present."

In a similar fashion to Genette, Todorov has also described the minimal narrative as a transformation. However, this transformation is formulated in terms that also suggest a circular rather than linear movement, and reflect the Aristotelian notion of a disturbed state of equilibrium. In his *Grammar of Narrative,* Todorov writes that "the minimal complete plot consists in the passage from one equilibrium to another" (Todorov 1977a, p.111):

> "An 'ideal' narrative begins with a stable situation which is disturbed by some power or force. There results a state of disequilibrium; by the action of a force directed in the opposite direction, the equilibrium is re-established; the second equilibrium is similar to the first, but the two are never identical."
> (Todorov 1977a, p.111)

From this formulation, Todorov reaches the conclusion that "there are two types of episodes in a narrative: those which describe a state (of equilibrium or of disequilibrium) and those which describe the passage from one state to the other" (Todorov 1977a, p.111). While the first type will be "relatively static" and possibly iterative, the second "will be dynamic and in principle occurs only once" (Todorov 1977a, p.111). Unlike Genette's reference to narrative as the expansion of a verb, Todorov's definition of narrative episodes pays equal attention to the verb and the adjective:

> "This definition of the two types of episodes... permit us to relate them to two parts of speech, the adjective and the verb... Narrative 'adjectives' will therefore be those predicates which describe states of equilibrium or disequilibrium, narrative 'verbs' those which describe the passage from one to the other." (Todorov 1977a, p.111)

Elsewhere, Todorov follows Greimas in using a four-term homology to give a similar characterisation of narrative episodes:

> "The only category we have for describing the variety of predicates is... that of static/dynamic, which adopts and makes explicit the grammatical opposition between adjective and verb... it seems that all we can assert about predicates, on the syntactic level, is exhausted by this characteristic: 'static/dynamic', 'adjective/verb'."
> (Todorov 1977b, p.220)

Todorov's "narrative verb" describes the sort of transformation or event that Genette identifies as a minimal narrative. However, his notion of "narrative adjective" provides a further argument that a minimal narrative can also be constituted by a scene, and that a scene can be treated as an expansion of the verb "to be". Discussing the free association experiment above, we concluded that, in the case of a sequential response, a noun serves as the prompt to a verb; the verb is either "to be" or the signifier of an event. While a narrative suggests sequential relations (Jakobson's "syntactic contiguity") and the expansion of a verb, we need to extend Genette's definition of a story so that "I am walking" is also a minimal narrative.

Moreover, the type of episode that Todorov calls "narrative adjective" includes not only description but also what Genette calls "iterative narrative" (Genette 1980, p.116). We have shown that Genette's distinction between story and narrative leads to a typology of narrative movements (pause, scene, ellipsis and summary). This distinction also leads to a typology of "relations of frequency" (Genette 1980, p.114). The first type is singulative narrative, where an event occurs 'n' times in the story and is reported 'n' times in the narrative (Genette 1980, pp.114-115).

The second type is repeating narrative, where an event occurs once but is reported 'n' times (Genette 1980, pp.115-116). The third type is iterative narrative, where an event occurs 'n' times but is reported once only (Genette 1980, p.116). One problem with this typology is the underlying assumption. To distinguish singulative from repeating narrative, we must be able to infer the ideal order of events given by the story, and this is not always possible. Has an event occurred once or more than once in Robbe-Grillet's *La Jalousie,* for example? In addition, it is the obvious presence of several narrators that seems to identify a repeating narrative (Faulkner's *The Sound and the Fury* for example), so that a repeating narrative is also a narrative with multiple focalization, which we discuss below.

However, the iterative narrative is more easily identified. The following extract is from George Eliot's introduction to *Felix Holt:*

> "Five-and-thirty years ago the glory had not yet departed from the old coach-roads: the great roadside inns were still brilliant with well-polished tankards, the smiling faces of pretty barmaids, and the repartees of jocose ostlers; the mail still announced itself by the merry notes of the horn; the hedge-cutter or the rick-thatcher might still know the exact hour by the unfailing yet otherwise meteoric apparition of the pea-green Tally-ho or the yellow Independent; and elderly gentlemen in pony chaises, quartering nervously to make way for the rolling swinging swiftness, had not ceased to remark that times were finely changed since they used to see the pack-horses and hear the tinkling of their bells on this very highway."

Here, iterative narration is marked by the pluperfect tense, the verb "to be", and the iterative "still"; for example: "had not yet departed", "were still brilliant", "still announced itself", "might still know" and "had not ceased to remark". In this example, iterative narration extends for several pages before any markers indicate a transition to singulative narration, such as "one day", "once", or "it was a bright morning in July when". Alternatively, one could say that the reader has to plough through several pages before anything happens. Genette remarks that in classical narrative, "the

iterative sections provide an informative frame or background" to singulative narration (Genette 1980, p.117). Thus "the classic function of iterative narrative is... fairly close to that of description, with which, moreover, it maintains very close relations" (Genette 1980, p.117). Together with Todorov's notion of "narrative adjective", the narrative episode that describes a state, Genette's observations suggest that iterative narrative can be treated as a scene, in our sense of the term; that is, as an expansion of the verb "to be".

So far in this discussion, we have shown that notions of story and narrative are prone to what Jakobson has called a similarity disorder. However, notions of narrative can also suffer from a contiguity disorder. Following Saussure's definition of semiology as a social science whose object of study is the sign, Levi-Strauss claims that anthropology is "the *bona fide* occupant of that domain of semiology which linguistics has not already claimed for its own" (Levi-Strauss 1978a, p.9). In his criticism of Propp's *Morphology of the Folktale* (Propp 1968), Levi-Strauss compares his method of structural analysis with what he describes as Propp's formalism (Levi-Strauss 1978b). According to Levi-Strauss, Propp's formalism lies in the assumption that structure is equivalent to syntagmatic or sequential relations; structural analysis must also take into account paradigmatic or associative relations. Yet while Propp gives priority to the event and sequential analysis, one could argue that Levi-Strauss is "the champion of paradigmatic structural analysis" (Dundes 1968, p.xii). Levi-Strauss' method is to construct a matrix of binary oppositions by analysing a corpus of myths; the result is a reading of myth that consists entirely of antithesis (Levi-Strauss 1977, Levi-Strauss 1986).

In the next chapter we argue that the symbolic is generally equivalent to antithesis in the context of the scene, but has other connotations when applied to events. Levi-Strauss' reading of myth in terms of antithesis extends to events. If Propp's analysis of folk-tales suffers from similarity disorder, then Levi-Strauss' analysis of myth suffers from contiguity disorder. Frye's notion of

structure as "a constellation of images" is a similar form of this disorder (Frye 1990, p.151). According to Frye, meaning is represented by a static pattern of imagery (Frye 1990, p.158). In Levi-Strauss' structuralism, form and content are united by the notion that structure is equivalent to antithesis, and a static pattern of meaning is represented by a matrix of binary oppositions. In this case, an application of Saussure's concept of syntagmatic and paradigmatic relations takes us away from structuring activities and back to the representation of meaning as a static structure existing in space.

Definitions of narrative, and notions of narrative structure, are therefore also prone to similarity and contiguity disorders, to the poles of metonymy and metaphor that Jakobson notes in literature itself. A balanced view is again provided by Todorov. Comparing Propp, whose analysis he describes as "fundamentally syntagmatic", with Levi-Strauss and Greimas, "who enclose themselves in an equally exclusive paradigmatism", Todorov concludes:

> "For our part, we refuse to choose between one or the other of these perspectives; it would be a pity to deprive the analysis of narrative of the double benefit it can gain from both Propp's syntagmatic studies and Levi-Strauss' paradigmatic analyses."
> (Todorov 1977b, p.224)

Following Todorov's avoidance of polar extremities, we return to both types of analysis in the next chapter.

7.3 REMEMBERING, IMAGINING, EVENTS AND SCENES

Cognitive psychologists researching into human memory also make the distinction between scenes and events (Cohen, Eysenck & LeVoi 1986, p.31). They have also distinguished between long-term and short-term memory (Cohen et al 1986, p.60); short-term memory is often referred to as working memory (Baddeley & Hitch 1974, Hitch & Baddeley 1976). A generally accepted model of working memory is illustrated by Figure 10 (Cohen et al 1986, p.67).

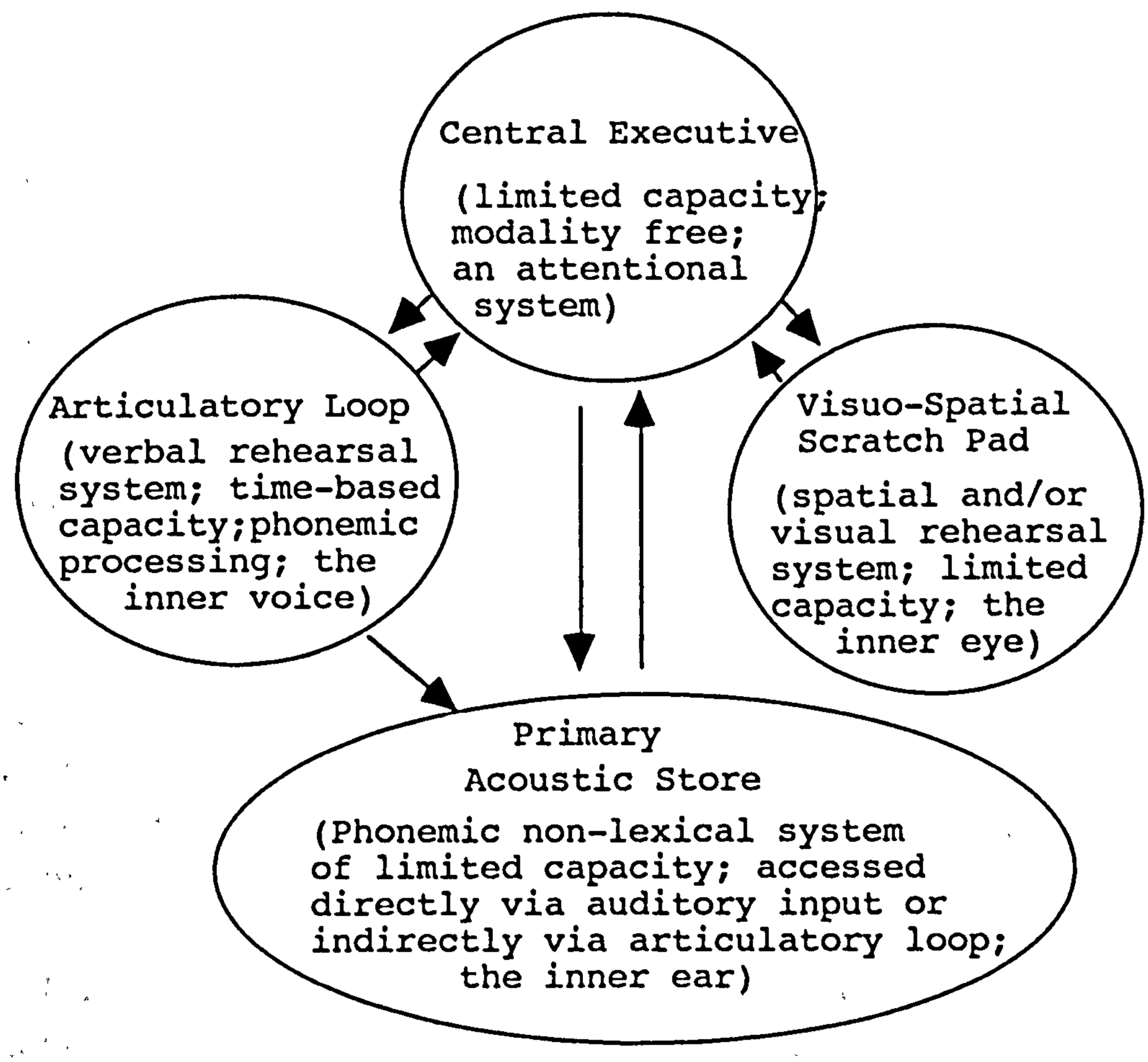


FIGURE 10: A MODEL OF WORKING MEMORY
(from Cohen et al 1986, p.67)

The principle function of working memory is to manage the information which humans need when performing activities. This involves transporting items to and from long-term memory, and retaining those that are essential to the current activity until they are processed or sufficiently "rehearsed" (Cohen et al 1986, p.61). For example, working memory retains speech when humans are engaged in conversation, or numbers when performing arithmetical calculations. Working memory also manages sensory information, the continuous stream of sights, sounds and smells that occurs whether or not humans are occupied with activities. The capacity of working memory is limited, and tests using lists of words or numbers suggest that the usual limit is seven chunks of information (Miller 1956).

The model of working memory illustrated by Figure 10 has four components. The "central executive" carries out the task of managing attention. The "articulatory loop" or inner voice organises information in a temporal and sequential fashion, rehearsing words about to be spoken for example, or a telephone number about to be noted. In relation to the process of writing, this component would be responsible for rehearsing words about to be written and organising them sequentially. The "visuo-spatial scratch pad" or inner eye deals with visual and spatial information, while the "primary acoustic store" or inner ear handles phonemic but non-lexical information. While this model is the result of cognitive research, clinical research into brain damage has concluded that the right hemisphere of the brain manages tasks that deal with visual or spatial information, while the left manages verbal and analytic tasks (Douglas 1991, p.57), a division of labour that harmonises with the model of working memory.

Cohen and colleagues (1986, p.68) describe three codes used by each component of the model: the visual code, the acoustic code, and the articulatory code. The visual code represents information as visual features like size, shape and colour, while the auditory code represents information as auditory features such as pitch and loudness. The articulatory code represents information "as it would be spoken" (Cohen et al 1986, p.68).

Can we use this model of working memory to develop a model of cognitive processes in fiction writing? A distinction between metonymy and metaphor is reflected in the distinction between temporal-sequential and visual-spatial components. Thus our model might include the separate processes of remembering events and remembering scenes. However, both components in the model of working memory have two aspects in the context of fiction writing. The temporal-sequential component might handle sequential relations, but sequential relations in fiction writing include the "articulatory" code of syntax as well as the syntagmatic code of events. The visual-spatial component might handle the associative relations of scenes, but this component has a metonymic aspect of spatial correspondences and a metaphoric one of visual correspondences. This last observation tends to confirm our conclusion above on Jakobson's distinction between semantic similarity and semantic contiguity: that physical objects can be remembered metaphorically by their visual attributes such as size, shape and colour, or metonymically by the temporal-spatial context in which they were seen.

In the case of the free association experiment, Jakobson concludes that there are two types of connection, metaphoric and metonymic, and two aspects of each, syntactic and semantic. Our alternative conclusion was that there are also two types of connection from the perspective of sequential and associative relations, and metaphoric and metonymic aspects of each. The two aspects of associative relations are defined by Jakobson's semantic distinction that we have just discussed. The two aspects of sequential relations that Jakobson defines by a syntactic distinction can also be defined by the verbal distinction: to be, or not to be - that is to say, that a fiction writer is mostly engaged in describing or narrating.

In comparing Jakobson's analysis with the model of working memory, there are now three problems we need to resolve to develop a model of thinking processes in fiction writing. On the one hand, the comparison suggests a need for sequential and

associative components in our model; on the other hand, a distinction between remembering events and remembering scenes. The first problem is whether a sequential component is not only responsible for remembering events but ordering them into some kind of sequence. Does the "linearization of content" that is an aspect of "cognitive planning" (Passerault & Coquin 1994) apply to fiction writing? The second problem is that a sequential component needs to handle syntax as well as events. The third problem is that the metaphoric aspect of a sequential component, defined by the verb "to be", appears to replicate the associative component of remembering scenes. We shall discuss these problems in reverse order.

The last problem is resolved by the consideration that it is only the phonemic processing of the inner voice that produces writing. McLuhan claims that one result of literacy is the split between eye and ear, a schizophrenic split produced by the phonetic alphabet, "with its abstraction of meaning from sound and the translation of sound into a visual code" (McLuhan 1969, p.32):

> "Only the phonetic alphabet makes a break between eye and ear, between semantic meaning and visual code..."
> (McLuhan 1969, p.38)

According to Ian Watt's account of the English novel (Watt 1972), the growth of literacy and the reading public parallels the development of capitalism and the rise of the individual. In non-literate societies organised on a tribal basis, the individual does not have much of an existence, and "inner verbalization is effective social action" (McLuhan 1969, p.30). McLuhan quotes a paper by Carothers (1959), who claims that individual thinking is hardly recognised in non-literate societies, so that voices in the head are generally attributed to possession by demons.

While the inner voice is a product of literacy, the concept of the event as a phenomenon that occurs once only is also culturally determined. In his discussions of history, Levi-Strauss has compared the Western notion of civilisation and cultural

progression with the ideas of so-called primitive societies (Levi-Strauss 1972, Levi-Strauss 1978c, Levi-Strauss 1978d). The latter are marked by a resistance to the notion of historical development or change (Levi-Strauss, 1978c, p.322). In these societies, the event is absorbed by structure, the diachronic by the synchronic:

> "Several types of historical sequences will still have to be distinguished. Some, while existing in duration, are of a recurrent nature; the annual cycle of the seasons, for instance, or that of individual life or that of exchanges of goods or services within the social group. These sequences raise no problem because they are periodically repeated in duration without their structure necessarily undergoing any change..."
> (Levi-Strauss 1972, p.234)

On the other hand, it is essential that "non-recurrent chains of events whose effects accumulate to produce economic and social upheavals... should be broken as soon as they form" (Levi-Strauss 1972, p.235); alternatively, that "the society should have an effective procedure to prevent their formation" (Levi-Strauss 1972, p.235). While events are recuperated by social structure, the notion of a one-off event has a specificity that is tied to mythological ancestry or the life-cycle of an individual, such as the initiation rite that occurs once in a person's lifetime. In this context, "once upon a time" signifies a recurring event in terms of the social structure of the tribe, but a non-recurring event in terms of an individual life-cycle.

Returning to the model of working memory, we can now identify a cultural determination in the temporal and sequential ordering performed by the articulatory loop. In so-called primitive thinking, verbal rehearsal is absent, and the event is absorbed by the scene. In Genette's narrative discourse, it is the alternation between singulative and iterative narration that distinguishes Proustian from classical narrative, which is marked by the alternation of detailed narration and summary (Genette 1980, p.143). In a similar way to primitive thinking, the iterative involves a denial of temporal segmentation:

> "To keep his thoughts fixed on two moments at the same time is almost always, for the Proustian creature, to consider them identical and to merge them: this strange equation is itself the law of the iterative."
> (Genette 1980, p.143)

However, the "law of the iterative" is not only found in primitive thinking. According to psychological research into human memory, a denial of temporal segmentation is a phenomenon that often occurs in the process of remembering "everyday events"; in Cohen's summary, "autobiographical memories which involve repeated occurrences of similar events become difficult to distinguish from each other" (Cohen et al 1986, p.54).

Genette characterises Proustian narrative as a "game with time" (Genette 1980, p.155). In Proust's "defiance of all chronology", events are connected by spatial proximity, climatic identity, or thematic kinship; thus Proust "made clear, more than anyone had done before him and better than they had, narrative's capacity for *temporal autonomy*" (Genette 1980, p.85). We argued above that iterative narration is a form of description and can be treated as an expansion of the verb "to be"; the iterative therefore reflects primitive thinking in its absorption of the event by the scene. In addition, the ways in which events are connected in Proustian narrative also show a similarity with primitive thought.

On the one hand, primitive thinking is marked by the absence of verbal rehearsal, and the absorption of diachrony by synchrony, metonymy by metaphor, sequential by associative relations. On the other hand, it is also marked by metonymy as well as metaphor in the sphere of associative relations (Levi-Strauss 1972, Frazer 1993, Freud 1985a). This is apparent in Frazer's explanation of magic.

According to Frazer, "if we analyse the principles of thought on which magic is based, they will probably be found to resolve themselves into two" (Frazer 1993, p.11). The first principle, which Frazer calls the law of similarity, gives rise to homeopathic or imitative magic. The principle here is that "like produces like,

or that an effect resembles its cause" (Frazer 1993, p.11). The second principle, which Frazer calls the law of contact or contagion, gives rise to contagious magic, and the principle here is that "things which have once been in contact with each other continue to act on each other at a distance after the physical contact has been severed" (Frazer 1993, p.11). Frazer points out that the principles which apply to the practice of magic represent a kind of primitive logic; this logic, to the magician's way of thinking, "regulates the operations of inanimate nature" (Frazer 1993, p.11).

Frazer explains the basis of primitive logic as "two different misapplications of the association of ideas" (Frazer 1993, p.12). Imitative magic is founded on the association of ideas by similarity, contagious magic on the association of ideas by contiguity (Frazer 1993, p.12). However, Frazer describes the first kind of "mistake" as the assumption that "things which resemble each other are the same" (Frazer 1993, p.12), while the second type of mistake lies in the assumption that "things which have once been in contact with each other are always in contact" (Frazer 1993, p.12). So, according to Frazer's own account, in primitive thought it is things or objects that are associated by similarity or contiguity, not ideas.

Moreover, it is questionable whether primitive thinking is indeed guilty of the first error of assuming that things which resemble each other are the same. According to Levi-Strauss, American Indians display an "extreme familiarity with their biological environment" which is shown by their comprehensive taxonomies, one tribe for example employing a botanical vocabulary that approaches two thousand terms (Levi-Strauss 1972, p.5). An alternative view of primitive thinking is that things which resemble each other have some kind of intimate relationship:

> "The real question is not whether the touch of a woodpecker's beak does in fact cure toothache. It is rather whether there is a point of view from which a woodpecker's beak and a man's tooth can be seen as 'going together' (the

> use of this congruity for therapeutic purpose being only one of its possible uses), and whether some initial order can be introduced into the universe by means of these groupings." (Levi-Strauss 1972, p.9)

In this view of primitive thinking, "things which have once been in contact with each other" will also have some kind of intimate relationship.

Freud points out that "the associative theory of magic merely explains the paths along which magic proceeds"; as an explanation of magic, Frazer's account is inadequate (Freud 1985a, p.141). Saussure's claim that associative relations in language are "connexions in the brain" (Saussure 1983, p.122), Jakobson's notion of semantic similarity and contiguity, cognitive research into human memory - all these considerations suggest that what Frazer calls principles of association are methods that humans have adopted for organising perceptual memory, methods that apply to humans in general rather than primitive thought in particular. The process of remembering physical objects, for example, follows the metaphoric path of visual similarities and contrasts, or the metonymic path of temporal-spatial contexts. In primitive thought, if the event is integrated into a synchronic or cyclic view of the world, then spatial contexts or scenes are not necessarily ordered on a temporal basis. In this case, metaphoric and metonymic paths in perceptual organisation are paths that pursue visual and spatial correspondences only.

Therefore, instead of arguing, as Frazer does, that primitive logic is based on the association of ideas by similarity or contiguity, we could argue that the reverse is the case: that the association of ideas by similarity or contiguity is based on primitive logic. To be more precise, given the absence of a clear definition of primitive logic, we can at least argue that the association of ideas is based on the metaphoric and metonymic organisation of perceptual memory. With these observations in mind, let's now return to the problems of modelling cognitive processes in fiction writing.

The third problem was resolved by the consideration that it is only the phonemic processing of the inner voice that produces writing. From this point of view, it is only the sequential responses in Jakobson's experiment that are our concern: that is, the responses that produce a verb. The associative responses merely serve to illuminate the process of remembering. From the same point of view, it would also be a mistake to label components of the model as sequential and associative. Our aim is to identify thinking processes in fiction writing, such as remembering and imagining. As activities, these verbs require objects, and the crucial distinction we have made is between event and scene. The result is that we have now identified the four distinct processes of remembering and imagining events and scenes. The specificity of events and scenes is not our concern; the how or why of remembering and imagining is the realm of associative relations or "connections in the brain", and this will depend on the individual writer.

As syntax is an aspect of sequential relations, we described the second problem in terms of a sequential component and the need to handle syntax as well as events. This problem is resolved firstly by the observation above: that we are more concerned with identifying thinking processes rather than what might constitute sequential and associative components. Secondly, by rejecting Chomsky's dualism in favour of Saussure's view of language, in which there is only one object of thought, syntax and events become distinct concerns. While ideas are inseparable from language, we have referred to the visual aspects of remembering and imagining scenes and events in chapter three. In addition, events already have some kind of temporal ordering because of the sequence in which they are remembered or imagined. However, syntax is defined by the full stop in the process of writing. To remember syntax is to remember the sequence of lexical items that the writer has just read. Imagining syntax is the process of verbal rehearsal, a process that might include the sequential ordering of lexical items. This is the activity that Cooper and Matsuhashi call sentence planning (Cooper & Matsuhashi 1983), and we concluded the last chapter by

observing that this activity generally demands more attention when writing argumentative texts.

The first problem was also described in terms of a sequential component, but the relevant question remains the same: does the "linearization of content" that is an aspect of "cognitive planning" (Passerault & Coquin 1994) apply to fiction writing? If that is the case, is the process of remembering events a separate activity from ordering them into some kind of sequence? This problem is partly resolved by the discussion in the last chapter. Chomsky's dualism in the separation of syntax and semantics reflects the distinction between form and content. In hierarchical models of planning, the first stage is to create content, while subsequent stages involve the linearisation of content, the arrangement of form, and the consideration of style. Applied to fiction writing, this suggests a model in which a writer first remembers or imagines the events that will form the content of the story. The next stage will be to arrange them into some kind of sequence. However, we have already noted that some kind of temporal ordering is implicit in the activity of remembering or imagining. The question is whether linearisation is an additional activity that occupies fiction writers, and to answer this question, we have to continue the discussion of magical thought.

Frazer's tendency to make moral judgements on the rectitude of science and the progress of civilisation is perhaps not the most sympathetic way of understanding primitive thinking. His comparison of magic and science reveals a Victorian concern for illegitimate children:

> "The principles of association are excellent in themselves, and indeed absolutely essential to the workings of the human mind. Legitimately applied they yield science; illegitimately applied they yield magic, the bastard sister of science."
> (Frazer 1993, pp.49-50)

On the other hand, Levi-Strauss argues that magic and science are equally legitimate:

"One deprives oneself of all means of understanding magical thought if one tries to reduce it to a moment or stage in technical or scientific evolution... Magical thought is not to be regarded as a beginning, a rudiment, a sketch, a part of a whole which has not yet materialized. It forms a well-articulated system, and is in this respect independent of that other system which constitutes science... It is therefore better, instead of contrasting magic and science, to compare them as two parallel modes of acquiring knowledge."
(Levi-Strauss 1972, p.13)

Describing the technological achievements that produced the Neolithic age, Levi-Strauss points out that these achievements "required a genuinely scientific attitude" of observation, experimentation, and a desire for knowledge for its own sake (Levi-Strauss 1972, p.14). Discussing the paradox that modern science is a fairly recent phenomenon, while in some societies science has not progressed beyond the achievements of the Neolithic age, he concludes:

"There is only one solution to the paradox, namely, that there are two distinct modes of scientific thought. These are certainly not a function of different stages of development of the human mind but rather of two strategic levels at which nature is accessible to scientific enquiry: one roughly adapted to that of perception and the imagination: the other at a remove from it."
(Levi-Strauss 1972, p.15)

In a similar fashion, Frankfort and colleagues have argued that what distinguishes primitive thinking is the inability to withdraw from perceptual reality (Frankfort, Frankfort, Wilson & Jacobsen 1949, p.24). They argue that it is not the notion of cause and effect that is alien to primitive thought, but the Newtonian notion of causality:

"If science... reduces the chaos of perceptions to an order in which typical events take place according to universal laws, the instrument of this conversion is the postulate of causality. Primitive thought naturally recognized the relationship of cause and effect, but it cannot recognize our

> view of an impersonal, mechanical, and lawlike functioning of causality."
> (Frankfort et al 1949, pp. 23-24)

According to Frankfort and colleagues, primitive thinking when searching for a cause looks for a 'who', not for a 'how':

> "If the rivers refuse to rise, it is not suggested that the lack of rainfall on distant mountains adequately explains the calamity. When the river does not rise, it has *refused* to rise. The river, or the gods, must be angry with the people who depend on the inundation."
> (Frankfort et al 1949, p.24)

Mythologists and anthropologists (Graves 1955, Harrison 1963, Thomson 1973) generally agree that what characterises primitive thought is the animistic attitude that invests nature and natural phenomena with a will, a motivation, a personality, or the kind of spiritual essence embodied in the Oglala Sioux's notion of "*Wakan-Tanka* " (Black Elk 1971). In a similar fashion to Levi-Strauss' characterisation of magical thought as a "well-articulated system" (Levi-Strauss 1972, p.13), Freud describes animism as a "system of thought" that "does not merely give an explanation of a particular phenomenon, but allows us to grasp the whole universe as a single unity from a single point of view" (Freud 1985a, p.134). However, unlike Levi-Strauss, Freud claims that human views of the universe have evolved through three stages: an animistic or mythological phase, a religious phase, and a scientific phase (Freud 1985a, p.134). Freud describes magic as the "technique" of the animistic mode of thinking (Freud 1985a, p.143), and the principle governing magical thought, the "dynamic factor" that Frazer omits from his explanation of magic (Freud 1985a, p.141), is what Freud calls the "omnipotence of thoughts" (Freud 1985a, p.143).

The omnipotence of thoughts is a principle that Freud defines in terms of the duality of mind and reality; it is an overvaluation of thought in relation to the external world (Freud 1985a, p.142). Elsewhere, Freud refers to the omnipotence of thoughts as "an over-estimation of the influence which our mental

acts can exercise in altering the external world" (Freud 1985b, p.360). Thus the assumption that underlies the practice of magic is the belief that thought can change reality. Freud describes the lack of a temporal order in primitive thought as a triumph of the will:

> "Since distance is of no importance in thinking - since what lies furthest apart in time and space can without difficulty be comprehended in a single act of consciousness - so, too, the world of magic has a telepathic disregard for spatial distance and treats past situations as though they were present."
> (Freud 1985a, p.143)

The relevance of this world of magic to artistic creation is noted by Freud (Freud 1985a, p.148). In fiction writing, an implicit belief in the omnipotence of thoughts is possibly the "unquantifiable element" (Boylan 1993, p.xi) that drives a writer's imagination. In fiction writing, a writer is not tied to the demands of argumentation. With the imagination unbound, a writer is free to remember past events and imagine different outcomes, to imagine oneself in unusual situations or to imagine oneself as someone else, or to create past and future worlds, landscapes, and peoples. The omnipotence of thoughts, like the imagination, unites the mental life of creative writers with that of children at play (Freud 1985b, p.360; Freud 1985c).

In Freud's discussion of the "uncanny" (Freud 1985d), the omnipotence of thoughts is related to a class of events that occur in adult life which, according to Freud, revive the animistic beliefs repressed since infancy: "an uncanny experience occurs either when infantile complexes which have been repressed are once more revived by some impression, or when primitive beliefs which have been surmounted seem once more to be confirmed" (Freud 1985d, p.372). Sometimes this distinction is blurred as infantile complexes are tied to primitive beliefs. One example of the uncanny is the experience of thinking about someone who one has not seen or heard in a long while; this person then appears on the street or telephones (Freud 1985d, p.362; Freud 1975, p.326).

It is as though our thoughts have conjured the person into life. Freud observes:

> "It seems as if each one of us has been through a phase of individual development corresponding to this animistic stage in primitive men, that none of us has passed through it without preserving certain residues and traces of it which are still capable of manifesting themselves, and that everything which strikes us as 'uncanny' fulfils the condition of touching those residues of animistic mental activity within us and bringing them to expression."
> (Freud 1985d, p.363)

Apart from the uncanny experience, perhaps the most frequent type of event to revive animistic mental activity is the accidental trip, fall or knock, where physical objects such as chairs or doors are credited with malevolent intentions and are thumped or kicked in retribution. In poetic writing, attributing a benevolent or malevolent intention to natural phenomena is what Ruskin in 1856 called the "pathetic fallacy" (Ruskin 1972). According to Ruskin, "all violent feelings have the same effect", which is to produce "a falseness in all our impressions of external things" (Ruskin 1972, p.603). Ruskin's "pathetic fallacy" is "caused by an excited state of the feelings, making us, for the time, more or less irrational" (Ruskin 1972, p.603).

While everyday life is riddled with bungled actions, slips of the tongue, errors, coincidences, and the forgetting of names and intentions (Freud 1975), some have found a remedy to this chaos of irrationality in narrative. In a recent essay titled *Narrative and Chaos,* Alex Argyros argues that traditional narrative needs to be defended from attacks by deconstructionists, radical feminists, neo-marxists, and other cultural theorists (Argyros 1992). According to Argyros, "one of the chief selective pressures for the evolution of the human brain was the challenge to create a network of individual and intersubjective models of the world" (Argyros 1992, p.661). One such model of the world is the narrative model:

> "Narrative is among the most powerful of these maps because it allows for the constitution of a representational structure whose basic unit is the causal frame: actor-action-object. The essential feature of narrative is that it maps the world causally. Given the universality of narratival structures, both in everyday discourse and in the myths, cosmologies and fictions generated by all human cultures, we must assume that the world is sufficiently causal to offer a species able to represent it in narratival forms a selective evolutionary advantage."
> (Argyros 1992, p.662)

With this definition, a narrative is not only a verb that signifies an event but one that assumes a cause and produces an effect. Narrative is therefore synonymous with causality: "The causal operator generates narrative automatically" (Argyros 1992, p.668). However, the logic of this essay leads to a conclusion that negates its initial assumption. The thread of the argument is that narrative imitates nature (p.662). Nature is chaotic (p.665); therefore narrative must also be chaotic (p.667). Consequently, narrative cannot be linear (pp.667-668); in fact, narrative structure is a sort of fractal geometry (p.670). Yet, chaos theory raises the question whether the causal frame is indeed the most appropriate framework for understanding natural phenomena (Gleick 1987). If narrative imitates chaos, we can only conclude that narrative is not equivalent to causality after all.

The notion of causality is based on the notion of time as a linear sequential order. In his *Aspects of the Novel,* Forster defines the story as a temporal ordering of events. A story is "a narrative of events arranged in their time sequence - dinner coming after breakfast, Tuesday after Monday, decay after death, and so on" (Forster 1962, p.35). In Forster's account, it is causality that defines the plot:

> "A plot is also a narrative of events, the emphasis falling on causality. 'The king died and then the queen died', is a story. 'The king died, and then the queen died of grief', is a plot. The time-sequence is preserved, but the sense of causality overshadows it."
> (Forster 1962, p.93)

However, while a temporal dimension is essential to the notion of cause and effect, a sequential order of events suggests that effects, in turn, can also be causes, as Edgar Allan Poe observed.

In Poe's tales and essays, the notion of cause and effect is a recurring concern and a reflection of his interest in science and verisimilitude. In his essay on the American drama, Poe compares human constructions with the constructions of the divine creator, as exemplified by the world of nature. According to Poe, God's work is marked by "the complete *mutuality* of adaptation" (Poe 1967, p.457), in which cause and effect are mutually interchangeable:

> "... in human constructions, a particular cause has a particular effect - a particular purpose brings about a particular object; but we see no reciprocity. The effect does not re-act upon the cause - the object does not change relations with the purpose. In Divine constructions, the object is either object or purpose as we choose to regard it, while the purpose is either purpose or object; so that we can never... decide which is which."
> (Poe 1967, p.457)

This reciprocity of cause and effect which is a feature of the natural world is also a feature of the perfect plot. A plot is perfect if we are "unable to detach from it or *disarrange* any single incident involved, without *destruction* to the mass" (Poe 1967, p.457). Poe's notion of the perfect plot therefore takes us back to the organic whole. As such perfection has never been achieved, Poe describes a more attainable objective by defining a plot as excellent "when no one of its component parts shall be susceptible of *removal* without *detriment* to the whole" (Poe 1967, p.457). The perfect plot moreover, although attainable in theory, is unattainable in fact, because it is a human construction. In comparison, "the plots of God are perfect"; "the Universe is a plot of God" (Poe 1967, p.458). Poe's notion of the reciprocity of cause and effect in nature is similar to the picture of natural phenomena presented by chaos theory, a picture that Argyros misrepresents

by his emphasis on the causal frame and its equation with narrative.

While Poe's tales show a concern for causality, science, verisimilitude, and reason, they also show a concern for pathological states of consciousness, for madness and the irrational. However, verisimilitude and the irrational are not mutually exclusive concerns. Culler discusses five levels of verisimilitude or vraisemblance from the point of view of intertextuality; these are "five ways in which a text may be brought into contact with and defined in relation to another text which helps to make it intelligible" (Culler 1975, p.140). The first is the unwritten assumptions that a text makes about the real world (in the context of Culler's intertextuality, the real world is also a text), and conventional attitudes to human behaviour form part of those assumptions. In the rationalistic tradition, humans are guided by plans, goals and motivations that are explicit and the result of a conscious process of decision making. Human actions can be mapped onto the causal frame, and irrational behaviour can be explained by referring to Ruskin's "heightened emotional states" (Ruskin 1972, p.603). In Beaugrande and Dressler's rationalistic approach to textuality, causal relations illustrate textual coherence (Beaugrande & Dressler 1981, p.4), and in the story grammarians' rationalistic approach to stories, semantic structure is represented by the causal relations between events.

Culler's second level of verisimilitude is what he calls cultural vraisemblance; this is the "cultural code" in Barthes' analysis (Barthes 1990). Cultural conventions include generalisations about race or gender. Three further levels of vraisemblance are conventions of genre, conventional attitudes to fiction (for example, Poe's contrast between narrative as truth and fiction as non-truth), and parody or irony.

From the perspective of fiction writing, all these aspects of verisimilitude are part of the cultural traditions that writers both inherit and create. In Poe's case, while a tale such as *Eleonora* questions assumptions about rationality, other conventions of

verisimilitude still serve to make the tale comprehensible. In Ian Watt's dualistic scenario, fiction writers might emphasise external behaviour or internal psychology; in either case, the English novel has developed within a realist tradition (Watt 1972, pp.335-337). On the other hand, in his comparison of the post-war English novel with its American counterpart, Bernard Bergonzi characterises the first as nostalgic and embedded in tradition, while the second is apocalyptic and open to experimentation (Bergonzi 1972). Meanwhile, Christine Brooke-Rose has recently referred to the apocalyptic as a variety of "magic realism" or what she, following Salman Rushdie, calls "palimpsest history" (Brooke-Rose 1992). Rushdie's *Satanic Verses* begins with the fall to earth of the two central characters from an aeroplane, a fall that does not end in death but rebirth. Here we have a story that seems to flout the laws of verisimilitude from the viewpoint of events in the real world, but from the viewpoint of intertextuality (animism in myths and fairy stories, the fall of man and the fall of Satan, Hinduism and rebirth, the jinn in the *Koran* and the *Arabian Nights*), there are ways of rendering the story comprehensible, as in Poe's case, by referring to other conventions and traditions.

Yet, whether a writer decides to write a classic realist text, an apocalyptic nightmare, or a modern *Arabian Nights,* a writer's thinking will include the four basic processes of remembering and imagining events and scenes. Moreover, metaphoric and metonymic associations will in any case guide the processes of remembering and imagining. In Freud's work on jokes and dreams (Freud 1976a, Freud 1976b), unconscious processes are marked by certain mechanisms such as condensation, displacement, and substitution; these devices can be characterised as metonymic and metaphoric devices. Although Freud refers to these devices as a specific feature of the unconscious, Todorov has pointed out that the operations that Freud identifies "are simply those of any linguistic symbolism, as they have been inventoried, most notably, by the rhetorical tradition" (Todorov 1982b, p.248). According to Todorov, Freud is describing "the forms of all symbolic processes, not those of an unconscious symbolism" (Todorov 1982b, p.248). Lacan's claim that "the unconscious is structured like a language"

is based on the effects of speech (Lacan 1979, p.149). However, it is possible to reach the same conclusion by a different route; that is, by referring to Saussure's notion of language on the one hand, and Freud's observations on the unconscious on the other. The common denominator is the organisation of human memory, and this provides another reason why the unconscious is structured like a language; in this context, remembering and imagining will also be guided by metaphoric and metonymic associations.

Following this discussion of magical thought, causality and verisimilitude, we can now return to the question whether the linearisation of events is an additional activity that occupies fiction writers. Some kind of temporal ordering is implicit in the activity of remembering or imagining. Events from a writer's personal experience will have some kind of metonymic organisation in episodic memory: "chronological (by time of occurrence) or spatial (by place of occurrence)" (Cohen et al 1986, p.47). Stories that a writer has read will also be metonymically organised in a writer's story memory. Story memory assists a writer's imagination from the point of view of intertextuality, so that the process of imagining events will be partly influenced by the ordering of events in story memory.

In addition, notions of causality and verisimilitude are part of the cultural traditions that a writer inherits, and some would argue that these conceptual concerns are organised in semantic memory (Cohen et al 1986, p.46). The extent to which a writer is conscious of those traditions will influence a writer's identification with those traditions. A writer may not be wholly aware of the conventions that he assumes; on the other hand, she may be consciously working against them. Assumptions about causality, temporal ordering, human behaviour and motivation, the behaviour of fictional characters, verisimilitude - such assumptions will influence how events and scenes are imagined, and how a story is formulated and developed. Conventions of causality might guide a writer's imagining, but in exercising the omnipotence of thoughts, fiction writers are not bound to consider rational codes of behaviour, or rational orderings of events, as

Genette's analysis of Proustian narrative makes clear. All these considerations do not give much support to the idea that a writer, having created the contents of a story in terms of events, then carries out a separate process of linearisation, of ordering these events into some kind of sequence.

7.4 FOCUSING THE IMAGINATION

While it appears that fiction writers do not carry out a separate process of linearising events, it appears from Genette's (1980) analysis of narrative discourse that they may create the contents of a narrative in terms of events, and then ask the separate question: "How shall this story be told?".

As we mentioned above, Genette makes the distinction between story and narrative, so that a story is the signified content of the text, while a narrative is the signifier given by the narrative text itself (Genette 1980, p. 27). A story is therefore an ideal order of events that a reader can infer from the text (Genette 1980, p.35), or that a writer has in mind before the process of writing has begun, a notion that becomes evident in Genette's discussion of "person":

> "Readers may have noticed that until now we have used the terms 'first-person - or third-person - narrative' only when paired with quotation marks of protest. Indeed, these common locutions seem to me inadequate, in that they stress variation in the element of the narrative situation that is in fact invariant - to wit, the presence (explicit or implicit) of the 'person' of the narrator. This presence is invariant because the narrator can be in his narrative (like every subject of an enunciating in his enunciated statement) *only* in the 'first person' - except for an enallage of convention as in Caesar's *Commentaries*; and stressing 'person' leads one to think that the choice the narrator has to make - a purely grammatical and rhetorical choice - is always of the same order as Caesar's in deciding to write his Memoirs 'in' one or another person. In fact, of course, this is not the issue. The novelist's choice, unlike the narrator's, is not between two grammatical forms, but between two

> narrative postures (whose grammatical forms are simply an automatic consequence): to have the story told by one of its 'characters', or to have it told by a narrator outside of the story."
> (Genette 1980, pp.243-244)

Genette argues that "the presence of first-person verbs in a narrative text can therefore refer to two very different situations which grammar renders identical but which narrative analysis must distinguish" (Genette 1980, p.244). The first situation is "the narrator's own designation of himself as such" (Genette 1980, p.244); for example, the "I" when Virgil writes "I sing of arms and the man...". The second situation is "the identity of person between the narrator and one of the characters in the story" (Genette 1980, p.244); for example, the "I" when Crusoe writes "I was born in the year 1632, in the city of York...". According to Genette, the term "first-person narrative" refers "only to the second of these situations" (Genette 1980, p.244).

However, while these two "I"'s are not the same, the "I" of Virgil's *Aeneid* is the same kind of "I" who appeals to the muse at the beginning of Homer's *Iliad,* which Lattimore translates as: "Sing, goddess, the anger of Peleus' son Achilleus and its devastation...". Both exemplify Genette's first type of narrative, in which the narrator is absent from the story he tells, while *Robinson Crusoe* exemplifies the second type, in which the narrator is present as a character in the story he tells (Genette 1980, pp.244-245). But Homer's *Iliad* is a story that was handed down by oral tradition for generations before it was written down, and part of that tradition is that "Homer" was the poet who made this particular story famous. While we cannot refer to Homer as a writer, but as a narrator in the oral tradition of story-telling, we also know that Defoe, rather than Crusoe, was the author of *Robinson Crusoe,* and that the writing of this particular novel is coincident with the development of printing and the growth of a "reading public" (Watt 1972).

These two different "I"'s, therefore, also reflect a difference between speech and writing, between oral tradition and the

technology of printing. In Genette's ahistorical view of narrative, writing is seen as a type of speech, a view that Derrida has called "phonocentrism" or the "privileging of voice" (Culler 1983, p.92). According to Genette's narrative discourse, a narrator is someone who tells a story, but above all, a narrator is someone who speaks.

Genette's treatment of a narrative as the expansion of a verb allows him to formulate "the problems of analyzing narrative discourse according to categories borrowed from the grammar of verbs", categories that he reduces to "three basic classes of determinations" (Genette 1980, pp.30-31). The first is "those dealing with temporal relations between narrative and story" which he arranges under the heading of *tense* (Genette 1980, p.31); these are the relations of order, duration and frequency that we have discussed above. The second is "those dealing with modalities (forms and degrees) of narrative 'representation', and thus with the *mood* of the narrative" (Genette 1980, p.31). Finally, the third is "those dealing with the way in which the narrating itself is implicated in the narrative" (Genette 1980, p.31). By narrating, Genette refers here to "the narrative situation or its instance", and the term that he uses to discuss this class of determinations is *voice* (Genette 1980, p.31).

Under the heading *mood*, Genette discusses the notion of *distance*, considering, for example, the amount of detail given by the narrator, and the difference between direct and reported speech. Under the same heading he also discusses the notion of *perspective* or "point of view". The notion of *voice* on the other hand leads to various considerations which include *person* - for example, the difference between "first person" and "third person" narrative that we have already mentioned. According to Genette, past theoretical work on the subject of "point of view" has suffered "from a regrettable confusion between what I call here *mood* and *voice*, a confusion between the question *who is the character whose point of view orients the narrative perspective?* and the very different question *who is the narrator?* - or, more simply, the question *who sees?* and the question *who speaks?*" (Genette 1980, p.186).

According to Genette, mood and voice have provided the basis for various taxonomies of narrative, but these taxonomies have presented both mood and voice under the single category of "point of view" or perspective. Leaving aside the question of voice, he concludes that there is a consensus for a "purely modal" typology that consists of three terms:

> "The first term corresponds to what English-language criticism calls the narrative with omniscient narrator..., and which Todorov symbolizes by the formula *Narrator > Character* (where the narrator knows more than the character, or more exactly *says* more than any of the characters knows). In the second term, *Narrator = Character* (the narrator says only what a given character knows); this is the narrative with 'point-of-view' after Lubbock... In the third term, *Narrator < Character* (the narrator says less than the character knows); this is the 'objective' or 'behaviourist' narrative... To avoid the too specifically visual connotations of the terms *vision, field,* and *point of view,* I will take up here the slightly more abstract term *focalization*..."
>
> (Genette 1980, pp. 188-189)

In Genette's typology, the first term is *nonfocalized* narrative, or narrative with *zero focalization* (for example, Fielding's *Tom Jones).* The second is narrative with *internal focalization* , which can also be *fixed (What Maisie Knew), variable* (Lawrence's *The Rainbow),* or *multiple* (epistolary novels such as Richardson's *Pamela* or Smollett's *Expedition of Humphry Clinker).* The third type is the narrative with *external focalization*, "popularized between the two world wars by Dashiel Hammett's novels, in which the hero performs in front of us without our ever being allowed to know his thoughts or feelings" (Genette 1980, p.190).

Can we use Genette's typology of mood to develop our hypothesis of cognitive processes in fiction writing? The first problem is that, for Genette, mood and voice are separate issues. However, are the concerns of perspective and person separate questions for the writer? Let's now return to the notion that, having created the contents of a narrative in terms of events, a writer then asks the question: "How shall this story be told?". We

now encounter two further problems in trying to translate or interpret Genette's textual analysis into a hypothesis of fiction writing. The first is Genette's phonocentrism, in which a narrator is someone who speaks, rather than someone who writes. The second is that Genette's "narrator" is given or implied by the narrative text, and this narrator is not the same person as the author of the text (Genette 1980, p.213).

On the one hand, Genette presents the choice of person as a decision that faces the novelist:

> "The novelist's choice, unlike the narrator's, is not between two grammatical forms, but between two narrative postures (whose grammatical forms are simply an automatic consequence): to have the story told by one of its 'characters', or to have it told by a narrator outside of the story."
> (Genette 1980, p.244)

In this scenario, the narrator, unlike the novelist, does not have any decision to make; the narrator can only be present in the first person. Yet on the other hand, Genette presents a choice of person as a decision that faces the *narrator*: "The real question is whether or not the narrator can use the first person to designate *one of his characters* " (Genette 1980, p.244). If the narrator can only be present in the first person, and is given or implied by the narrative text, then this "real question" is one which faces the writer, not the narrator. It is the writer who creates "characters", including the "I" of the "first-person narrative" who, as Barthes has also pointed out, also constitutes a character (Barthes 1990, p.68).

For a theory of writing, the implication of Genette's distinction between mood and voice is that there is a difference between the novelist's relation to her characters (a question of mood), and the novelist's relation to her story (a question of voice). However, this implication gives rise to two problems. Firstly, if a writer decides to have a story told by one of its characters, then the question of voice immediately becomes a question of mood. The second is the problem that we have already

mentioned: that *histoire* has a prior existence to *narration*, the story to its telling, so that, having a story in mind, the writer now asks the question "How shall the story be told?".

This question would appear to have more relevance for story-tellers in the oral tradition, such as the poets and bards of the Middle Ages who might have been expected to recite yet another version of King Arthur's European conquests. The question is also relevant to writers who decide to produce a re-telling of myths or folk-tales from an alternative perspective or in a contemporary setting. But for some writers, it is clearly not the case that a story has a prior or a separate existence to its writing or narrating. The anecdotes of professional fiction writers show the extent to which character dominates their thinking, while the plot is a marginal concern (Boylan 1993). Deborah Moggach is one of the few writers in Boylan's collection of essays who mention plot. However, while she remarks that she always starts with the outline of a story, she also adds that "once a character gets going they push it off in their own direction" (Moggach 1993, p.135). For some writers then, characters drive the story, and provide a further method of organising or linearising events.

The anecdotes in Boylan's compilation provide a basis for arguing that it is through the realisation of character that fiction writers exercise the omnipotence of thoughts. While the omnipotence of thoughts suggests a triumph of the will in Freud's *Totem and Taboo* (Freud 1985a, p.143), according to Nietzsche's *Zarathustra,* "willing is creating" (Nietzsche 1969, p.223).

We can therefore distinguish a further thinking process in fiction writing which we shall call "focusing the imagination", after Genette's use of the term "focus" in his typology of perspective. Focusing the imagination is the process in which a writer imagines he is someone else. The imagination still has to focus "on" something, and one way of focusing the imagination is to focus on syntax. To focus on syntax, one might imagine how someone speaks; a method of creating "character" that is described by Plato.

According to Genette, the question of a narrator's distance from his story is first discussed in Plato's *Republic,* where the technique of simple narrative (telling or reporting) is contrasted with that of representation (showing or imitating) (Genette 1980, p.162). Plato approaches this subject by referring to the beginning of Homer's *Iliad,* where "the poet is speaking in his own person, and does not attempt to persuade us that the speaker is anyone but himself" (Plato 393). However, Plato continues, "afterwards he speaks in the person of Chryses, and does his best to make us think that it is not Homer but an aged priest who is talking". According to Plato, when Homer speaks in the person of someone else, "he is imitating as nearly as he can the manner of speech of the character concerned". In Desmond Lee's commentary, "direct speech...requires the poet or narrator to put himself in the position of the character speaking, think his thoughts and feel his feelings" (Lee 1955, p.130). Thus the poet imagines he is someone else, and in Lee's characterisation of direct speech, the poet becomes an actor.

In fiction writing, characters are created when imagining events or scenes that involve people. A character can be imagined metaphorically by their appearance, or metonymically by their actions or behaviour. In either case, to describe or to narrate in this instance is to produce a narrative with zero or external focalization in Genette's typology. According to Genette, the difference between these text types is whether the narrator knows more or less than the characters in the story. From the point of view of the writer, who must always know more than her creations, the difference would seem to be that the events and scenes which some writers imagine include the event of writing or the scene of the book (or the page in the case of Sterne's *Tristram Shandy),* and that these thoughts are incorporated into the story. In *Tom Jones* and *Joseph Andrews* for example, the omniscient narrator whose voice is a projection of Fielding or the "implied author" (Rimmon-Kenan 1989, p.86) reminds his readers that characters are the product of his creative powers. In the case of external focalization on the other hand, a writer creates a character merely by describing someone's behaviour, and does not provide any

intrusive commentary; this reporting is an example of Plato's pure narrative.

In the case of epistolary novels such as *Pamela* and *Humphry Clinker,* where characters are created by their letters, the events that a writer imagines also include the act of writing. However, these examples also exemplify Genette's multiple focalization, where the same events are seen through the eyes of different characters. In this case, characters are created not only by their differences in perception, but also by the differences in how they write. We can argue, therefore, that they are also the result of focusing the imagination on syntax. However, instead of the phonocentric question, "If I were someone else, how would I speak?", the question here is: "If I were someone else, how would I write?". A further example of multiple focalization is Faulkner's *The Sound and the Fury,* where characters are once again created by their differences in perception. In this case however, they are also created by a further kind of difference, that of "thinking". In this context, thought is speech (Genette 1980, p.178), and a difference in thinking is also represented in writing by a difference in syntax. So, a third way of focusing on syntax is given by the question: "If I were someone else, how would I think?".

It is the description of someone's thoughts that, in Genette's typology, distinguishes internal from external focalization, where description is limited to behaviour. Like multiple focalization, internal focalization must be the result of what we have called focusing the imagination, a process in which the writer imagines he is someone else, so that events and scenes are seen through the eyes of a character. So far, we have only mentioned syntax, and the question "*How* , if I were someone else, would I think, speak, or write?". But what do characters think, speak, or write about? Metaphor and metonymy are relevant here, as one can focus the imagination by imagining a character's thoughts about the scenes in which they are situated, or about the events in which they are an active participant; the syntactic question might be avoided altogether.

However, we have yet to explain how characters may drive the plot. Characters need models, and this suggests two possible ways in which a writer imagines that "I am someone else". Firstly, I can choose myself as a model; secondly, I can choose the other, where the other is taken from real or textual worlds.

For example, I decide to write a semi-autobiographical novel based on events from my own life or personal experience. I take myself as a model for a character, and "I become someone else" by becoming the main character (hero/heroine) in the story or novel that I am in the process of writing, whether this story is written in the first person (Dickens as David Copperfield, Charlotte Bronte as Jane Eyre), or the third person (Dickens as Pip in *Great Expectations,* John Cowper Powys as Wolf Solent in *Wolf Solent,* DH Lawrence as Paul Morel in *Sons and Lovers).* In writing this novel and in exercising the omnipotence of thoughts, events may not produce the same outcome as they produced in real life. I may also take myself as a model and imagine myself in a different place or time, in a different occupation, or behaving in a different way. In either case, "I become someone else" by becoming the main character in the story I am writing, and the result is a narrative with internal focalization, where the narrative is focused on one character.

On the other hand, I might take the other as a model for a character, where the other is a fictional character or someone from the real world. I imagine what life would be like if I were that person, how I might think or behave in particular situations, what would be my preoccupations, and "I become someone else" in this process. If this activity is combined with the previous one, or if I take several others as models, the result might be a narrative with multiple or variable focalization.

Yet whether I take the self or the other as a model, this process of focusing the imagination by "becoming someone else" does not explain what prompts a writer to choose the first or third person. Taking the self as a model, I may attempt to observe the self as I would the other, so that the "I" becomes a "he" or a "she".

Taking the other as a model, I may attempt to absorb the other so that the other becomes part of me, and the "she" or the "he" becomes an "I". These examples would appear to represent two extremes in focusing the imagination or "becoming someone else", but we cannot make the equation that these extremes necessarily produce a third person narrative in the first case, or a first person narrative in the second.

According to Genette, the writer's question is whether to have a story told by one of its characters (first-person narrative), or to have it told by a narrator who remains outside of the story (third-person narrative); an alternative form of this question is whether or not the first person can be used to designate a character. We have argued that it is not always the case that a writer has prior knowledge of the events in a story, and that characters can drive the plot by the process we have just described. In this case, the second form of Genette's question would seem to be more relevant than the first, although we cannot explain how a writer makes a final choice of person. The first variant is more appropriate when a writer takes an existing story and decides to write another version by changing the perspective or the setting.

In either case, the choice of person is an aspect of the relations not only between the writer and his story (in Genette's phonocentrism, a question of voice) but also between the writer and her characters (a question of mood), so that mood cannot be separated from voice. Equally in either case, Genette's typology of narrative suggests that in order to produce a narrative with internal, multiple or variable focalization, some kind of focusing of the imagination is necessary on the part of the writer. In comparison, a narrative with zero or external focalization would appear to be the result of simply imagining events and scenes.

7.5 CONCLUSION

In this chapter we discussed narration and description in fiction writing. We began with Saussure's view of linguistics, and his view of language as a system of sequential and associative relations. We discussed Jakobson's discoveries of similarity and contiguity disorders in speech impairment, and of metaphoric and metonymic poles in literature. We found similarity and contiguity disorders in definitions of narrative, including the notion of a minimal narrative, and we compared Genette's ideas with those of Todorov. We argued that although a narrative can be treated as the expansion of a verb, verbs can signify scenes as well as events, and we argued that iterative narration is a form of description.

In cognitive terms, events are verbal representations, while scenes are visual representations. We discussed a model of short-term memory developed by cognitive psychologists that features this distinction, and compared it with Jakobson's observations on metaphor and metonymy. In this discussion we identified *events*, *scenes*, and *syntax* as distinct objects of thought in fiction writing - the objects of *remembering* and *imagining*. We also referred to accounts of magical or primitive thought, and argued that magical thought is evident in fiction writing. Fiction writers are not obliged to follow rationalistic orderings of events; in fiction writing, the imagination is restrained not by reason, but by the sequential and associative relations of long-term memory.

In the final part of the chapter, we discussed Genette's analysis of narrative discourse. In his discussion of perspective or "point-of-view", Genette uses the term "focus" to classify narrative texts. Using his analysis and the accounts of fiction writers on their characters, we identified the process of *focusing the imagination* in fiction writing. Focusing the imagination is a process in which a writer imagines she is someone else, and we showed how this process also applies to *events*, *scenes*, and *syntax*.

In summary, we have now identified three thinking processes in fiction writing: remembering, imagining, and focusing the imagination. Each of these activities can be applied to events, scenes, and syntax. In addition, we have identified two ways of focusing the imagination, which depend on the model that is chosen for a character. In the case of syntax, the imagination can focus on inner speech (someone's thought), outer speech (conversation), or writing. Finally, to account for Genette's notion of "narrative levels" (Genette 1980, pp. 227-243), we need to add that events include narrating, story-telling, and writing, while scenes include the text, the book, and the page. In the case of Italo Calvino's *If on a winter's night a traveler*, events include reading and the reader's activity, which we discuss in chapter nine. Firstly however, as we suggested that the process of imagining events may be influenced by the ordering of events in story memory, we need to look at story memory in more detail.

CHAPTER EIGHT:

STORY MEMORY AND THE SYMBOLIC

8.1 INTRODUCTION

In the last chapter, we identified some of the basic thinking processes in fiction writing as remembering, imagining, and focusing the imagination, each of which can be applied to events, scenes, and syntax. The notion that events require a separate process of linearisation was discounted for two reasons: firstly because some kind of ordering is inherent in remembering and imagining, and secondly because of the likely influence of the ordering of events in story memory.

In this chapter we look at story memory in more detail. We begin by looking at the feats of story tellers in the oral tradition. Psychologists researching into story memory argue that story tellers, writers and readers have mental schemata for different types of story. They have used stories from the oral tradition to investigate accuracy when listeners and readers recall stories. We discuss their findings and identify two problems with their research. The first arises from their use of grammars to represent the structure of stories, which leads to the question of how a story grammar is related to a story schema. The second is that people not only comprehend but also interpret the stories they read or hear. We find evidence for this observation in their research, and we argue that the function of a story schema is to guide interpretation rather than comprehension.

Research into story memory suggests that "the kind of story schema developed from hearing stories from the oral tradition may be a cognitive universal" (Mandler 1982, p.210). To investigate whether this is the case, we discuss the representation of stories at different levels of abstraction, referring to Propp's *Morphology of the Folktale* and Aristotle's writings on the plot. We find sequential similarities between folktales from different cultures, so that there is evidence to support the claim for a cognitive universal. We then look for an explanation of why this should be the case. One explanation is that the similarities reflect a common experience in the human mind - this is the explanation given by Jung, Freud, and Levi-Strauss.

A second explanation is that sequential similarities reflect a common experience in social development. To investigate this claim, we digress into a discussion on the social origins of Greek tragedy, and its evolution from ancient festivals and mysteries. This digression also serves a three-fold purpose. Firstly, it gives us a definition of "the plot", and an explanation of why the plot and mystery are inseparable. Secondly, it gives us a clue to an alternative definition of a story schema, and thirdly, it provides us with specific examples that show how story schemata guide interpretation. We find sequential similarities between tribal initiation rites and folktales, but the evidence that folktales reflect a common tribal stage in social development is inconclusive.

Returning to the discussion of story memory, we argue that interpretation has a role in generating new stories. In fiction writing, interpretation fills a gap between remembering events (either from a writer's story memory or from her personal experience) and imagining the events of her fictional work. We show how story schemata are used in this process. Looking at the results of research into story memory, we find evidence of the operations noted by Freud in his accounts of the unconscious, and we argue that these operations also apply to the process of interpretation in the generation of new stories.

In the course of this chapter we have reason to refer to symbolism on several occasions; Todorov (1982a, p.19) argues that symbolism and interpretation are inseparable. We conclude by discussing different notions of the symbolic, and we identify three different kinds of symbolism in the context of literary texts. The first is a narrative symbolism based on the creation of correspondences between events, the second is a poetic symbolism based on the use of verbal symbols, and the third is a structural symbolism based on antithesis.

8.2 THE ORAL TRADITION AND STORY MEMORY

In Plato's *Phaedrus,* one of the criticisms levelled at the new art of writing is its likely effect on the art of memory. In the story narrated by Socrates, Thoth brings the invention of writing to Ammon in Egypt, but Ammon is not impressed:

> "... you, who are the father of writing, have out of fondness for your offspring attributed to it quite the opposite of its real function. Those who acquire it will cease to exercise their memory and become forgetful; they will rely on writing to bring things to their remembrance by external signs instead of on their own internal resources. What you have discovered is a receipt for recollection, not for memory."[1]

For story tellers in the oral tradition, the art of memory was a skill that required many years of training. According to Robert Graves, prodigious demands were placed on the memory of the Irish ollave or "master-poet":

> "The ollave in ancient Ireland had to be master of one hundred and fifty Oghams, or verbal ciphers, which allowed him to converse with his fellow-poets over the heads of unlearned bystanders; to be able to repeat at a moment's notice any one of three hundred and fifty long traditional histories and romances, together with the incidental poems they contained, with appropriate harp accompaniment; to have memorized an immense number of other poems of different sorts; to be learned in philosophy; to be a doctor of civil law; to understand the history of modern, middle and ancient Irish with the derivations and changes of meaning of every word; to be skilled in music, augury, divination, medicine, mathematics, geography, universal history, astronomy, rhetoric and foreign languages; and to be able to extemporize poetry in fifty or more complicated metres." (Graves 1961, p.457)

Graves adds that "among the Maoris of New Zealand where a curiously similar system prevailed, the capacity of the ollave to memorize, comprehend, elucidate and extemporize staggered

---

[1] p.96 in Walter Hamilton's translation for Penguin (1973).

Governor Grey and other early British observers" (Graves 1961, p.457). To recite just one heroic poem as long as Homer's *Iliad* or *Odyssey* would seem to make a prodigious demand on the memory of the story teller. One technique to alleviate these demands is the use of formulaic expressions; Finley estimates that one third of the *Iliad* is composed of lines which occur more than once in the work (Finley 1972, p.34). However, the choice of expression is determined at the time of the recitation by the demands of metre. According to Finley, "the bard composes directly before his audience; he does not recite memorized lines" (Finley 1972, p.34). He recounts the following example:

> "In 1934, at the request of Professor Milman Parry, a sixty-year-old Serbian bard who could neither read nor write recited for him a poem of the length of the *Odyssey*, making it up as he went along, yet retaining metre and form and building up a complicated narrative. The performance took two weeks, with a week in between, the bard chanting for two hours each morning, and two more in the afternoon." (Finley 1972, pp.34-35)

As Finley points out, the bard has at his disposal a stock of myths and tales handed down by the oral tradition: "Out of these building-blocks the poet constructs his work, and each work - each performance, in other words - is a new one, though all the elements may be old and well known" (Finley 1972, p.35).

How do story tellers who have no recourse to writing organise their material in memory? Some psychologists argue that familiar events are organised by human memory into schemata (Bartlett 1932). AI researchers have adopted the alternative notion of frames (Minsky 1977) or scripts (Schank & Abelson 1977). According to the explanation of Cohen and colleagues:

> "*The use of past experience to deal with new experience is a fundamental feature of the way the human mind works.* According to *schema theory* the knowledge we have stored in memory is organized as a set of *schemas* or mental representations, each of which incorporates all the knowledge of a given type of object or event that we have acquired from past experience. Schemas operate in a top-down

> direction to help us interpret the bottom-up flow of information from the world."
> (Cohen, Eysenck & LeVoi 1986, p.26)

The aim of research into story memory is to investigate story schemata. Mandler also describes "one of the tenets of schema theory" as the notion that "schemata consist of expectations built up from experiencing regularities in the environment" (Mandler 1982, p.207). Describing one such regularity as "the structure of traditional stories, such as folktales, fables and myths", she continues: "It is assumed that people incorporate knowledge about the typical structures of traditional stories through listening to and reading them" (Mandler 1982, p.207). It is stories from the oral tradition that Mandler and Johnson use to investigate story schemata. They explain this choice as follows:

> "In attempting to uncover the details of story schemata, folktales, fables and myths can be used to great advantage. Such stories, which stem from an oral tradition, have very similar and unusually clear structural characteristics compared to many other types of prose. The reasons seem obvious. If a story is not written down, but is preserved only through retelling, it must respect the limitations on memory. We assume that an orally transmitted story will survive only if it conforms to an ideal schema in the first place or has gradually attained such a structure through repeated retellings. Thus, the structure of a folkstory must be one which has been influenced by what people can remember."
> (Mandler & Johnson 1977, p.113)

Schema researchers have represented story structure by story grammars (Rumelhart 1975, Thorndyke 1977, Mandler & Johnson 1977, Mandler 1978, Johnson & Mandler 1980). Mandler explains that "a story grammar is a formal rule system used to describe regularities in the structure of stories", whereas "a story schema is a kind of mental structure and processing mechanism" (Mandler 1982, p.207).

Recent research into story memory seems to have received its initial impetus from Propp's *Morphology of the Folktale*, first

published in Russian in 1928 but not translated into English until 1958. In his introduction to the second edition of that work, Alan Dundes outlines a research agenda which includes the implication of Propp's work for "studies of thinking and learning processes", particularly the acquisition of fairy tale structures in children (Dundes 1968, p.xv). Colby, who describes the development of a grammar for Eskimo folk tales, and Rumelhart, who describes a generalised schema for stories, both acknowledge Propp's influence (Colby 1973, Rumelhart 1975). Thorndyke develops Rumelhart's schema into a grammar which he uses to investigate story comprehension and recall (Thorndyke 1977). He finds that structural similarities assist remembering, and that high-level structures in the grammar are more memorable. Mandler and Johnson also develop Rumelhart's schema, and describe a grammar that represents "the ideal structure of simple stories" (Mandler & Johnson 1977, p.132).

Both Thorndyke's story grammar and that of Mandler and Johnson are influenced by Chomsky's work in linguistics, as we showed in chapter six. In Mandler and Johnson's grammar, a *story* can be re-written as a *setting* plus an *event structure*. An event structure can be re-written as a sequence of connected *episodes*. An episode consists of a *beginning*, a *development*, and an *ending*, with *causal* connections. A development can be re-written as a *simple reaction* which *causes* an *action*, or as a *complex reaction* which *causes* a *goal path*. A goal path can be re-written as an *attempt* which *causes* an *outcome*, or recursively as a further goal path. The basic unit or node of the grammar is the *event*; events are connected by simultaneity (the *and* connector), by temporal order (the *then* connector), or by causal sequence (the *cause* connector). The surface structure of the story (its sentences) may require transformational rules in order to construct the canonical sequence defined by the grammar (Mandler & Johnson 1977, pp.129-132). In further research, Mandler and Johnson develop their grammar as a transformational grammar, and adapt Chomsky's methods to evaluate story grammars (Johnson & Mandler 1980).

Mandler and Johnson claim their long-term goal is "to be able to predict precisely what people will and will not remember from connected discourse" (Mandler & Johnson 1977, p.148). They use their grammar as a basis for making four sets of predictions about the remembering of stories. These concern the extent of recall, the recall of particular constituents, likely inversions of sequence, and likely additions and distortions. The first prediction is that "the more a story conforms to an ideal structure, the better recall will be" (Mandler & Johnson 1977, p.132). Evidence that confirms this prediction can be found in Thorndyke's research (Thorndyke 1977). He investigates the recall of different versions of the same story, and finds that the canonical version is more memorable than the jumbled version.

The second prediction is that the basic units defined by the grammar will be better recalled than elaborations, such as descriptive adjectives, and optional deletions; that is, units that can be deleted from a story without violating the canonical sequence. In addition, Mandler and Johnson predict that "causally connected episodes will be better recalled than temporally connected episodes" (Mandler & Johnson 1977, p.133). These predictions are generally confirmed by the results of an empirical investigation, in which Mandler and Johnson compare children's recall abilities with those of adults. For example, "descriptive adjectives were poorly recalled" by adults and children (Mandler & Johnson 1977, p.145). Units called *reactions* in the grammar were also poorly recalled, particularly in the case of children, who tend to recall "the outcomes of action sequences rather than the actions themselves or the internal events motivating them" (Mandler & Johnson 1977, p.145). An unexpected result is that settings and beginnings were better recalled than endings, by both experimental groups, children and adults (Mandler & Johnson 1977, p.145).

The third set of predictions concerns sequential re-orderings. While "a story with an ideal structure will produce few if any inversions in the order of recall", the likelihood of inversion increases the more the story departs from the ideal structure

(Mandler & Johnson 1977, pp.133-134). In addition, the inversion of phrases within episodes will be more frequent than the inversion of episodes themselves (Mandler & Johnson 1977, p.134). These predictions are also confirmed by experiment, where results support "the hypothesis that well-structured stories produce well-ordered recall" (Mandler & Johnson 1977, p.146). The most frequent inversion was the re-ordering of events into a causal sequence (Mandler & Johnson 1977, p.147). In further research, Mandler investigates the recall of a story with two episodes, in which the events of one episode are interwoven with the events of the other (Mandler 1978). Adults and children find this interwoven structure difficult to recall, and tend to reproduce each episode as separate sequences (Mandler 1978, p.33). When younger children were asked to reproduce an interwoven structure, they were "essentially unable to recall the stories in any other than their canonical form" (Mandler & DeForest 1979, p.886).

The fourth set of predictions concerns additions and distortions. Mandler and Johnson predict that the additions of new material will supply canonical units missing from the story, while distortions will occur when the story violates the ideal structure (Mandler & Johnson 1977, p.134). Their empirical evidence does indicate the addition of new material, but less than one third consists of units omitted from the story (Mandler & Johnson 1977, p.148). To account for the range of additions, Mandler and Johnson adopt three categories (Mandler & Johnson 1977, p.147). The first consists of adjectival expressions added for rhetorical emphasis. The repetition of phrases for a similar purpose is also included in this category. The second consists of reasonable elaborations; here the purpose is to explain events or supply reactions missing from the story. The third consists of irrelevant elaborations and inaccuracies. According to Mandler and Johnson, children are more likely to produce "irrelevant" or "fanciful" additions (Mandler & Johnson 1977, p.148).

In further research, Mandler distinguishes between "reasonable additions" and "distortions" (Mandler 1978, pp.23-24).

The first consists of redundancies, reasonable presuppositions, and exaggerations, while the second consists of repetitions, irrelevant elaborations, the substitution of irrelevant or incorrect material, and character and event confusions. The last sort of distortion was frequently found in the experiment using a two-episode story with an interwoven structure. In the case of character confusion, "the two-episode structure of a story was kept relatively intact, but a single character became the common protagonist of the two episodes" (Mandler 1978, p.33). In the case of event confusion, a single episode is created out of material taken from both episodes.

Empirical research into the recall of stories has therefore tended to confirm the four sets of predictions. However, this research has set out to investigate human abilities to reproduce an accurate version of a story. What do the results tell us about story schemata and the organisation of story memory? How do story tellers and fiction writers use their story memory to generate new stories?

To answer these questions, we face an initial problem concerning the relation between a story schema and a story grammar. In her summary of recent research on story grammars, Mandler makes a clear distinction between a schema and a grammar, as we saw above (Mandler 1982). In the literature however, sometimes this distinction becomes blurred, and sometimes the two are viewed as equivalent. According to Thorndyke for example, a story grammar constitutes a framework or schema (Thorndyke 1977, p.78). He describes a story grammar as "a stereotypical narrative framework" which "can be modified to fit the characteristics for a particular story by specifying how the details of the story map onto the abstract rules and relationships" (Thorndyke 1977, p.83). Following Minsky's notion of "frames" as a way of representing knowledge (Minsky 1975), Thorndyke explains that his grammar describes the specific knowledge domain of stories:

> "The domain of stories... may be conceptualized as comprising a "frame" that encodes the invariant structure common to all exemplars of the domain. The components of

> the frame, the abstract story elements, are "slots" that become instantiated according to the grammar with the specific details or content of the particular story in question."
> (Thorndyke 1977, p.83)

Thorndyke assumes "a hierarchical organisational framework of stories in memory, determined by the grammar" (Thorndyke 1977, p.77). In this account, a schema, a framework, and a frame are all equivalent terms, and a story schema is determined by a story grammar.

In the work of Mandler and Johnson however, the relation between a story grammar and a story schema is an ambiguous one. On the one hand, a story schema is defined as a mental representation:

> "We use the term "story schema" to refer to an idealized internal representation of the parts of a typical story and the relationships among those parts. It is claimed that people use this type of representation of stories to guide comprehension during encoding and as a retrieval mechanism during recall."
> (Mandler & Johnson 1977, p.111)

On the other hand, a story schema is a set of expectations:

> "We will use the term "story schema" to refer to a set of expectations about the internal structure of stories which serves to facilitate both encoding and retrieval."
> (Mandler & Johnson 1977, p.112)

According to these definitions, a story schema is both a mental representation of an ideal structure, and a set of expectations about structure. However, Mandler and Johnson also claim that their *grammar* describes "an ideal structure of simple stories", and express the belief that "people use story schemata, based on such structures, to guide encoding and retrieval processes" (Mandler & Johnson 1977, p.132). If a story schema is a mental representation of an ideal structure, and is based on an ideal structure described by the grammar, then does the grammar not describe a schema?

Whereas Thorndyke's grammar *determines* a story schema, the relation between Mandler and Johnson's grammar and a schema is not defined in such explicit terms.

This ambiguity becomes more evident when the grammar is used to explain comprehension rather than recall. Mandler and Johnson point out that "although the schemata used to encode a story and to retrieve it are related, we do not assume that they are identical" (Mandler & Johnson 1977, p.112). Comparing the process of encoding with that of retrieval, they claim that memory is more flexible in the former process rather than the latter (Mandler & Johnson 1977, p.149). Mandler also makes the distinction between the *use* of a story schema for encoding, and the *use* for retrieval (Mandler 1978, pp.15-19). However, the same grammar is used to explain how a schema for traditional stories influences both types of processing, listening and remembering. The same grammar also serves to represent an ideal structure. It therefore appears that in this case, there is only one kind of schema, and that this schema is represented by the grammar.

This raises the question of how such a schema or grammar is constructed in the first place. Story grammars and schemata guide reading and listening in a "top-down" fashion. In Thorndyke's account, comprehension is a top-down process of activating a frame or schema, represented by the grammar, and filling in the slots of the frame with the incoming information (Thorndyke 1977). Mandler explains the use of a schema for encoding in a similar fashion, pointing out that "the set of grammatical rules which specify whether or not a story is well formed is intended to represent expectations which a listener has incorporated in the form of a cognitive schema" (Mandler 1978, p.15). She explains that a schema for traditional stories becomes activated by linguistic cues such as "Once upon a time" (Mandler 1978, p.15). According to Johnson and Mandler, it is the regularity of structure in traditional stories that strengthens expectations and results in top-down processing (Johnson & Mandler 1980, p.52). Mandler argues that the use of a schema in comprehension is indicated by

a slowing down in the speed of reading at episode boundaries (Mandler 1982, pp.211-213).

However, Johnson and Mandler argue that in comparison with traditional stories, printed texts "are not subject to the same limitations in form", so that reading is more of a constructive or "bottom-up" process (Johnson & Mandler 1980, pp.52-53). Responding to the criticism that story grammars provide a purely top-down account of reading and comprehension, Mandler comments that "a story schema does not need to work on the basis of expectations that force incoming material into a particular mold" (Mandler 1982, p.213). As an alternative explanation of how schemata influence reading, she suggests that "a schema can be useful as a hypothesis-forming mechanism" (Mandler 1982, p.213). Elsewhere, she suggests that readers may draw on a multitude of schemata to make inferences when reading, and may change their schemata as a story proceeds (Mandler 1978, p.15). From this point of view, reading is neither a strictly top-down nor strictly bottom-up process, but rather one of textual interaction in which the two kinds of processing are interrelated. The notion of reading as a kind of hypothesis testing is one that we return to in the next chapter.

In the case of traditional stories, Mandler and Johnson offer the explanation that a story schema is partly the result of bottom-up processing in reading development, and partly the result of developing a more general knowledge of the world:

> "People construct story schemata from two sources. One source comes from listening to many stories and consists of knowledge about the sequencing of events in stories, including how they typically begin and end. The other source comes from experience and includes knowledge about causal relations and various kinds of action sequences. However, the units which eventually form a story schema either condense or ignore many aspects of logical and experiential knowledge about the world."
> (Mandler & Johnson 1977, p.112)

However, other schema theorists would argue that "logical and experiential knowledge" is not as unessential to story understanding as Mandler and Johnson claim. Thorndyke and Yekovich characterise formulations of schema theory by the influence of "the class of memory processes under consideration" (Thorndyke & Yekovich 1980, p.26). From this perspective, one formulation, exemplified by frames and scripts, is concerned with "input processes" and the use of schemata to guide encoding. The second, exemplified by story grammars, is concerned with "output processes" and the use of schemata to guide retrieval. However, story grammars have also been used to explain input processes, as we have seen, while Thorndyke refers to a grammar as a frame and uses his grammar to explain output processes (Thorndyke 1977).

The difference between story grammars on the one hand and frames and scripts on the other does not concern input and output processes, but the domain of representations. AI theorists claim that frames and scripts represent general knowledge (Minsky 1975, Schank & Abelson 1977), while story grammarians claim that their grammars represent story structure. AI theorists also argue that story understanding requires a general knowledge of causal relations, temporal ordering, and human psychology and behaviour (Black & Wilensky 1979, Black & Bower 1980, Black et al 1982). This knowledge can be represented by frames and scripts, and AI researchers argue that comprehension does not require additional story schemata. In their rationalistic view of human behaviour and understanding, fictional characters pursue the same well-formed plans and goals as real humans (Black & Bower 1980).

However, the sort of general knowledge that AI researchers represent by frames and scripts is not a cultural invariant, as was pointed out in the last chapter. In the myths, legends and folktales of non-literate societies, characters do not behave according to these rationalistic models. Psychological motivation is frequently absent, and causality does not necessarily operate according to a Newtonian model. While Mandler and Johnson's grammar tries to

capture the structural similarities of traditional tales, the strange experiences which they contain are such that others have sought to interpret their meaning and explain their perpetual popularity with children (Bettelheim 1978).

Following Chomsky's rationalistic methods, Mandler and Johnson develop a grammar to describe a sequence of events in which motives and logical relations are often absent. This task is not without its difficulties. On the one hand, they claim that the units that form a story schema ignore much of the experiential knowledge that AI theorists argue is more influential in understanding. On the other hand, the grammar clearly specifies causal connections between units, a feature that AI theorists would argue belongs to a general knowledge of events rather than a specific knowledge of folktales. Yet having specified causal connections in the grammar, Mandler and Johnson then acknowledge that they may be absent from traditional tales, and are inferred by the listener: "a canonical story need not specify causal connections between nodes in the surface structure; these are automatically supplied by the listener" (Mandler & Johnson 1977, p.131). This acknowledgement suggests that the grammar not only represents story structure, but also reflects the interpretative strategies of listeners and readers. Moreover, while Mandler and Johnson incorporate causal links into their story schema, this acknowledgement supports the argument that listeners also use experiential schemata to comprehend stories.

However, so far in this discussion we have not made a distinction between comprehension and interpretation. In his discussion of symbolism and interpretation, Todorov claims that the decision to interpret is triggered by the gap between two meanings; in the case of patristic exegesis, the gap between the literal meaning of the biblical text, and the spiritual meaning as determined by Christian doctrine (Todorov 1982a, p.98). Thus interpretation "is nothing other than the course which allows us to relate, and thus to identify, the one with the other, by means of a series of equivalences" (Todorov 1982a, p.98). Strictly speaking then, comprehension refers to the process of understanding the

literal meaning of the text in question. Interpretation, on the other hand, refers to the process of finding correspondences between the text in question on the one hand, and a set of expectations about the text on the other. Such expectations may stem from other texts, or from worldly experience, and constitute what psychologists define as schemata.

Given these definitions, the function of a schema is to guide interpretation rather than comprehension. For comprehension it is linguistic knowledge, rather than experiential schemata, which suffices. AI researchers would argue that linguistic knowledge also constitutes a schema, but they do not distinguish between knowledge, as represented by frames or scripts, and expectations which are based on knowledge. On the other hand, Mandler and Johnson's experiments show firstly that reading and listening are processes that involve both comprehension and interpretation. Secondly, they show that interpretation is influenced not only by story schemata, but also by schemata that are derived from worldly experience. Thirdly, they show that how stories are interpreted influences how those stories are remembered.

More evidence that confirms these proposals is provided by the remembering of "reactions". The grammar is the basis for predicting that "simple reactions and goals" will tend to be forgotten, as their omission does not violate the canonical sequence described by the grammar (Mandler & Johnson 1977, p.130). Yet the results of the empirical investigation show that simple reactions were not forgotten to the predicted extent (Mandler & Johnson 1977, p.145). Moreover, the additions of new material include elaborations that provide reactions where these are omitted from the story, additions that were predicted on the grounds that their omission does violate the canonical sequence. In this context, Mandler and Johnson point out that:

> "...if the underlying reaction or goal is ambiguous or counter to our expectations about the world, its omission would lead to a violation. It is this kind of omission which makes a well-formed story from one culture appear ill-formed to another. A goal path may be clearly motivated for one audience

> whether the goal is stated or not because it fits a cultural stereotype; that same goal path may be utterly mysterious to another group without specific statement of the underlying goal."
> (Mandler & Johnson 1977, p.130)

In a similar fashion, Mandler and Johnson acknowledge that characters in traditional tales sometimes appear to lack any motive for their behaviour, but claim that this is because their motive is not relevant to the story:

> "Characters sometimes respond in a relatively planless way, especially when the simple reaction consists of an emotion. In this case, the protagonist simply engages in an action rather than in an attempt to reach a goal. This is not to say that the behavior of the protagonist is unmotivated, but merely that his or her goal is irrelevant to the story line. We assume that all behavior in stories is motivated..."
> (Mandler & Johnson 1977, p.120)

The results of the empirical investigation show that in remembering, listeners were also supplying psychological motivation where this was lacking in the story, and trying to understand traditional tales in the light of a broader semantic knowledge of the world. Once again therefore, our "expectations about the world" play a role in interpreting and remembering stories, so story schemata are not the only schemata that influence these processes.

Mandler and Johnson try to resolve this problem by incorporating interpretative strategies into the grammar, so that the grammar represents an "ideal" story, a story that readers or listeners have never read or heard. It is the "idealized form of a story" which they attempt to capture (Mandler & Johnson 1977, p.150), and it is this ideal form that listeners remember: "recall will be, in part, a function of... the extent to which the story matches an ideal schema" (Mandler & Johnson 1977, p.113). However, they also claim that the relevance of this ideal story is not confined to a specific cultural group of Western Europeans, but has a universal application.

According to Johnson and Mandler, the problem of cultural specificity is one that causes difficulties in developing a transformational grammar of stories (Johnson & Mandler 1980). They discuss how to evaluate such a grammar by using a version of Chomsky's criteria of observational and descriptive adequacy (Chomsky 1965). In this context, one problem is whether the "well-formed story" is a cultural invariant:

> "A further complication arises when one encounters a story whose structure is not straightforwardly related to the current rules of one's grammar. Is the story well-formed and the grammar inadequate, or vice versa?"
> (Johnson & Mandler 1980, p.79)

As a specific example, they discuss the question whether a grammar that characterises the structure of European folktales can also characterise that of American Indian stories. Researchers have found that Europeans have difficulties in remembering the latter, and suggest that difficulties in comprehension arise partly from the absence of causal or temporal connections between episodes (Kintsch & Greene 1978). However, Johnson and Mandler dispute the absence of temporal ordering and argue that American Indian stories are not recorded accurately by Western observers. In addition, they argue that "differences in cultural conventions can obscure causal connections when one attempts to transport a story from one culture to another" (Johnson & Mandler 1980, p.80). The arguments that were applied above to the apparent strangeness of European folktales is applied here to American Indian stories. Johnson and Mandler point out that "motivations that are apparent to one cultural group may not be apparent to another", and similarly, that because causal connections are not apparent, "it does not mean that causal connections did not exist in the story as understood in the original culture" (Johnson & Mandler 1980, p.80).

In short, Johnson and Mandler argue that their grammar is an adequate characterisation of structures in both European folktales and American Indian stories. As further evidence for this

claim, they cite a cross-cultural study which compared the performance of Liberians with that of Americans in remembering the same European folktales, which found "few differences in memory" between the two groups (Johnson & Mandler 1980, p.80). They conclude that "some types of story formats are universal" (Johnson & Mandler 1980, p.80). In Mandler's summary of story grammar research, the same evidence provides an argument that the schema itself has universal application:

> "Groups of Liberian subjects ranging in age from six to fifty, schooled and unschooled, literate and nonliterate, all produced the same patterns of recall as did American university subjects hearing the same stories.
> On the basis of these data we suggested that the kind of story schema developed from hearing stories from the oral tradition may be a cognitive universal."
> (Mandler 1982, p.210)

If some story structures are universal structures, and the schema of the ideal story a cognitive universal, then the grammar that captures the ideal story must be construed as some kind of universal grammar. However, the grammar not only reflects story structure but also the interpretative strategies of European listeners, the strategies that create ideal versions of a story. Can such a grammar be construed as a universal grammar, and a schema of the ideal story as a cognitive universal? Are the structures of traditional tales universal structures?

8.3 THE UNIVERSAL STORY

To answer these questions, we need to look firstly at the tales themselves. This was the task that Propp set out to achieve in his *Morphology of the Folktale,* in which he analyses a corpus of Russian folktales and formalises their structural similarities (Propp 1968). In summary, these similarities are twofold. Firstly, the tales contain a similar set of characters, or rather protagonists who play similar roles in the tales: the *hero,* the *villain,* the *princess,* the *helper,* the *donor* or provider, the *dispatcher,* and the *false hero.* Secondly, the tales contain a similar sequence of

events, which Propp segments into thirty-one units. The units are defined according to the *functions* of the protagonists. The results of this syntagmatic analysis is summarised in Figure 11.

Colby develops a grammar of Eskimo folktales by a similar syntagmatic analysis, but segments a sequence of events into "eidons" rather than functions. According to Colby, "eidons are classes of narrative actions of the same type as Propp's thirty-one Russian fairy tale functions, except that eidons are additionally defined in terms of sequencing rules and higher level categories" (Colby 1973, p.645); in other words, sequential units of the tales are defined according to grammatical functions rather than functions of character. Some eidons are similar to Propp's units, but most are distinct, and Colby argues that "the set of Eskimo eidons are culture specific, not universal" (Colby 1973, p.646). According to Colby, "with minor regional variations, the narrative elements and rules resulting from this analysis appear to apply to the folktales of all Eskimo, but not to the folktales of neighbouring peoples" (Colby 1973, p.645).

However, most eidons are distinct from Propp's functions because of this cultural specificity. For example, one eidon is defined as: "The protagonist asks a herdsman to lasso his reindeer wife" (Colby 1973, p.648). Colby admits that "some eidon varieties are more specific than others because only one or two examples occurred in the stories analyzed" (Colby 1973, p.646). In addition, Colby's purpose is not only to analyse a sequence of events, but to construct a hierarchical grammar, including a set of rules that show how the basic units (eidons) are to be selected, combined, and placed in the hierarchy. According to Colby, if one used a transformational grammar to analyse Russian folktales, the resulting tree structure would be quite different to one that represents Eskimo folktales (Colby 1973, p.661).

Conversely, if one used Propp's methods to analyse Eskimo folktales, the results would probably indicate structural similarities between the folktales of the two countries. Colby's analysis indicates the presence of similar protagonists (hero,

0. Initial situation
1. One of the members of the family is absent from the home
2. An interdiction is addressed to the hero
3. The interdiction is violated
4. The villain makes an attempt at reconnaissance
5. The villain receives information about his or her victim
6. The villain attempts to deceive his victim in order to take possession of his or her belongings
7. The victim submits to deception and thereby unwittingly helps his enemy
8. The villain causes harm or injury to a member of the family
8a. One member of the family lacks something or desires to have something[2]
9. The misfortune or lack is made known; the hero is approached with a request or command; is allowed to go or dispatched
10. The seeker hero agrees to or decides upon counteraction
11. The hero leaves home

---

12. The hero is tested, interrogated, or attacked, which prepares the way for receiving a magical agent or helper
13. The hero reacts to the actions of a future donor
14. The hero acquires the use of a magical agent
15. The hero is transported, delivered or led to the whereabouts of the object of the search
16. The hero and the villain join in direct combat[3]
17. The hero is branded
18. The villain is defeated
19. The initial misfortune or lack is liquidated
20. The hero returns

---

21. The hero is pursued
22. The hero is rescued from pursuit
23. The hero, unrecognised, arrives home or in another country
24. The false hero presents unfounded claims
25. A difficult task is proposed to the hero
26. The task is resolved
27. The hero is recognised
28. The false hero or villain is exposed
29. The hero is given a new appearance
30. The villain is punished
31. The hero is married and ascends the throne

FIGURE 11: PROPP'S MORPHOLOGY OF THE FOLKTALE

---

[2] Element 8 or 8a is an obligatory element.
[3] The pair of elements 16 & 18 and the pair 25 & 26 are mutually exclusive.

villain, helper, donor) and although only a few eidons are similar to Propp's functions, they turn out to be key elements in the Proppian sequence (the lack, an act of villainy, a departure, a contest, a victory, the return of the hero, with, sometimes, a marriage as the conclusion). If one defines sequential units in the culturally specific manner of Colby, then these similarities disappear. Stories can be represented at different levels of abstraction, and the perception of structural similarities is partly dependent on the level that is used to compare them (Gick & Holyoak 1980).

According to van Dijk, the development of a story grammar requires a level of abstraction that Propp's analysis fails to provide:

> "It should be noted - a point often overlooked by literary theorists - that Propp's functions are not proper narrative categories, but rather fixed 'themes' characterizing the specific content of simple narratives like folktales. Only sufficient abstraction from these functions allows the establishment of more general narrative categories (*e.g.* 'initial state of balance', 'disruption' . . . 're-establishment of the state of balance')..."
> (van Dijk 1980, p.8)

The story grammarians acknowledge Propp's influence on their work while seeking to develop this general grammar. For example, Rumelhart comments that his approach is "designed to be a systematization of Propp's analysis", and that the rules of his grammar "are designed to capture the relationships among the structures developed by Propp" (Rumelhart 1975, p.235). In this process of abstraction, Rumelhart, Thorndyke, and Mandler and Johnson all agree on a basic rule, a rule that is also suggested by van Dijk and Todorov. In Mandler and Johnson's formulation, an episode has a beginning, a development, and an outcome. In Thorndyke's grammar, an episode also has three units: an initial state that describes a goal, an attempt to attain the goal, and an outcome (Thorndyke 1977, p.79). In Rumelhart's schema, an event structure involves a change of state (Rumelhart 1975, pp.214-215). In Todorov's formulation of narrative episodes, a minimal

narrative also involves two states and a transformation or movement from one to the other.

If the highest level of abstraction is number, then there appears to be a general consensus that at this level, a narrative is a sequence of events with three distinct phases, a formulation that seems to derive from Aristotle. Discussing the scope of the plot in Greek tragedy, he comments:

> "I have already laid down that tragedy is the representation of an action that is complete and whole and of a certain amplitude - for a thing may be whole and yet lack amplitude. Now a whole is that which has a beginning, a middle, and an end. A beginning is that which does not necessarily come after something else, although something else exists or comes about after it. An end, on the contrary, is that which naturally follows something else either as a necessary or as a usual consequence, and is not itself followed by anything. A middle is that which follows something else, and is itself followed by something."
> (Aristotle 1965, p.41)

Aristotle adds that the length or amplitude of a plot should be long enough to cover a change of fortune, from misery to happiness or vice versa (Aristotle 1965, p.42). For Aristotle then, the simple plot consists of three episodes and a transformation or change of fortune. Propp's sequence of functions also breaks down into three distinct phases. The beginning phase, consisting of functions 1 to 10, all take place at the hero's home, and ends with the hero's departure (function 11). The middle phase, consisting of functions 12 to 19, recount the hero's adventures away from home, and ends with the hero's return (function 20). The third phase, consisting of functions 21 to 31, recount the subsequent adventures of the hero on his return. At the numerical level of abstraction, the Eskimo tales in Colby's analysis have a parallel structure to the Russian tales in Propp's. Moreover, both sets of tales not only have these three distinct phases, but also have a metonymic equivalence in terms of the hero's movements, consisting of home and departure, adventures away from home,

and a return. More parallels also exist at the specific functional level: the act of villainy, the contest, the victory.

These sequential similarities are also found in African folktales. According to Dseagu, "many, if not all, African folktales involve a movement from home into the forest wilderness and back again to the homestead" (Dseagu 1992, p.590). Dseagu also points out that this movement in space is interpreted as a movement in time: "The tale teller and the audience clearly see the journey motif in allegorical terms as a reflection of a person's progress in life" (Dseagu 1992, p.590). Dseagu argues that in Zulu folktales, for example, the episodes "tend to mark important epochs in the rites of passage of the individual", and that the three most important phases are birth, adulthood, and old age (Dseagu 1992, p.590).

However, according to anthropological studies of tribal cultures in Africa, Australia, and America, the rites of passage from child to adult and from adult to elder are both marked by this change of location. In George Thomson's account, both rites consist of three episodes: a departure from the home, a sequence of initiation rites, and the return of the initiated as an adult or elder (Thomson 1973, pp.91-119). The departure of the child is marked by much weeping, because the event is viewed as a death and resurrection: "At puberty the child dies as a child and is born again as a man or woman" (Thomson 1973, p.91). The rites themselves involve a surgical operation in which some part of the body is removed, followed by "rites of purification and ordeals" (Thomson 1973, p.92). In Australia, this process generally consists of the following:

> "The novices are washed in water or blood, they bathe in a stream or the sea, or are scorched in front of a fire; they run races, sometimes with painful handicaps; they engage in sham fights, often with fatal consequences; they are scourged until they are unconscious; their ears and noses are bored, their flesh gashed or tattooed. The physical pain incidental to most of these rites is universally explained as a trial of strength or endurance..."
> (Thomson 1973, pp.92-93)

After undergoing these ordeals, the novice then "receives instruction in the customs and traditions of the tribe" (Thomson 1973, p.93). According to Thomson, this might include a further test in the form of a catechism, the revelation of sacred objects, and an explanation of their significance. The entire ceremony is strictly secret:

> "It is performed at a distance from the tribal settlement, usually on a specially prepared ceremonial ground... In many tribes the actual initiation is preceded by a period of seclusion, which may last for months..."
> (Thomson 1973, p.93)

Thomson also points out that "among most hunting tribes, initiation is followed immediately by marriage" (Thomson 1973, p.93). In addition, the initiates are given new names to mark their re-birth. Thomson's account of the child's initiation into adulthood is summarised in Figure 12.

1. Departure from home as a child
(symbolic death)
2. Removal of part of body
3. Purification ordeals and contests, including fights
4. Instruction
5. Further tasks, including catechism
6. Discovery of sacred objects
7. Return to home as an adult
(symbolic re-birth)
8. Marriage

FIGURE 12: TRIBAL INITIATION - CHILD INTO ADULT

Sequential similarities therefore exist not only between folktales from different parts of the world, but also between folktales and tribal initiation rites. These similarities exist at two levels: an abstract or Aristotelian level that specifies number and relation (three episodes and a transformation), and a detailed

level that specifies the location of each episode (the home, the journey, and the return).

Given that these correspondences have such a global extent, it is tempting to seek some sort of explanation. Mandler and Johnson offer two conflicting reasons for structural similarities in European folktales. Firstly, they observe that if a story is not written down, it must respect the limitations on human memory (Mandler & Johnson 1977, p.113). On that basis they argue that the structural similarities of such tales must reflect these limits and, therefore, their conformity to an ideal schema. The second explanation is that "the recurring themes of traditional stories are presumably a reflection of commonalities in human experience" (Johnson & Mandler 1980, p.52).

The problem with the first explanation is the assumption that the capacity of human memory is itself a cognitive universal. Plato's prediction suggests that this is not the case, and that a culture of literacy encourages humans to use writing as an aid to memory. Evidence that the memory of non-literate peoples is not limited to simple stories comes from a range of sources, such as the vast taxonomies employed by American Indians, and the two-week recitation by the Serbian story-teller. While the capacity of *working* memory is limited, it would appear that *long-term* memory in oral cultures contains far more than Mandler and Johnson allow, and that structural similarities are not the result of a universal limit on human memory.

It therefore seems more plausible that structural similarities reflect commonalities in experience. However, some would argue that uniformities are to be found in the human mind, while others seek uniformities in social, historical and cultural development. Jung's theory of archetypes is one example of the first approach (Jung 1959). In Kirk's characterisation, archetypes are images that recur ad infinitum in myths, dreams and folktales, and are products of the collective unconscious (Kirk 1974, p.77). According to Jungian theory, myths and folktales can be explained in purely psychological terms, as poetic expressions of unconscious fears

and desires. The characters in myths and folktales are to be interpreted in a similar fashion, and personify aspects of the unconscious mind. The Greek god Poseidon, for example, is an archetypal image of the "serious, mature, bearded man", and represents "the anima introvertedly expressed though the cyclothymic masculine mode" (Hope 1989, p.22).

In Frye's application of Jungian theory to literary criticism, archetypes are "communicable symbols", at the centre of which is "a group of universal symbols" (Frye 1990, p.118). He explains:

> "I do not mean by this phrase that there is any archetypal code book which has been memorized by all human societies without exception. I mean that some symbols are images of things common to all men, and therefore have a communicable power which is unlimited. Such symbols include those of food and drink, of the quest or journey, of light and darkness, and of sexual fulfilment, which would usually take the form of marriage."
> (Frye 1990, p.118)

In Jungian theory, the quest or journey is a universal and archetypal symbol, and is to be understood as a quest of the psyche for integration and wholeness, a process that Jung calls "individuation" (Walker 1957, pp.94-95). To realise her full potential, the individual must recognise the unconscious and undeveloped aspects of his personality, and integrate them into a new one. Jungians interpret folktales in terms of this psychological narrative, so that the hero and the villain represent conflicting aspects of the individual's personality, and the contest between them a mental conflict (Hope 1989, pp.78-90). This psychological narrative also involves a symbolic death and re-birth, in this case of the old personality and the new one.

Above, we referred to Todorov's discussion of symbolism and interpretation, and his claim that the decision to interpret is triggered by the gap between two meanings; in the case of patristic exegesis, between the literal meaning of the biblical text, and the spiritual meaning as determined by Christian doctrine (Todorov 1982a, p.98). In Todorov's formulation, interpretation "is

nothing other than the course which allows us to relate, and thus to identify, the one with the other, by means of a series of equivalences" (Todorov 1982a, p.98). When these meanings conflict, it is the spiritual meaning which is viewed as the "true" meaning.

Psychoanalytic interpretation operates in a similar fashion; in this case, a psychological narrative provides the model for the metaphorical or true meaning of the text in question. In Bettelheim's interpretation of fairy tales, it is Freud's model of the unconscious, rather than Jung's, that provides the means of discovering the "true" meaning. Thus some of the characters in fairy tales personify the ego, the id or the super-ego, while the sequence of events represents the conflict between them. For example, birds (particularly doves) "symbolize the higher aspirations of the superego and ego ideal" (Bettelheim 1978, p.102), whereas frogs and toads represent genitalia (p.290). The Freudian narrative is a narrative in which the child overcomes their infantile sexuality and becomes a sexually mature adult with a life-long partner.

In psychoanalytic interpretation, archetypal or sexual symbolism operates without restraint, embracing civilisations and cultures far removed in time and space. In Frye's qualified archetypalism however, some symbols are universal, but some are not:

> "It is inadvisable to assume that an Adonis or Oedipus myth is universal, or that certain associations, such as the serpent with the phallus, are universal, because when we discover a group of people who know nothing of such matters we must assume that they did know and have forgotten, or do know and won't tell, or are not members of the human race."
> (Frye 1990, p.118)

Freudians assume that an association between frogs and genitalia, for example, has universal relevance, but were such associations made by the people who created the tales? One problem with traditional European folktales and fairy stories is that the cultures which produced the tales have disappeared, and there are no

informants to enlighten us. According to Levi-Strauss, it is the lack of an ethnographic context that characterises Propp's morphology of the folktale (Levi-Strauss 1978b, p.131). Consequently, Propp is unable to show any correspondence between the tale and the missing context. In his analysis of myths of the American Indians, Levi-Strauss is able to provide an ethnographic context, and point out correspondences (Levi-Strauss 1986). For example:

> "In the mythology of Guiana the hummingbird is presented as being in correlation with, and opposed to, the bunia bird... together they help a man who is trapped at the top of a tree to get down, then to find his way back to his village. But whereas the bunia bird is a foul-smelling creature whose droppings are transformed into creepers... the hummingbird emits a delightful perfume, although it is occasionally soiled by excrement... We have therefore a twofold contrast: bad smell/pleasant smell, and defiling/defiled..."
> (Levi-Strauss 1986, p.205)

So, Levi-Strauss not only explains the cultural significance of the specific animals and plants that feature in Indian myths, but also awards these items a semantic value. He then uses these semantic values to construct a system of correspondences between myths, a system based on binary oppositions. According to Levi-Strauss, the human mind has a universal propensity to structure, and a universal tendency to use antithesis as a structuring device. However, demonstrating this tendency by using myths of the American Indians is another process that requires textual interpretation. As Culler indicates, it is not necessarily the case that the semantic values awarded by Levi-Strauss are values that are used by the natives themselves (Culler 1975, pp.45-46). Levi-Strauss' purpose is to show that primitive thought operates in a logical fashion. In pursuing this objective, he does not use contextual knowledge to interpret myth, but the principle of antithesis to interpret both.

So, structural similarities are interpreted by Jungians as an argument for archetypes and the universal narrative of individuation, by Freudians as an argument for sexual symbolism and the universal narrative of sexual development. For Levi-

Strauss, the use of antithesis as a structuring device is also a cognitive universal. In the first two examples, a process of textual interpretation maps the text in question onto another narrative; in the third, onto a system of binary correspondences.

Let's now turn from those who seek uniformities in the human mind, to those who seek uniformities in social and cultural development. Above, we referred to Todorov's discussion of patristic exegesis, in which the decision to interpret is triggered by the gap between two meanings, the literal and the metaphorical (Todorov 1982a, p.98). In the case of myths and folktales, one could argue that it is the difficulties of constructing a literal meaning - an absence rather than a gap - that triggers the psychoanalytic interpretation. For readers removed from the cultures that created such tales, difficulties in comprehension would seem to be caused by the lack of contextual knowledge. Yet according to Dseagu, a metaphorical meaning is still preferred even where contextual knowledge is available (Dseagu 1992). He claims that the journey motif in African folktales is seen in allegorical rather than literal terms, "as a reflection of a person's progress in life" (Dseagu 1992, p.590).

However, the journey is also a feature of the initiation rites that mark a person's progress in life in tribal societies, and the question arises whether this similarity reflects a relationship between the African folktale and the tribal background of African society, or indeed, a general one between folktale and ritual. Is the sequence of events in the European folktale a reflection of a tribal stage of development in European societies? To answer this question, we shall look firstly at the history of ancient Greece, and secondly at the origins of Greek tragedy. This excursion will also provide us with examples of interpretation in the context of stories, and with an alternative definition of a story schema.

8.4 THE PLOT IN ANCIENT GREECE

George Thomson argues that the evolution of Indo-European societies is marked by increasing social divisions (Thomson 1973). Prior to the economic changes caused by the neolithic revolution, Indo-European societies were generally organised on the basis of tribal co-operation. The tribe is ruled by a group of elders, who appoint a king with responsibilities of a magical nature. With the growth of private ownership stimulated by the domestication of cattle, warfare becomes a prominent feature of society, and the king's function changes: "warfare requires unity of leadership, and consequently these tribes" (ie pastoral) "develop a type of kingship which is primarily not magical, but military" (Thomson 1973, p.29). The tribe devolves more powers from its group of elders to the king, and more land becomes privately owned:

> "The Homeric evidence shows clearly that, while power or privilege was in the gift of the king, land was in the gift of the people, who bestowed on their leaders, in reward for military service, estates which differed from the others in that they were not assigned by lot to tribe or clan, but by special gift to an individual."
> (Thomson 1973, p.38)

So a monarchic society evolves into an aristocratic one, a society that is still ruled by a king with military responsibilities, but one that is now marked by the rift between peasant and landowner.

Thomson argues that this evolutionary process can be traced in the archaeological and documentary records of ancient Greece. Classical scholars generally agree that although the Homeric poems were composed some time around 750BC, the Trojan war occurred some time around 1200BC (Burn 1966, p.53; Kitto 1957, p.18; Finley 1971, p.21; Finley 1972, p.32). At that time, the Achaean civilisation celebrated by Homer was a federation of monarchies that were to be wiped out around 1000BC by the Dorians, military invaders who re-organised Greek society along aristocratic lines. Following these invasions, some of the Achaean Greeks settled in Asia Minor, where the Homeric poems originated: "In these conditions, the minstrels no longer sing of

contemporary victories, because there are none to sing of, and so they turn back to the idealised traditions of the past" (Thomson 1973, p.61). According to Thomson, "It was in this environment, with the monarchy already in decline, that Greek epic matured" (Thomson 1973, p.61). He disagrees with the tendency to attribute the Homeric poems to a single composer, and claims they are the result of several generations of story-telling:

> "The masterly construction of these poems is so impressive that it has been adduced as evidence of single authorship; but there is no reason why the same effect should not have been produced over a number of generations in the conditions of oral transmission. One may still encounter among the peasantry sagas or folk-tales which are artistically perfect - not because they are the work of a conscious artist, but because in the course of centuries they have been progressively shaped and polished by a sort of natural erosion, which has worn away excrescences and fashioned by slow degrees a final unity."
> (Thomson 1973, p.61)

The period following the Dorian invasions is characterised by the growth of trade, the rise of a merchant class, and the building of towns (Thomson 1973, p.79). Economic and political change is intensified in the seventh and sixth centuries BC by the exploitation of gold and silver and the introduction of coinage. Merchants become more powerful, some becoming *tyrannoi*, a new breed of king in the developing "city-states". The ensuing conflict between the peasantry, the aristocracy and the middle class of traders and merchants leads to the development of Athenian democracy, and a shift in the balance of power away from the aristocracy towards the middle class.

In this process of social change, certain features of the tribal system are carried over by the aristocracy, and are still retained in the new democracy. Thomson points to the preservation of the tribe or phratry in the military organisation of the emerging aristocracy. While the relationship of king to vassal is a personal one, in which the vassal is rewarded for his military service by a

gift of land, the vassal's armed forces are drawn from the old tribal unit:

> "We learn from a single verse of the Iliad that the Achaean army, like those of Athens and Sparta many centuries later, was organised on a tribal basis; but the fact is mentioned incidentally, and it is never mentioned again. This reticence on the subject of tribal institutions does not mean that they had ceased to exist, but that the poems belonged to the tradition of a ruling class which instinctively made little of the loyalties it had defied. The common soldiers continued to be marshalled phratry by phratry, but the vassal followed his lord."
> (Thomson 1973, p.58)

Thomson argues that in its conflict with the emerging middle class, the Athenian aristocracy continued to exercise power and privilege by appealing to the old tribal loyalties. Under the new democracy, the merchants and traders sought to undermine this influence by a process of tribal re-construction, and "when the primitive tribal system was superseded, the external features of the old order were faithfully reproduced in the new" (Thomson 1973, p.193):

> "The vital unit in the new system was the *demos*, or parish. As a territorial unit, the *demos* had existed since prehistoric times. In a great many cases it bore the name of a clan..."
> (Thomson 1973, p.193)

Membership of the *demos* was initially determined by an electoral register, but was then made hereditary, so that kinship traditions were continued. However, the major change consisted of a new arrangement of phratrys. With the new method of defining tribal membership, the urban population was able to exercise an influence disproportionate to its numbers:

> "Thus the middle class of merchants, manufacturers, and artisans secured a permanent advantage over the land-owners, farmers and peasants, and at the same time the interests of the country were subordinated to those of the town."
> (Thomson 1973, p.194)

In this change "from tribe to state", the heritage of a tribal culture is apparent not only in military and political organisation but also in religion. Jane Harrison (1962) finds documentary evidence for two different notions of sacrifice in ancient Greece. The first type of sacrifice is performed as a prelude to a communal feast, in which Olympian deities are invited to partake; the second type of sacrifice is performed to placate chthonic or underworld deities (Harrison 1962, pp.1-31). The latter kind of ritual, she argues, shows the presence of a "lower stratum" of thought, more magical rather than religious, and it is this kind of ritual that marks many of the seasonal festivals in the Greek calendar (Harrison 1962, p.29). She finds evidence that many of these festivals have a pre-Olympian antiquity. Two examples are the Anthesteria, a spring festival, and the Thesmophoria, an autumn festival. Before we can discuss the origins of Greek tragedy, we need to discuss some examples of ancient festivals, which also include the Eleusinian mysteries and the Dionysia. The festivals are summarised in Figure 13.

The Anthesteria takes its name from the Greek month Anthesterion, which roughly corresponds to February in the Roman calendar. According to Apollodorus, it was celebrated in honour of Dionysus, and its three parts were known as *pithoigia* (cask-opening), *choes* (cups), and *chytroi* (pots). Documentary sources record that the festival was viewed as a wine-festival and an occasion for much drunkenness. However, Harrison argues that a closer examination of the sources "reveals beneath the surface rejoicings... another and more primitive ritual, and a ritual of widely different significance" (Harrison 1962, p.34). This closer examination shows that the festival was traditionally viewed as a festival of ghosts or ancestral spirits.

According to Harrison, the name of pots refers not only to storage jars but also to holes in the ground, which "were in many parts of Greece regarded as the constant haunt of ghosts going up and down" (Harrison 1962, p.38). The name of cups refers to a specific type of cup, one that was used for libations to ancestral

ANTHESTERIA
1. pithoigia (cask-opening) = letting out the ghosts
2. choes (cups) = remembering the dead
3. chytroi (pots) = putting away the ghosts

THESMOPHORIA
1. kathodos and anodos (downgoing and uprising) = sacrifice
2. nesteia (fasting) = abstention
3. kalligeneia (fair birth) = fertilisation

HALOA
1. purification
2. secret ceremony, which includes the offering of first fruits
3. feasting

ELEUSINIAN MYSTERIES
1. agon (contest)
= ordeals of purification (bathing, sacrificing, fasting)
2. pompe (ceremonial departure)
3. anagnorisis (discovery)
= secret ceremony, which includes revelation of sacred objects, a sacred marriage and a divine birth
4. komos (triumphal return)

DIONYSIA (first day)
1. pompe (ceremonial departure)
= procession with statue of Dionysus
2. agon (contest) or sparagmos (tearing apart)
= sacrifice of bull
3. komos (triumphal return)
= return procession with statue of Dionysus

FIGURE 13: FESTIVALS IN ANCIENT GREECE

spirits. The name of casks refers to funerary urns, urns containing bones of the dead which were stored in holes in the ground. Harrison argues that February was traditionally viewed by Greeks and Romans as the month of the dead, while spring was a time to placate ancestral spirits in order to insure the earth's fertility (Harrison 1962, p.54). Thus the traditional sequence of events is not concerned with consuming vast quantities of alcohol, but can be re-constructed as follows. On the first day of "cask opening", the urns containing the ancestral spirits are disinterred, re-opened, and the spirits invited to come out. The second day of "cups" is devoted to remembering the dead, and the ancestral spirits are offered food and drink, which, unlike the communal feast, is offered to them alone. On the third day of "pots", the spirits are invited back into their urns, which are then re-sealed and re-interred for another year. Thus Harrison compares the Anthesteria to a festival of "all souls" (Harrison 1962, p.36).

The Thesmophoria was an autumn festival, held in the Greek month of Pyanepsion (October/November). According to Harrison, the rites that were practised at this festival "were practised by women only and were of immemorial antiquity" (Harrison 1962, p.120). The first day was called both *kathodos* and *anodos* (downgoing and uprising), the second *nesteia* (fasting), and the third *kalligeneia* (fair-born or fair-birth). It was generally viewed as a fertility festival, held in honour of Demeter, the goddess who gave the gift of agriculture to women. The first day is marked by a mass sacrifice of pigs, who are taken down a chasm and ritually slaughtered. The women then bring up the remains of the pigs sacrificed the previous year. The second day is marked by a fast, and the third day is marked by the strewing of the dead flesh onto the fields. The purpose of the ceremony is to insure the earth's fertility before the autumn sowing begins.

The Haloa was another festival organised exclusively by women, and also held in honour of Demeter. Harrison describes the Haloa as a harvest festival, in which the first fruits of the harvest were offered to the goddess, and which culminated in a huge feast. Part of the festival involved handling "the sacred

symbols of both sexes", while some sources refer to the presence of cakes made in the shape of genitalia (Harrison 1962, pp.148-149). A ceremony involving similar *sacra* also features in the annual festival at Eleusis, and Harrison argues that the Eleusinian mysteries "were in their enactments the very counterpart of the Haloa" (Harrison 1962, p.150).

The overt references in the literature to the revelation of mysteries make the Eleusinian festival rather different from the other seasonal festivals in the Greek calendar. What were these mysteries? In Harrison's view, the ancient Greek mysteries were predominantly organised by and for women:

> "Mysteries were by no means confined to the religion of Demeter and Kore. There were mysteries of Hermes, of Iasion, of Ino, . . . , of Hecate. In general mysteries seem to occur more usually in relation to the cult of women divinities, of heroines and earth-goddesses; from the worship of the Olympians in Homer they are markedly absent. In general, by a mystery is meant *a rite in which certain sacra are exhibited, which cannot be safely seen by the worshipper till he* (sic) *has undergone certain purifications.*"
> (Harrison 1962, p.151)

According to Harrison then, mysteries involve the revelation of sacred objects. Those who partake in this secret ceremony are forbidden to disclose what they have seen, and must perform a purification ritual beforehand. In Thomson's view however, mysteries are also inseparable from *initiation.* This feature enables him to detect a tribal heritage in the period of Athenian democracy. Above, we summarised Thomson's account of tribal initiation rites, in which the child is initiated into adulthood, and the adult into an elder. According to Thomson, these sort of rites are apparent in Plutarch's account of the education of Spartan youth, and Aristotle's account of archaic institutions in Dorian Crete (Thomson 1973, pp.97-101). He also points out that initiation was a pre-requisite for entry into the religious cults of tribal societies (Thomson 1973, pp.95-96). The proceedings at Eleusis also involved initiation into a mystery. However, in the

democratic period, it seems that every Athenian citizen, including slaves, was initiated into the Eleusinian mysteries, and that parts of the ceremony are obscure because they were so well-known (Thomson 1973, pp.110-114).

The sequence of events is as follows (Harrison 1962, pp.150-161). Each candidate for initiation first goes through a process of purification by bathing in the sea. Each person brings a sacrificial pig, which is also bathed. The pig, while sacred to Demeter, also indicates the democratic nature of the event; Harrison comments that "the pig was the cheapest and commonest of sacrificial animals; one that each and every citizen could afford" (Harrison 1962, p.153). The pig is sacrificed, and the next stage involves a fast. The initiates then set off in a procession from Athens to Eleusis, where the rest of the proceedings take place. In the hall of initiates, the candidate drinks from a sacred cup, and handles the sacred objects. Following this secret ceremony, the initiates return to Athens.

While the Greater Mysteries were performed at Eleusis in the autumn and were sacred to Demeter, the Lesser Mysteries were performed at Agrae in the spring and were sacred to Kore or Persephone, Demeter's daughter (Harrison 1962, p.559). Moreover, a candidate for initiation had to attend the lesser before they were qualified for the greater. If the mysteries were based on tribal initiation rites, then it would seem that the basis of the lesser was the initiation of child to adult, and of the greater, adult to elder. On the other hand, the mysteries also coincide with stages of the agricultural cycle, and as Harrison points out, the relation between mother and daughter is also one between the seeds of autumn and the growth of spring (Harrison 1962, pp.257-321).

The Greater Mysteries at Eleusis share certain features with the Thesmophoria and the Haloa, while their performance coincides with the start of the agricultural year and the autumn sowing season. Thomson comments that "the great service of Demeter to mankind, which the Mysteries were believed to

commemorate, was the discovery of agriculture" (Thomson 1973, p.110). However, following Harrison's observation that most of the mysteries were organised by women, one could argue that the secrets of agriculture were initially known only to women. She argues that the evolution of the mysteries indicates the changing relations between the sexes, social changes that were reflected in religious changes. According to Harrison, the Greek goddesses were traditionally represented as a triad of youth, mature woman, and older woman, or as a pair of mother and maiden (Harrison 1962, pp.163-321). With the establishment of the Olympian pantheon, the goddess becomes less important, and the pairing of mother with daughter is replaced by the pairing of mother with son, the son replacing the daughter in vase paintings and other art forms (Harrison 1962, pp.322-571). Finally, the son becomes more important than the mother (Harrison 1962, p.562).

These changes are reflected in the Eleusinian mysteries. Initially organised by women and seen as sacred to Demeter, the mysteries were also connected with Dionysus, at some stage before the democratic period. Part of the proceedings involved the enactment of a sacred marriage, and the birth of a divine child (Harrison 1962, pp.548-571); Harrison regards "the rite of the Sacred Marriage and the Birth of the Holy Child" as "the central mystery" (Harrison 1962, p.563). In Thomson's view, the enactment of a sacred marriage is another example of the heritage of tribal initiation, in which initiation into adulthood was frequently followed by marriage; he comments that "marriage was constantly regarded as a mystery, and the parties to it as initiates" (Thomson 1973, p.116).

While Demeter was generally viewed as a goddess of agriculture, associated with corn and the invention of bread in particular, Dionysus was generally viewed as a god of plants, associated with ivy, the vine and the invention of wine. He was a late comer to the Greek pantheon; Frazer (1993, p.387), Harrison (1962, pp.364-379), and Thomson (1973, p.143) all agree that his worship came from Thrace. Frazer argues that Dionysus was a god of vegetation who annually dies and is born again (Frazer 1993,

p.386). He records many examples of god-kings who reign for a fixed term, and are ritually sacrificed by their inheritors (Frazer 1993, pp.264-288). He argues that such kings personify the life forces that wax and wane with the seasons, and that traces of the ritual of killing the old year and bringing in the new can be found in the traditional customs of European rural communities (Frazer 1993, pp.296-323).

The worship of Dionysus, however, was also associated with wild women, dancing, debauchery, and a state of intoxication. As exemplified by Euripides' *The Bacchae,* his worship, like that of Demeter, was confined to women, and involved escorting a representative of Dionysus into the country, where, in a state of exhilaration, the women tear the god to pieces. The women return and hold a celebratory feast. Thomson describes the sequence of events as a *pompe* (procession), an *agon* (contest), and a *komos* (triumphal return), the same ritual pattern exhibited by the Eleusinian mysteries and the Olympian games (Thomson 1973, p.156). According to Thomson, "the cults of Dionysus... were very ancient - older, in fact, than the god to whose name they were attached - and they consisted of a primitive form of agricultural magic" (Thomson 1973, p.141). The magical element becomes evident by comparing the rites of Dionysus with the Thesmophoria, in which ritually slaughtered flesh is strewn over the fields to insure their fertility. Thomson argues that under the tyranny of Pesistratos, who wanted to undermine the religions of the aristocracy, at Athens the worship of Dionysus was not only tolerated but brought under state control because of its popularity among the peasantry - so "the worship of Dionysus was brought to town" (Thomson 1973, p.141).

The City Dionysia, according to Thomson, lasted five or six days (Thomson 1973, pp.155-158). The first day, he argues, is marked once again by the sequence of *pompe*, *agon*, and *komos*. The statue of Dionysus is brought out of its temple and taken in ceremonial procession to a shrine outside Athens where it was said to originally belong. Animals are sacrificed in his honour, the main one being a bull offered by the City of Athens; Thomson

argues that the bull is an incarnation of Dionysus. A feast is held, and at the end of the day's festivities the statue is brought back to Athens, where it is placed in a theatre until the end of the festival. The rest of the festival is given over to dramatic competitions and dithyrambs. A prize bull is awarded to the winners.

The dithyramb was a hymn sung in honour of Dionysus. Following Aristotle, Thomson argues that here lies the origin of Greek tragedy. The dithyramb involved a leader and a chorus, and according to Thomson, "since there is reason to think that the leader of the choir impersonated the god, it is plain that we have here the germ of a ritual drama": the leader became an actor (Thomson 1973, p.162). Moreover, Thomson argues that the leader is descended from the god-priest of the secret societies that performed the rites of Dionysus (Thomson 1973, p.172). As the rites were a mystery "which only those who had been initiated into the secret were able to understand", when the ritual became a drama - that is, "a mimetic rite performed by initiates before an uninitiated audience" - the ritual needed an interpreter or *hermeneus* (Thomson 1973, p.172).

Now, as Harrison reveals, the word used in Aristotle's *Poetics* that is generally translated as *plot* is *muthos* (Harrison 1963, pp.327-331). Frye also refers to the equivalence of the two terms (Frye 1990, p.52). In the context of tragedy, Aristotle explains that "the representation *(mimesis)* of the action is the plot *(muthos)* of the tragedy; for the ordered arrangement of the incidents is what I mean by plot" (Aristotle 1965, p.39). In the case of tribal societies, Thomson argues that a myth is "the spoken form of the ritual act - the collective expression of the unforgettable experience periodically shared by the participants in the rite itself" (Thomson 1973, p.96). At a later stage of social development, he continues, myth may become detached from ritual, but the two remain attached "in the drama of the magical fraternity":

> "In these conditions, since the fraternity is secret, the myth becomes a mystery, which is revealed to the uninitiated only in its outward and visible form, its inner meaning being

> reserved for "those who understand". Lastly, when the fraternity itself declines, its dramatic function is usually the most persistent. The society of mystics becomes a guild of actors, whose plays have lost their esoteric significance, but still retain to some extent the character of a mystery..."
> (Thomson 1973, p.96)

In the case of ritual drama then, the *muthos* or *plot* is the mystery or inner meaning of the mime that is performed by the actors, a mystery that is explained by the interpreter or *hermeneus*.

Aristotle distinguishes the complex plot from a simple one by the occurrence of a reversal *(peripeteia)* or a discovery *(anagnorisis)*, in addition to a change of fortune (Aristotle 1965, p.45). Following Murray (1963, pp.341-363), Thomson argues that "the themes of early tragedy were drawn from the myths of Dionysus", the myths not only of the god's death but also of his birth and resurrection (Thomson 1973, p.177). Murray argues that a *peripeteia* is to be found in the change of emotion from sorrow to joy that accompanies the god's death and subsequent resurrection, and that "such a Peripeteia is clearly associated with an Anagnorisis, a Recognition or Discovery" (Murray 1963, p.342). However, Thomson argues that anagnorisis applies not to the god's death, as Murray claims, but to his resurrection:

> "... the theme of the recognition is derived from the self-revelation of the god after his re-birth or resurrection. His appearance was followed, we may suppose, by an interrogation on the part of the chorus, at the end of which he proved his identity by revealing to them the sacred objects or mystical symbols associated with his cult."
> (Thomson 1973, p.177)

Thomson argues that more support for this proposal comes from the type of dialogue in Greek tragedy called *stichomythia*, a series of alternating question and answer, which Thomson argues is a vestige of the catechisms of primitive initiation, and connected with the riddle (pp.177-179).

Given the argument that tragedy originated in the rites of Dionysus, the enactment of his birth, death, and re-birth, Murray identifies the following elements in Greek tragedy as "ritual forms": *agon* (contest) or *sparagmos* (tearing to pieces), *pathos* (a ritual death or sacrifice), messenger (who announces the god's death), *threnos* (a lament), *anagnorisis* (discovery or recognition), and *theophany* (a resurrection, epiphany or apotheosis). Murray also argues that this sequence of events can be traced in the surviving plays of Aeschylus, Sophocles and Euripides (Murray 1963, pp.341-363).

1. agon (contest)
2. pathos or sparagmos (ritual death or sacrifice)
3. messenger, conveying news of the death
4. threnos (lamentation)
5. anagnorisis (discovery or recognition)
6. theophany (resurrection)

FIGURE 14: RITUAL FORMS IN GREEK TRAGEDY

Following Aristotle however, Murray, Thomson and others have pointed out that tragedy and comedy *both* originated in the rites of Dionysus, and that the primitive drama consisted of three plays and a satyr play, in which the re-born god returns in triumphal procession. The fourth play became detached from the sequence and evolved into comedy, while the first three evolved into the tragic trilogy, as exemplified by the *Oresteia* of Aeschylus, and finally into the single play (Thomson 1973, pp.217-295). Murray argues that when comedy broke off from tragedy, the tragedy must either end with a threnos or include its own theophany, and he finds examples of these two variant endings (Murray 1963, p.345). However, Thomson finds no evidence to support Murray's suggestion that the trilogy initially represented the stages of the god's life (birth, maturity, and death), and argues

that the episodic division served the same function as acts in the Elizabethan drama (Thomson 1973, p.227).

Summarising his argument, Thomson concludes that "the art of tragedy was descended, remotely but directly, and with each stage in its evolution conditioned by the evolution of society itself, from the mimetic rite of the primitive totemic clan" (Thomson 1973, p.183). In addition, he argues that the mystical doctrine of the mysteries "reproduces the pattern of tribal initiation at every point", while "the old pattern has been charged with an entirely new meaning" (Thomson 1973, p.118).

8.5 STORY SCHEMATA AND INTERPRETATION

Following this excursion into the social origins of Greek tragedy, we can now return to story memory. Above, we concluded that a schema is a set of expectations which guide interpretation, and argued that textual interpretation is guided by two kinds of schemata, one that stems from reading stories, and one derived from worldly experience. We have seen that Mandler and Johnson and others have sought to represent schemata using a grammatical approach influenced by Chomsky's linguistics. For an alternative approach to schemata we turn once more to Saussure's notion of language as a system of sequential and associative relations. Given the discussion in the last chapter, we can also make a further distinction between schemata for events and schemata for scenes, a distinction that reflects two different kinds of information, verbal and visual. Using the definition of a story as a sequence of events, a story schema is a sequence of events to which we can attach a name, and which acts as a guide to textual interpretation. Each of the above illustrations therefore represents a specific type of story schema.

Using Todorov's formulation of interpretation as a process of finding correspondences between meanings, we argued that psychoanalytic interpretation is a process of finding correspondences between two narratives, between a Jungian or Freudian

narrative, and the narrative of the text in question. The discussion of Greek tragedy provides further examples of interpretation. In tracing the process of social evolution, Thomson's schema consists of the sequence of events in tribal initiation. In arguing that tragedy arose from the rites of Dionysus, Murray's schema consists of the sequence of events in the god's life story. From this perspective, Murray argues that the trilogy must have initially represented the three stages of youth, maturity and old age. The difference in schemata is reflected in the identification of *anagnorisis.* For Murray, it is the discovery of the god's death which is interpreted as *anagnorisis*, for Thomson, who appeals to the correspondence between *stichomythia* and the catechisms of tribal initiation, it is the discovery of his re-birth.

The ordering of events in the schema also influences the process of finding correspondences. Murray claims that the order shown in Figure 14 is "the sequence in which these should normally occur" (Murray 1963, p.344). However, the argument that this sequence is preserved in the surviving Greek tragedies depends on interpretation. In Sophocles' *Oedipus Rex* for example, Murray identifies the *agon* as the verbal contest between Oedipus and the shepherd, which also brings about a *peripeteia* and an *anagnorisis* (Murray 1963, p.358). In this altercation, Oedipus, seeking to unravel the mystery of his origins, threatens to kill the shepherd unless he speaks the truth. In hearing the shepherd's replies, Oedipus recognises that the events which he had tried to avoid have indeed occurred - he has murdered his father, and married his mother - and in this moment of realisation, or seeing, he blinds himself.

However, the murder of his father also constitutes an *agon*, which has already taken place before the play begins. Moreover, the contest between Oedipus and the shepherd turns into a series of rapid questions and answers or *stichomythia*, which in Thomson's schema correspond to the catechisms of tribal initiation, so that *anagnorisis* is again equivalent to the discovery of a new identity, rather than an old one. Similar problems arise with Thomson's schema: firstly, in finding correspondences, and

secondly, in the preservation of order. For example, the *agon* is the sacrifice of a bull in the case of the Dionysia, but the *agon* is a fast in the case of the Eleusinian mysteries. A *pompe* is followed by an *agon* in the case of the Dionysia, but this order is reversed in the case of the mysteries.

Similar problems also arise in trying to trace the social origin of folktales. Let's return to the question whether there is a relationship between folktales and a tribal stage of social development. If we compare the sequence of events in tribal initiation rites (Figure 12) with Propp's sequence of functions in the folktale (Figure 11), then certain similarities between the two will become apparent.

Both sequences contain a departure, a series of events that occur away from the home, and a return. Propp finds that every opening sequence in his analysis contains function 8a - the lack that motivates the quest. In addition, the folktale often begins with the disappearance or death of a member of the hero's family, a beginning that also marks Sophocles' *Oedipus Rex*. In the latter case, the king has died, the gods have deserted the land, and the crops are dying in the fields; a beginning that has similarities with "journey to the underworld" myths, such as the Babylonian story of Inanna, who searches for her consort Dumuzi, the god of vegetation. In the case of Oedipus, the lack motivates the quest to find the murderer. The initiation rites also begin with a loss, but this occurs both in the symbolic death of childhood, and in the physical removal of some part of the body. Additionally, one could argue that the lack which motivates the departure is a lack of the knowledge which the rites are designed to provide.

Both sequences contain a set of physical ordeals and a set of difficult tasks. Both contain the magical helper or instructor, who gives the hero a secret weapon in the one case, or reveals some sacred objects in the other case. The closing sequence of the folktale often involves the hero being given a new identity, and frequently ends with a marriage, events that also feature in the initiation rites.

Now, in his critique of Propp's morphology, Levi-Strauss calls Propp's sequential analysis formalist (Levi-Strauss 1978b). While others criticise Propp for a lack of abstraction, Levi-Strauss criticises Propp for too much:

> "Unless the content is surreptitiously reintegrated into the form, the latter is condemned to remain at such a level of abstraction that it neither signifies anything any longer nor has any heuristic meaning. *Formalism destroys its object.* With Propp, it results in the discovery that there exists in reality only one tale."
> (Levi-Strauss 1978b, p.132)

However, in Propp's formula there is not one but two stories. He finds that the two functions 16 and 18 (the physical contest with the villain, the hero's victory) do not occur in the same tale with the two functions 25 and 26 (the difficult task, its resolution). The folktale, according to Propp, therefore consists of two variants. In looking for correspondences with tribal initiation rites, the difficult task occurs in the rites of passage from child to adult, but the physical contest with the villain features more prominently in the rites of kingship, in which the old king is ritually murdered by the new one. One could construct an argument, therefore, that the two variants in the folktale reflect a difference in derivation.

However, although these correspondences can be identified, is there a basis for arguing that the one sequence is derived from the other, that the folktale represents the collective memory of a tribal stage of social development? Levi-Strauss points out the difficulties of establishing historical priority in the case of myths and folktales, arguing that "their relationship is not that of anterior to posterior", but a complementary one (Levi-Strauss 1978b, p.130). In the case of Greek tragedy, we have concrete evidence for the anteriority of rituals and festivals, texts that can be given an approximate date, and contextual documentation. Thomson is able to draw on such evidence to explain the relation between tribal initiation rites, the mysteries, Greek tragedy, and social and historical development. In comparison, we have problems dating myths and folktales, and often lack contextual

knowledge. There are no definitive texts for stories in the oral tradition; there is only the process of telling and re-telling.

8.6 STORY SCHEMATA IN FICTION WRITING

Let's return to the question of how story tellers and fiction writers use their story memory to generate new stories. We defined a story schema as a sequence of events to which we can attach a name, and which acts as a guide to textual interpretation. Fiction writing involves memory and imagination, in remembering events and scenes from stories or experience, and imagining the events and scenes of a new story. One conclusion to the discussion on story memory was that interpretation has an influence on how stories are remembered. Does interpretation also play a role in writing? Given its definition as a process of finding correspondences between meanings, or between narratives, then interpretation in fiction writing must fill the gap between memory and imagination, or between remembering and imagining. In this context then, interpretation is a process of creating correspondences between events from a writer's personal or textual experience, and the events of a new story.

The results of research into story memory are summarised by Mandler (1982), Thorndyke and Yekovich (1980) and Beaugrande and Dressler (1981). All three summaries describe the results that are outlined in Mandler and Johnson's predictions above; but account for them in slightly different ways. Thorndyke and Yekovich give an account of these results from the perspective of schema theory (Thorndyke & Yekovich 1980, pp.33-38), while Beaugrande and Dressler summarise the results from the perspective of "text-presented knowledge" (Beaugrande and Dressler 1981, pp.202-204). Mandler summarises the results from the perspective of story grammars; so, given that the above predictions "have been confirmed in a variety of stories and populations", the results tend to justify the use of grammars (Mandler 1982, p.210). What do the results tell us about story schemata and the organisation of story memory?

According to Thorndyke and Yekovich, the assumptions of schema theory include concept abstraction and hierarchical organisation: "A schema represents a prototypical abstraction of the concept it represents" and "schemata are organized into a generalization hierarchy in memory (Thorndyke & Yekovich 1980, p.27). To these assumptions, we can add the notion that a schema can be represented by a grammar. However, the criticisms of Thorndyke and Yekovich are more concerned with the assumption that reading or encoding is a top-down process, in which a schema is instantiated by matching input to vacant slots (Thorndyke & Yekovich 1980, p.28), and the assumption that there is only one schema "for the comprehension of narrative texts" (Thorndyke & Yekovich 1980, p.41). They describe schema theory as incomplete rather than inaccurate (Thorndyke & Yekovich 1980, p.42).

However, using a grammar to represent a story schema is not the only way to explain concept abstraction and hierarchical organisation. We defined a story schema from the perspective of sequential and associative relations, as a sequence of events to which we can attach a name. At the Aristotelian level of abstraction, the sequence consists of three episodes, a beginning, a middle and an end. At the minimal level, each episode must contain a verb, and at least one of these verbs must signify an event. Thorndyke and Yekovich, like Mandler, are more concerned with the *accurate* recall of a story, rather than the process of remembering. For the former purpose, the grammar serves as a *measure*, and additions, deletions and distortions are defined accordingly. However, the results can also be summarised from the alternative perspective of sequential and associative relations in remembering.

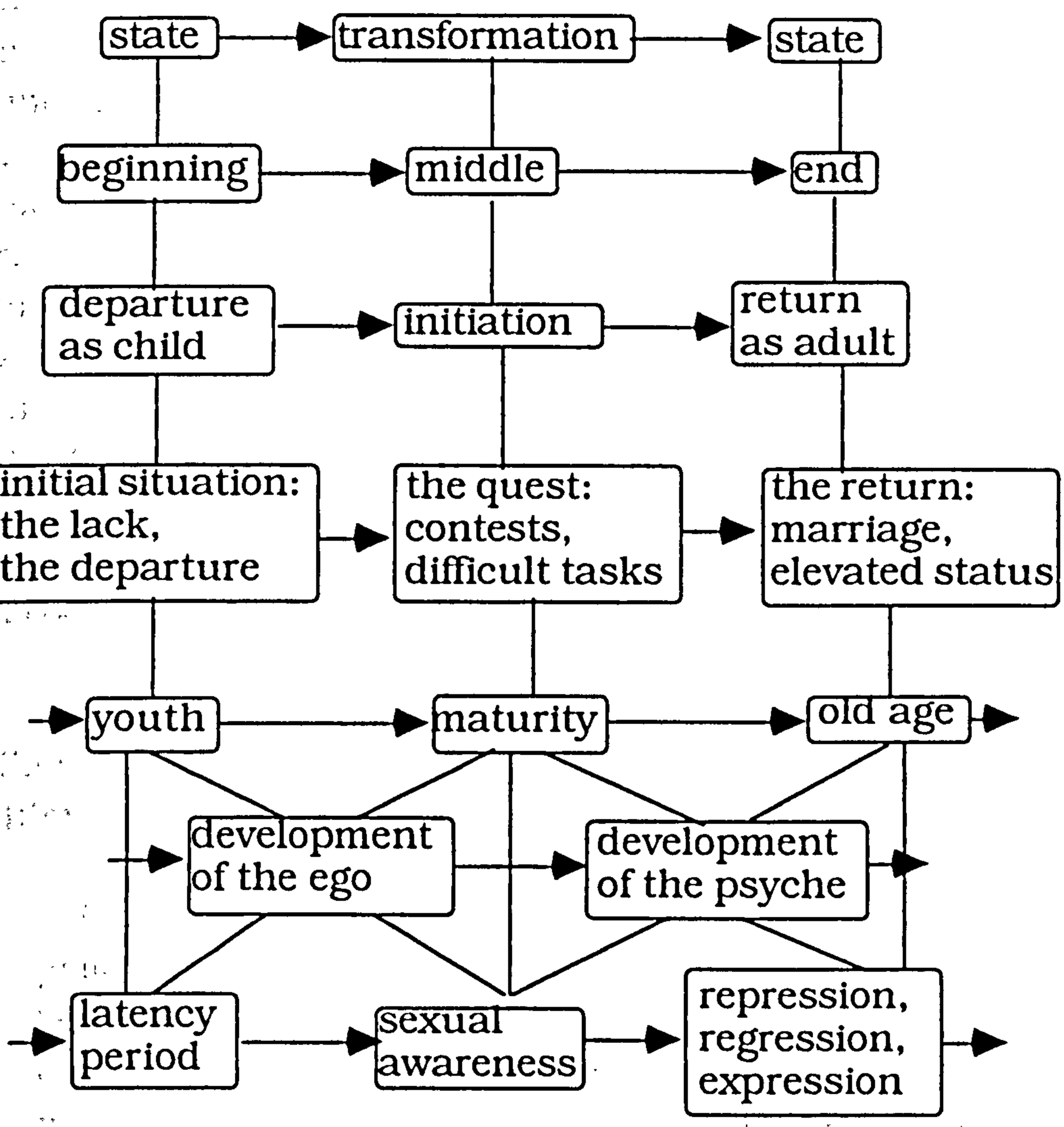
From this perspective, the results confirm Freud's work on the interpretation of dreams, in which he seeks to establish correspondences between events in the dreamer's personal experience and events in the dream (Freud 1976b). As mentioned in the last chapter, Todorov points out that the operations which Freud attributes to the unconscious are no different to those

involved in any symbolic process, as recorded in writings of the rhetorical tradition (Todorov 1982b, p.248). These operations include condensation, displacement, substitution and negation. As an example, let's assume we are writing fiction, and that we are engaged in the interpretative activity of remembering events from personal experience and imagining the events of a story. This activity will involve some of the following operations:

- *condensation and expansion:* certain events in the original sequence may be contracted, while others may be expanded;
- *ellipsis:* many events may be omitted altogether;
- *insertion:* imaginary events may be inserted into the original sequence;
- *displacement:* the original order of events is reversed or re-arranged;
- *substitution:* an event in the original sequence is replaced by an imaginary one;
- *negation:* an event in the original sequence is replaced by its opposite (eg *a rise* is replaced by *a fall*).

Research into story memory indicates that the remembering of stories also involves these operations. In writing for a specific group of readers or producing a fiction for a specific genre (crime thriller, teenage horror), fiction writers may use particular stories as models, and apply the above operations to create a new one.

Associative relations in story memory help the writer to imagine specific events. In addition, fiction writers can use their story memory to create a sequence of imaginary events by calling on various schemata at different levels of abstraction (Figure 15). Although derived from an analysis of Greek tragedy, the Aristotelian notion of the plot represents a higher level of abstraction than considerations of genre. Although derived from an analysis of the folktale, Propp's sequence of functions represents a level of abstraction which also seems to encompass different genres and different art forms, such as films, comics and novels.



from top: a minimal narrative schema (from Todorov 1977a); an Aristotelian schema; an initiation schema; a Proppian schema; a human life schema; a Jungian schema; a Freudian schema.

sequential operations in fiction writing: condensation, expansion, ellipsis, insertion, displacement.
associative operations in fiction writing: substitution (eg loss: of money, of parent, of child, of lover), negation (eg loss - gain, departure - return, rise - fall).

FIGURE 15: STORY SCHEMATA

The significance of Propp's analysis lies in the relevance of his discoveries not only to the folktales of other countries, but also to the artefacts of contemporary popular culture. The amenability of cinematic narrative to Propp's analysis was demonstrated by Peter Wollen (Wollen 1976). One of his motives in analysing Hitchcock's film *North by North-West* was to investigate whether there is any affinity "between the folk stories of a traditional, oral culture and those of contemporary mass culture" (Wollen 1976, p.22). A second motive is Truffaut's suggestion that many of Hitchcock's films resemble fairy tales, while Hitchcock likens them to the short story and the day-dream (Wollen 1976, p.23). Wollen shows that *North by North-West* follows the Proppian pattern, and suggests that this pattern is also to be found in other films by Hitchcock.

Moreover, the Proppian sequence of functions is not unique to Hitchcock. Here, if my memory serves me well, is a synopsis of the film *The Karate Kid:*

> A New York youth (the hero) seeks the attentions of a girl (the princess). She, however, likes boys who drive cars, and rejects the hero because he rides a bicycle. The hero then faces competition from the local gang-leader (the villain) for the attentions of the princess. In a physical confrontation, the villain humiliates the hero and damages his bike. A karate competition is advertised at the local youth-club, in which the villain seems the likely victor. The hero tries to learn karate from an instructor at the club but fails to make progress. However, help arrives from an unexpected quarter. The hero's family have a mysterious Oriental gardener (the helper and donor), whose wisdom includes an intimate knowledge of Zen (the secret weapon) and its application to karate. After overcoming his scepticism regarding the Oriental's strange methods of instruction, the hero agrees to a course of arduous training, enters the competition, defeats the villain, receives the gift of a car from the all-knowing Oriental, followed by much admiration from the princess, and offers to take her for a celebratory ride...

In the above example, the main characters in the film play the roles of hero, villain, princess, and helper. Certain functions are expanded, while many are omitted, such as the pursuit and the rescue. Examples of the Proppian sequence can also be found in other products of popular culture, such as children's comics (teenage romances, cartoon adventures, the *Bunty* and the *Judy).*

According to the comparative study reported by Mandler and Johnson, Liberians find European folktales "to be perfectly acceptable as local tales" (Johnson & Mandler 1980, p.80). However, the most likely explanation of this phenomenon is the ubiquity of the Proppian sequence of functions, rather than Mandler and Johnson's grammar. Dseagu argues that it is the indigenous tradition of the folktale, rather than Western traditions of novel writing, which has been the major influence on the development of the African novel. Moreover, "the modern novel in Africa tends to reflect the plot structure of the folktale" (Dseagu 1992, p.593).

Dseagu argues that criticism of the African novel tends to suggest that the novel is primarily a Western form, which has recently been brought to Africa from Europe. Consequently, the African novel is held to be at an early and inferior stage of development compared to its Western counterpart. According to Dseagu, the underlying assumption of this Eurocentric criticism is that the conditions which enabled the English novel to develop are a *universal* necessity for the novel's development:

> "A great deal of the critical perception of the African novel stems from the view that the novel as an art form originated in the West in the eighteenth century. Ian Watt, in his important work *The Rise of the Novel,* appears to have given currency to this impression by not providing adequate warning that he was confining himself strictly to the novel in England even while generalizing about the early beginnings of the novel. Thus, certain of his arguments pertaining to the social factors behind the rise of the novel in England are often reproduced to evaluate the situation of the African novel."
> (Dseagu 1992, p.584)

In Watt's account of the English novel, the rise of the individual in a burgeoning capitalist society is one of the conditions for the rise of the novel, the growth of a reading public, and the development of character (Watt 1972). According to Dseagu, critics compare these conditions with those that prevail in traditional African society; conditions that impose conformity rather than individuality, to argue that characters do not exist in the African novel, and that there is no basis for their development. Dseagu argues that characters do exist, but African novelists work with a different notion of character:

> "Most African novelists, if not *all*, use character, not as a reflection of individualism, but as a reflection of the ideals of communalism, group solidarity, and conformity to emphasize the principles of Africa's morality. The technique most favored by many African novelists is to make character representative and functional..."
> (Dseagu 1992, p.596)

This functional notion of character is one of the influences of the folklore tradition:

> "In all the folktales of Africa the principle is the same: the character is easily identified for what he stands for, and very little or no attempt is made to give this character any psychological specificity."
> (Dseagu 1992, p.598)

A further influence on the novel is the sequence of events in the folktale, which, as we have seen, are marked by a departure, a set of adventures, and a return. The Senegalese novel is marked by a similar structure of departure, initiation and return (Dseagu 1992, p.591). According to Dseagu, the episodes in Zulu folktales "tend to mark important epochs in the rites of passage of the individual", and the three most distinctive phases are birth, adulthood, and old age (Dseagu 1992, p.590). Dseagu argues that "in the African novel, precisely the same passage from birth to adulthood is at the core of the plot structure" (Dseagu 1992, p.591). On the basis of this parallel, Dseagu concludes that "more

than 75 percent of Africa's novels are based on the plot structure of the folktales" (Dseagu 1992, p.591).

So it would seem that in this context, the Proppian sequence does have a cultural connection with tribal initiation rites, and that this connection is also apparent in the African novel. Yet this division into episodes that mark stages in the narrative of life can also be found in the English novel. Charlotte Bronte's *Jane Eyre*, for example, can be broken down into four distinct stages: the first ten chapters contain Jane's youth (her experiences at school, her upbringing as an orphan with the Reeds); the next seventeen chapters contain Jane's maturity (her relationship with Rochester at Thornfield Hall, the prospect of a marriage that fails to occur because of Rochester's non-human wife who is locked in the attic); the next eight chapters contain Jane's escape from Thornfield Hall (in which she spends several nights sleeping alone on the moors, and discovers distant cousins living in an isolated cottage); and the final sequence contains Jane's approach to old age (her return to Thornfield Hall and the now blind and wifeless Rochester). The sequence in which Jane escapes to the moors has certain similarities with initiation ceremonies that require the initiate to spend some nights alone in a forest or wild place. Moreover, Jane also discovers a new identity in finding her lost cousins, a family which is lacking at the beginning of the novel.

Similar folktale motifs are found in Jane Austen's novels, which also culminate in marriage, while the journey is a prominent feature of many novels, such as *Don Quixote, The Pilgrim's Progress, David Copperfield, Heart of Darkness, Portrait of a Lady, Ulysses,* and *Sexing the Cherry.* Many of these journeys involve some kind of initiation, such as *Heart of Darkness* , and Jungians would describe such narratives as symbolic - symbolic, that is, of a narrative of individuation. However, the biographical narrative which describes the development of child into adult, such as *David Copperfield* , and the narrative which describes the problems of achieving a successful match, such as Jane Austen's novels, are also narratives of initiation, narratives that describe the rites of passage into adulthood, marriage, or both.

8.7 THE SYMBOLIC

Moreover, in Todorov's view symbolism and interpretation are inseparable (Todorov 1982a, p.19), so that any narrative X becomes symbolic of another narrative Y if we can establish a series of correspondences between the events of X and the events of Y. If the narrative Y belongs to the same textual category as X, then X is conventionally designated a "re-make" of Y and we are in the realm of intertextuality (such as Joyce's *Ulysses* in relation to Homer's *Odyssey*). However, if the narrative Y belongs to a different textual category (psychoanalytic, religious, scientific, or extra-textual rather than literary), then X is conventionally termed an allegory or a symbolic narrative.

For example, we could interpret *Jane Eyre* as a Freudian narrative of repressed desire (Jane flees Thornfield Hall because she desires Rochester; she sublimates her sexual desire by throwing herself into teaching while living with St John the Christian), a Jungian narrative of individuation (Jane's desire to express her inner self is symbolised by her visionary paintings; the desire of her psyche for liberation is symbolised by her staring out the window at the moon; she flees Thornfield to rediscover the mother earth within on the moors), or a Proppian narrative of the heroine who survives various tests to achieve marital status (Jane the orphan re-discovers her family; the non-human wife who threatens Jane's prospect of marriage is a villain who is vanquished in a fire; St John is a false hero who tries to lure Jane into marriage).

As correspondences can be established between all three of these narratives (Jungian, Freudian, Proppian), if a story is symbolic in one of these senses it must also be symbolic in the other two. A narrative can therefore be defined as symbolic if it contains a sequence of events that can be mapped onto Propp's functions in the folktale. However, while this notion of the symbolic applies to events, the symbolic is also used to describe the rhetorical device of antithesis, in which two terms are set in direct opposition to each other, such as *good* and *evil.* When a

number of antithetical pairs occur in close textual proximity, a correspondence is established between the positive terms of the pairs, and another between the negative terms. When one group of terms are set in direct opposition to another group, we have what Barthes calls the symbolic code (Barthes 1990, pp.26-28). In the Balzac tale, *Sarrasine*, for example, the opening description creates the set of oppositions *inside/outside, heat/cold, life/death, young woman/old man* (Barthes 1990, p.65).

Such correspondences are created by description, so that the symbolic code of antithesis is a symbolism of the scene, compared with the symbolism of events described above. However, for Levi-Strauss, antithesis is the guiding principle that creates structures, and in his analysis of Indian myth, this principle applies equally to events and scenes (Levi-Strauss 1986). According to Levi-Strauss, antithesis is a cognitive universal, and this device is used to show how the thinking of primitive peoples obeys a certain logic (Levi-Strauss 1972). In Leach's summary, Levi-Strauss shows that sets of relationships among humans may be represented in myth as relations between animals and plants, or relations between different categories of animal, food, sound and silence, smell and taste, or landscape (Leach 1970, p.66).

Correspondences on a universal scale are a major feature of what Tillyard (1972) describes as the "Elizabethan world picture". In comparison with what Levi-Strauss would call an unconscious process (creating structures by antithesis), the medieval view of the universe was a conscious enterprise, in which a "resolution to find correspondences everywhere was a large part of the great medieval striving after unity" (Tillyard 1972, p.91). In this world picture, the universe was ordered both vertically and horizontally: vertically, as a hierarchical chain of creation which "stretched from the foot of God's throne to the meanest of inanimate objects" (Tillyard 1972, p.33); horizontally, as a series of planes, "arranged one below another in order of dignity but connected by an immense net of correspondences" (Tillyard 1972, p.91).

Correspondences were held to exist between all the orders of creation, so that the sun among the planets, the king among men, the lion among the animals, the eagle among the birds, and the rose among the plants, could all be seen as equivalent because they occupy the same place in the categories to which they belong, at the top of the vertical order (Tillyard 1972, p.39). Each could therefore stand as a symbol for any of the others. Yet such correspondences were not without a political significance. In terms of the "body politic", in which the organisation of society is likened to the human organism, the peasant must know that his place was firmly entrenched at the bottom of the human anatomy, but, just as the feet were essential to support the rest of the body, the ploughman's labour was necessary to support the rest of society; if the feet refused to function, the body would no longer be mobile (Tillyard 1972, pp.104-106).

In creating this system of correspondences, the guiding principle appears to be the hierarchy, rather than antithesis: a vertical ordering of the universe enables the horizontal system of equivalences. However, the domination of the Christian church ensures that antithesis is a prominent feature in medieval literature, an antithesis that might take the form of *God/Satan, good/evil,* or *sin/virtue.* Chaucer's moral tales, for example, serve to illustrate one of the seven sins or one of the corresponding virtues, which the characters serve to personify. Medieval notions of character also reflect medieval notions of the human (Tillyard 1972, pp.73-87). According to medieval physics, the four humours of melancholy, phlegm, blood, and choler, which are created in the liver, are the "life-giving moisture of the body" (Tillyard 1972, p.77). An imbalance of the humours in our physical composition creates a particular temperament. Our higher faculties form another hierarchy, with the five senses at the bottom, the three components of common sense, fancy or imagination, and memory forming a middle layer, and reason (comprising the will and understanding) at the top (Tillyard 1972, pp.78-79).

A further aspect of the medieval world picture is the influence of the planets on human behaviour. In the Elizabethan

view, "the stars sway the mind to certain states by acting on our physical predispositions" (Tillyard 1972, p.64):

> "If a man is weak in will and naturally choleric, for instance, the stars may greatly influence him. Such a man may forget that reason should rule the passions and, prompted by stellar influence, may give way to them. In this he becomes near the beasts. . ."
> (Tillyard 1972, p.64)

Each planet exercised its own influence, which generally reflected the attributes of the deity after whom they were named. Venus and Mars, two planets that feature in Chaucer's *The Knight's Tale,* form an antithetical pair, in that Venus, as Aphrodite the goddess of love, provoked desire, while Mars, as Ares the god of war, provoked belligerence.

This medieval world picture can be traced in the plays of Shakespeare. In this case, Elizabethan notions of the human constitution, mental faculties and behaviour all serve to create characters of a more complex sort than Chaucer's. In addition one could argue that, for Shakespeare, antithesis was a structuring device and a source of drama. In *Measure for Measure,* for example, one such antithesis is *lust v abstinence,* an opposition that reflects the medieval heritage of the seven sins and the seven virtues. In *As You Like It, Antony and Cleopatra,* and *Romeo and Juliet,* one such antithesis is *peace v war,* and here one could argue that Venus and Mars are responsible for the dispositions of the main characters and the events that unfold.

The pairing of Venus with Mars serves to create drama out of the conflict between the two terms of associated pairs, such as *desire v belligerence, love v hate* or *peace v war.* This conflict may take the form of an internal conflict within characters, or an external conflict between two or more characters. In addition, the conflict between Venus and Mars may be reflected metonymically by spheres of influence, in which case one location is ruled by Venus, and a second by Mars. Figure 16 illustrates these various conflicts.

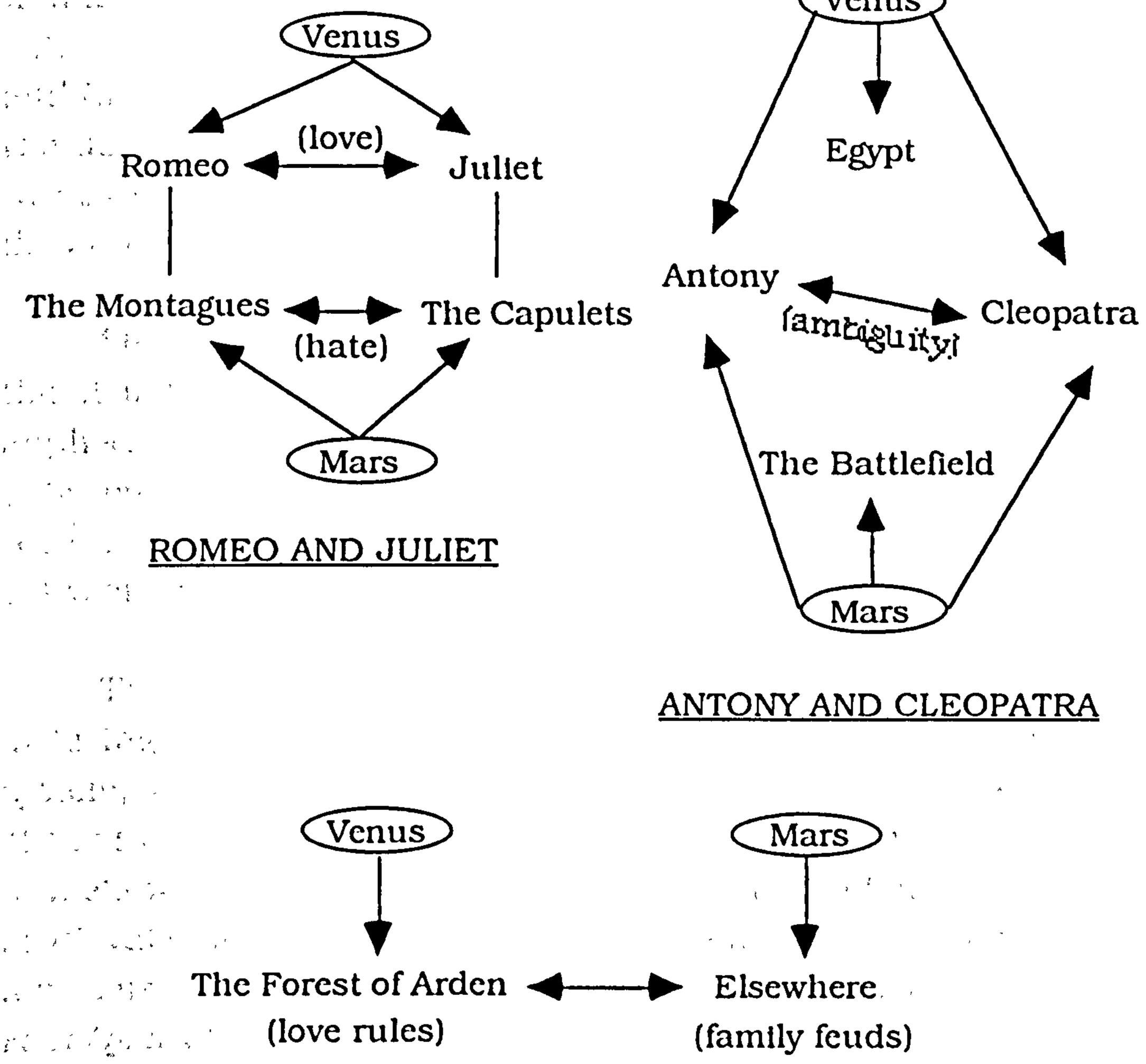


FIGURE 16: VENUS AND MARS IN SHAKESPEARE'S DRAMAS

In *As You Like It,* Venus rules the Forest of Arden, while Mars rules elsewhere. The forest is a magical place where the banished Orlando discovers romance, his belligerent brother discovers a harmonious disposition, the brothers are reconciled, and four weddings conclude the play. In *Romeo and Juliet,* Venus rules the dispositions of Romeo and Juliet, while Mars rules the families to which they belong. In *Antony and Cleopatra,* Venus rules in Egypt, while Mars rules the battlefield. However, Antony and Cleopatra are ruled by both planets: Antony is torn between the demands of military duty and the temptations of Cleopatra, while Cleopatra fluctuates between a soothing and an aggravating disposition, and between affection and animosity towards Antony.

Shakespeare's plays show that antithesis may function as the structuring device envisaged by Levi-Strauss, which can be applied to events and scenes. We therefore need to distinguish between a symbolism of antithesis, a poetic symbolism based on the symbol, and a narrative symbolism based on correspondences between events.

The medieval system of correspondences was a way of ordering the universe conceptually. In this two-dimensional system, a symbol is a name which is substituted for another name of the same horizontal value. This notion of the symbol as a kind of metaphor is what might be termed poetic symbolism, and the medieval system of associations has provided a lexicon of symbols for poets of the "symbolist" school (the lily and the rose in Eliot's *Four Quartets,* for example).

Any historical context for a lexicon of symbols is denied by Jungians, who argue for a universal lexicon of archetypal symbols. Frye's application of Jung to literary criticism can also be characterised by a resolution to find correspondences everywhere, in the search for some kind of organic unity (Frye 1990). Frye identifies four narrative categories which he calls "logically prior to the ordinary literary genres" (Frye 1990, p.162). These archetypal categories, which Frye calls *mythoi* or generic plots, are romance, tragedy, irony or satire, and comedy (Frye 1990, p.162).

In Frye's system of correspondences, comedy is associated with spring, romance with summer, tragedy with autumn, and satire with winter (Frye 1990, pp.131-239). Having observed that tragedy and comedy were once episodes of the same sequence, Frye then constructs a "total quest-myth" which spans the four seasons (Frye 1990, p.215). In constructing this myth, Frye identifies the theme of each *mythoi* as one of four elements in Greek tragedy, so that these elements also turn out to be archetypal:

> "The four *mythoi* that we are dealing with, comedy, romance, tragedy, and irony, may now be seen as four aspects of a central unifying myth. *Agon* or conflict is the basis or archetypal theme of romance. . . *Pathos* or catastrophe . . . is the archetypal theme of tragedy. . . *Sparagmos* . . . is the archetypal theme of irony and satire. . . *Anagnorisis* . . . is the archetypal theme of comedy."
> (Frye 1990, p.192)

In this construction of correspondences, all literatures and all narratives are connected by a schema of archetypes, onto which all stories can be mapped, and, presumably, from which they all derive. Yet Frye is less concerned with interpreting a symbolism of events than with establishing relations between categories, and associations between images, so that his global view of literature represents a similar construction to the medieval world picture.

While Jung argues for the archetypal symbol, some interpreters of neolithic culture have argued that the primitive human lived in a world of symbols (Dames 1976, pp.81-84). According to what Hawkes calls the romantic view of metaphor, as exemplified by Shelley, Herder, and Vico, myths reflect primitive man's metaphorical response to the world, and primitive language was a language of metaphor and symbol (Hawkes 1989, pp.38-39). Others have argued that human thought or language has evolved from the use of symbols to the use of signs. In Kristeva's view, for example, "the second half of the Middle Ages (thirteenth to fifteenth centuries) was a period of transition for European culture: thought based on the sign replaced that based on the symbol" (Kristeva 1980, p.38).

However, Todorov argues that attempts to describe the language of primitive peoples in terms of the symbol, and attempts to explain the evolution of the sign from the symbol, both show the presence of the symbol in our own thought and language (Todorov 1982b, pp.222-246). In the first case, the assumption is that our language is "made up solely of signs, in the restricted sense - thus of logic, thus of reason":

> "More precisely, as it is difficult to ignore the symbol altogether, we declare that we - normal adult males of the contemporary West - are exempt from the weaknesses linked to symbolic thought, and that the latter exists only among the *others* : animals, children, women, the insane, poets (those harmless lunatics), savages, our ancestors - who, in turn, know no form of thought but this."
> (Todorov 1982b, p.223)

Whereas some argue that our thinking knows only signs, while the other knows only symbols, Todorov argues that "our thinking uses the same mechanisms as that of "primitives" or of people who are "sick"" (Todorov 1982b, p.223). He then proceeds to identify "the mechanisms of symbolic thought in those who claim to have none" (Todorov 1982b, p.225), such as Levy-Bruhl and Piaget. One example of the supposedly primitive mechanisms in our own thinking is the confusion of temporal order with causality (Todorov 1982b, p.243). Here, Todorov recalls Barthes' definition of the law of narrative, according to which "the mainspring of narrative is precisely the confusion of consecution and consequence, what comes *after* being read in narrative as what is *caused by* " (Barthes 1979a, p.94). In that case then, we can say that narrative obeys the rules of a primitive logic.

In the second case (the evolution of sign from symbol), Todorov argues that "thinking that they are describing the origin of language and of the linguistic sign, or their childhood, people have in effect projected onto the past an implicit knowledge of the symbol as it exists in the present" (Todorov 1982b, p.227). Thus descriptions of "original language" can be re-interpreted to show, not that they are necessarily false, but that they have "mis-

identified their object": "in the belief that they were discovering *the other's* sign, they have often described *our own* symbol" (Todorov 1982b, pp.225-226).

The difference between linguistic sign and verbal symbol is that the sign entails a signifier and a signified, whereas the symbol involves an association, or a correspondence, between names or signifiers. As Todorov explains in his *Symbolism and Interpretation:*

> "...meaning is not simply an association like any other. Association implies the possibility of conceiving of each of the associated entities autonomously. Now the signifier exists only because it has a signified, and vice versa; they are not two freely existing entities that someone has decided to link together at a given moment."
> (Todorov 1982a, p.16)

Todorov also suggests that "the receiver *understands* discourses but *interprets* symbols" (Todorov 1982a, p.18). However, while the receiver might understand *signs,* a *discourse* involves participants and interpretation, as well as receivers and understanding. Moreover, one could argue that it is from a cultural distance that symbols need to be interpreted, and that the symbols in Shakespeare's dramas, for example, were readily understood by a contemporary audience. Just as the Eleusinian mysteries were so well known that much detail was not recorded, Tillyard points out that many assumptions in the Elizabethan world picture were such common knowledge that they are hardly mentioned in contemporary texts (Tillyard 1972, p.17). Furthermore, Todorov's own argument above shows that what we interpret as *symbols* may be understood as *signs* by others.

In his *Theories of the Symbol,* Todorov points out that the hermeneutic tradition recognised very early the difference between two orders of language, *logos* and *muthos,* "and, consequently, between two modes of reception, comprehension in the one case and interpretation in the other" (Todorov 1982b, p.30). In the case of the *muthos* however, it is not *symbols* which are interpreted, but *symbolism* : in particular, the symbolism of

events, in which one narrative or sequence of events is explained by referring to another.

As we have seen, it was the function of the *hermeneus* to interpret the *muthos* or plot of the ritual drama in the mysteries. Discussing the connection between myth and religious ritual, Harrison describes a myth, in this context, as a story with a magical purpose (Harrison 1963, pp.327-331). However, for the story or the ritual in which everyone participates or performs, there is no audience, and there is no symbolism. If symbolism is inseparable from interpretation, it is only when there is a separation between performers and spectators that a drama becomes symbolic and requires interpretation by the *hermeneus*. The role of the *hermeneus* was to explain the mystery or the symbolism of the unfolding events, rather than interpret symbols, so that symbolism and mysteries were intertwined. However, according to Barthes' (1990) classification of textual signifiers, the symbolic code is a code of antithesis, while the hermeneutic code is a code of enigmas or mysteries. In the next chapter, we look at the hermeneutic code in more detail, and investigate mysteries in the context of fiction writing.

8.8 CONCLUSION

In the last chapter, we identified some of the basic thinking processes in fiction writing as remembering, imagining, and focusing the imagination, each of which can be applied to events, scenes, and syntax. The notion that events require a separate process of linearisation was discounted for two reasons: firstly because some kind of ordering is inherent in remembering and imagining, and secondly because of the likely influence of story schemata - that is, the ordering of events in story memory.

In this chapter we looked at story memory and story schemata in more detail. We discussed psychological research into the accuracy of story recall, and identified two problems with this research. The first arises from the use of grammars to represent

the structure of stories, which leads to the question of how a story grammar is related to a story schema. The second is that people not only comprehend but also interpret the stories they read or hear. We found evidence for this observation, and argued that the function of a story schema is to guide interpretation rather than comprehension. However, instead of defining a story schema by a grammar, we argued for a definition of a story schema as a sequence of events to which we can attach a name.

We found evidence for the suggestion that "the kind of story schema developed from hearing stories from the oral tradition may be a cognitive universal" (Mandler 1982, p.210). In the course of this investigation, we discussed the representation of stories at different levels of abstraction, referring to Propp's *Morphology of the Folktale* and Aristotle's writings on the plot. We found sequential similarities between folktales from different cultures, and then looked for an explanation of why this should be the case. One explanation is that the similarities reflect a common experience in the human mind - this is the explanation given by Jung, Freud, and Levi-Strauss. A second explanation is that sequential similarities reflect a common experience in social development. We investigated this possibility and found sequential similarities between tribal initiation rites and folktales, but the evidence that folktales reflect a common tribal stage in social development was inconclusive. In the course of this investigation, we digressed into a discussion on the social origins of Greek tragedy, and its evolution from ancient festivals and mysteries. This discussion served to explain the origins of the term "plot" and its attachment to mystery. It also provided specific examples of how story schemata guide interpretation.

We argued that interpretation has a role in generating new stories. In fiction writing, interpretation fills a gap between remembering events (either from a writer's story memory or from her personal experience) and imagining the events of her fictional work. We showed how story schemata are used in this process. Looking at the results of research into story memory, we found evidence of the operations noted by Freud in his accounts of

the unconscious, and we argued that these operations also apply to the process of interpretation in the generation of new stories.

We concluded by discussing different notions of the symbolic, and we identified three different kinds of symbolism. The first is a narrative symbolism based on the creation of correspondences between events, the second is a poetic symbolism based on the use of verbal symbols, and the third is a structural symbolism based on antithesis.

This chapter has explained how story memory and story schemata can influence the process of imagining the events of a new story. In the course of this explanation, we have referred to mysteries in the context of ancient Greece. In the next chapter, we consider mysteries in the context of fictional texts, and identify further thinking processes in fiction writing.

CHAPTER NINE:

NAMING AND PROBLEM SOLVING

9.1 INTRODUCTION

In chapter six, we showed how linguistic approaches to modelling writing are dominated by Chomsky's transformational grammar and by a rationalistic view of language. As we saw in the last chapter, these views are also reflected in the use of story grammars to represent story schemata. In chapter seven we discussed Saussure's view of language, and we pursued this approach in discussing narration and description in fiction writing, and in giving an alternative definition of a story schema. In chapter seven, we identified the processes of remembering, imagining, and focusing the imagination. Each of these activities can be applied to events, scenes, and syntax. In the last chapter we showed how story schemata guide interpretation in the process of fiction writing.

To identify further thinking processes in fiction writing, we now return to the suggestion made at the end of chapter six. There we said that to develop a model of fiction writing that made use of Saussure's semiological view of language, we would need to look at alternative models of reading, as these are more developed than models of writing - models of reading that provide an alternative to Chomsky's rationalistic account of sentence comprehension (Figure 17).

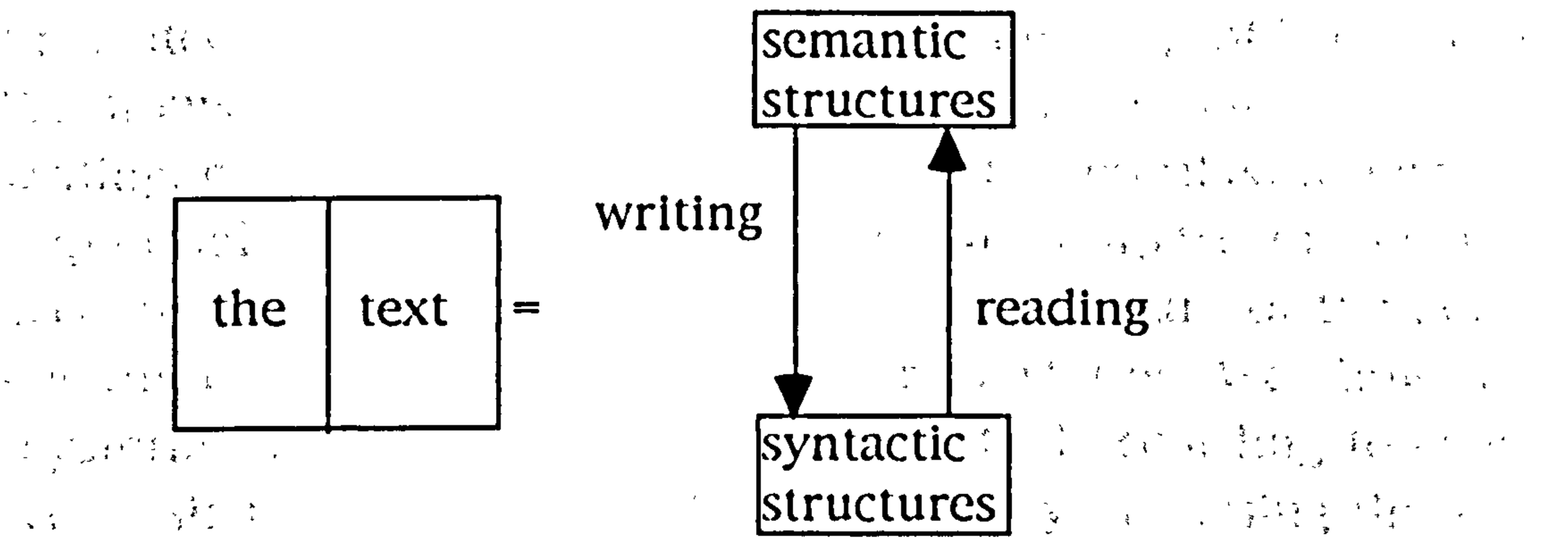


FIGURE 17: WRITERS, READERS AND TEXTS: THE TEXT AS STRUCTURE

In this chapter we pursue that suggestion in more detail. We begin by discussing different perspectives on the relationships between writers, readers, and texts. A shift of emphasis from product to process has occurred not only in composition studies in the USA but also in literary theory. Our discussion in this chapter concentrates on Barthes' (1990) account of the process of reading, in which he classifies textual signifiers. Our assumption here is that avenues of meaning for readers can also be avenues of meaning for writers.

Barthes describes reading as a process of hypothesis testing, in which naming is equivalent to problem solving. We explore the role of naming in reading and writing. Following Saussure, we argue that names are signifiers, rather than elements in an inventory of things. Assuming Saussure's notion of the linguistic sign, we identify the recall of signs as the thinking that occurs automatically whenever a writer is generating text. We argue that naming in writing is not the continuous process given by rationalistic accounts of language, but refers to the specific process of *imagining names* or *signifiers*. We conclude this section by adding signifiers to the objects of thought in fiction writing, and show how the processes we have already identified (remembering, imagining, and focusing the imagination) apply to this object.

Following this discussion of naming, we explore the role of problem solving in reading and writing. AI researchers have presented an account of story understanding as problem solving. We discuss their argument and show that, in the context of fiction writing, methods of problem solving can be described in terms of sequential and associative relations. We compare rationalistic accounts of problem solving with Barthes' account of the hermeneutic code - a code of enigmas or mysteries. We show how mysteries in fictional texts can be classified according to event, scene, signifier, and syntax. We conclude by discussing the ways in which fiction writing can be described as problem solving; these include the creation of enigmas for the reader.

9.2 READING AND WRITING, WRITERS AND READERS

The development of composition studies in the USA is marked by a shift from emphasising product to emphasising process (Flower & Hayes 1980a). Recent developments in literary theory are also marked by this change of emphasis, and one aspect of current literary theory is a concern for the reader and the process of reading (Culler 1983). Before discussing a model of reading, let's consider different perspectives on the relationships between writers, readers, and texts.

As a commodity, the text is no different from other commodities that are produced for exchange and circulation in the market-place (Figure 18). Writers produce texts that are sold to publishers, and texts are presented in publications that are aimed at specific markets (newspapers, romance magazines, academic journals). The publication is a commodity that is distributed to points of sale and bought by consumers. Writers maintain a relationship with readers only through their publishers and the publication, and the market requires the production of texts that are aimed at specific readers. The constraints on the writer are determined by the constraints on the reader and the demands of the market: some publications may be aimed at readers who have

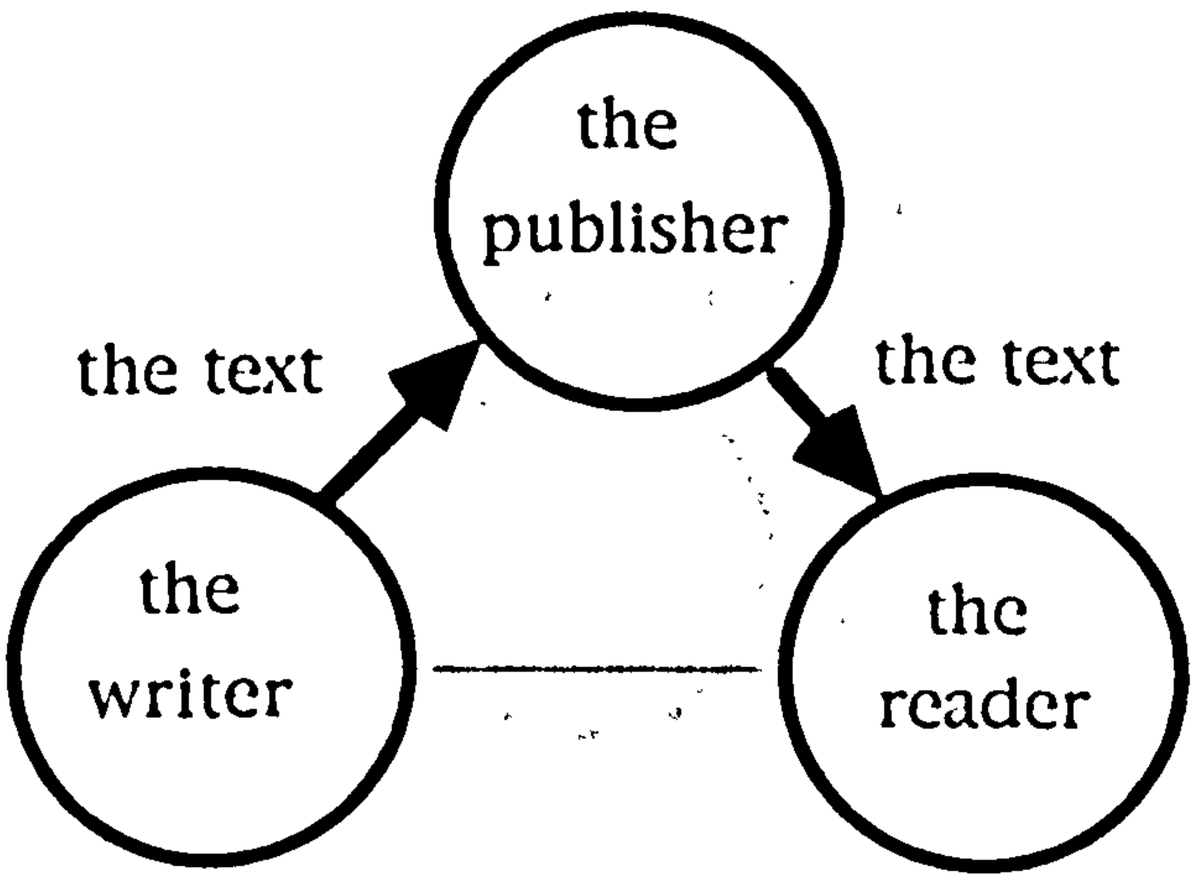


FIGURE 18: WRITERS, READERS, AND TEXTS: THE TEXT AS A COMMODITY

limited time for reading, so that texts must be short, entertaining, and so forth. The diverse types of publication in the market-place (magazines, journals, paperback books) each aim at a diversity of readers, whose interests are often explicitly defined by age, gender, income, employment or leisure activities (teenage schoolgirl, independent career woman, young housewife, mountain climber, train spotter, antique collector).

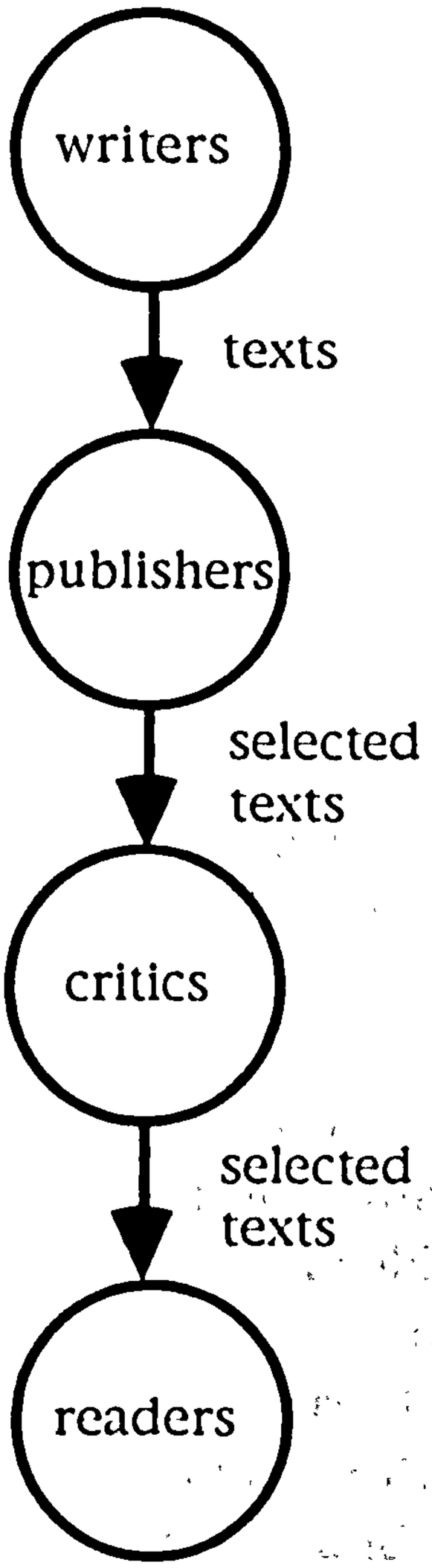


FIGURE 19: WRITER, READERS AND TEXTS: THE CRITIC AS A FILTER

Given this plurality of texts and readers, some have argued that there is a need for a specialised group of readers whose function is cultural evaluation, interpretation, and dissemination. This ethical perspective is exemplified by Liddell's view of literary criticism (Liddell 1965). In his view, the literary critic is a reader with a censorious function; his role is to mediate between authors and readers by passing judgement on literary works (Figure 19). Serious criticism must be applied to serious works, so that the critic must initially select the serious works that are worthy of his attention. This selection excludes some aspects of popular culture in their entirety, while certain categories of the novel, such as science fiction and pulp romance, are popular genres that are equally unworthy of serious attention. This leaves a nebulous category of serious novels, which the serious critic must read in order to evaluate the quality of the author's mind (Liddell 1965, p.22). Great minds, great works, and good works (the minor classics) are worthy of the attentions of posterity, while novels that are beneath serious criticism are designated "middlebrow" or "lowbrow" (Liddell 1965, p.20). In this way, the critic gives moral instruction to the general mass of readers regarding what to read and where to find the humanistic values that are essential to the survival of civilisation.

From this perspective, any attempt to deal with the profusion of texts and signs that proliferate in bookshops or on television is regarded with suspicion or hostility. Hough, for example, regards Barthes' application of semiology as "trivial" (Hough 1969, p.109). Cultural studies, semiology, and text linguistics are different ways of approaching a plurality of texts. However, we have already noted the problems of establishing a taxonomy of text types in chapter six. A further problem lies in the hybrid approach to texts endorsed by Beaugrande and Dressler's text linguistics (Beaugrande & Dressler 1981). In their application of communications theory and information theory to textual analysis, all texts are regarded as information. Information is encoded by senders and decoded by receivers. Decoding is a reverse process to encoding, so that the message encoded by the sender can be understood by the receiver (Beaugrande & Dressler

1981, pp.42-43). The process of writing, therefore, is like sending a fax or electronic mail, while the writer represents some kind of human modem. However, writing that involves the translation of syntax into a binary sequence of ones and zeroes is usually the occupation of computer programmers who write in machine code.

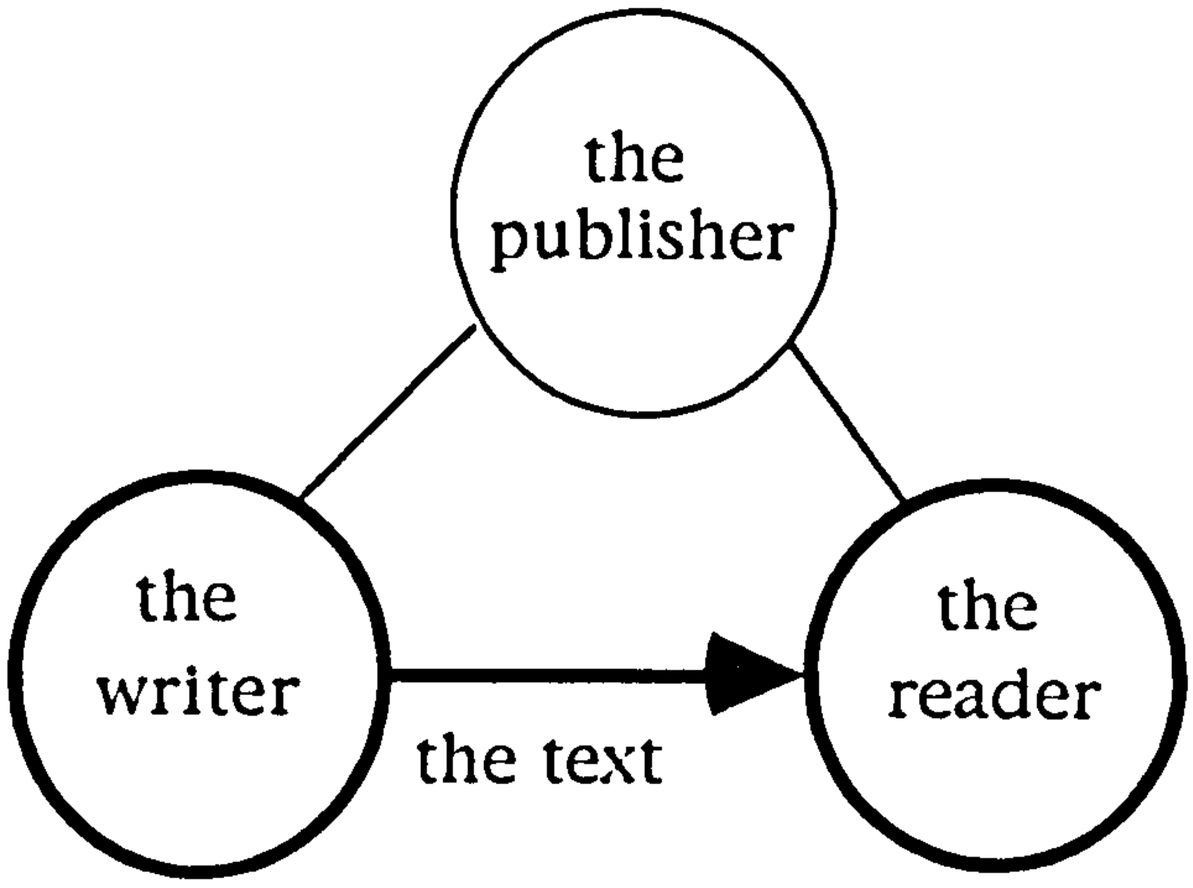


FIGURE 20: WRITERS, READERS AND TEXTS: THE TEXT AS SPEECH

Apart from the metaphor of writing as electronic communication, there is a further analogy in Beaugrande and Dressler's text linguistics. Just as writing is like sending an electronic message to a human modem, writing is also like speech, another type of communication that involves sending and receiving. We have noted the use of this metaphor in chapter five, where we discussed Flower and Hayes' model of planning (Flower & Hayes 1980a). In their functional approach to texts, Beaugrande and Dressler assume a two-way communication circuit of senders and receivers, in which writing is like a speech act (Figure 20). Thus, the textual functions of narration, description, and argumentation are transmitted by the writer and received by the reader in a similar fashion to Saussure's description of the speech circuit (Saussure 1983, p.11).

As Beaugrande and Dressler indicate, discourse analysis is a term that was initially used to describe the study of conversation (Beaugrande & Dressler 1981, p.19). One problem with the notion

that writing can be studied as a type of speech is the distortion of the relationships between writer, reader, and text. If we compare Figure 20 with Figure 18, the text as a commodity has been replaced with the text as a direct link between writer and reader. Yet readers do not interact with writers but with texts (Figure 21), and the problem with Beaugrande and Dressler's metaphors for the process of reading is that they do not throw any light on this process.

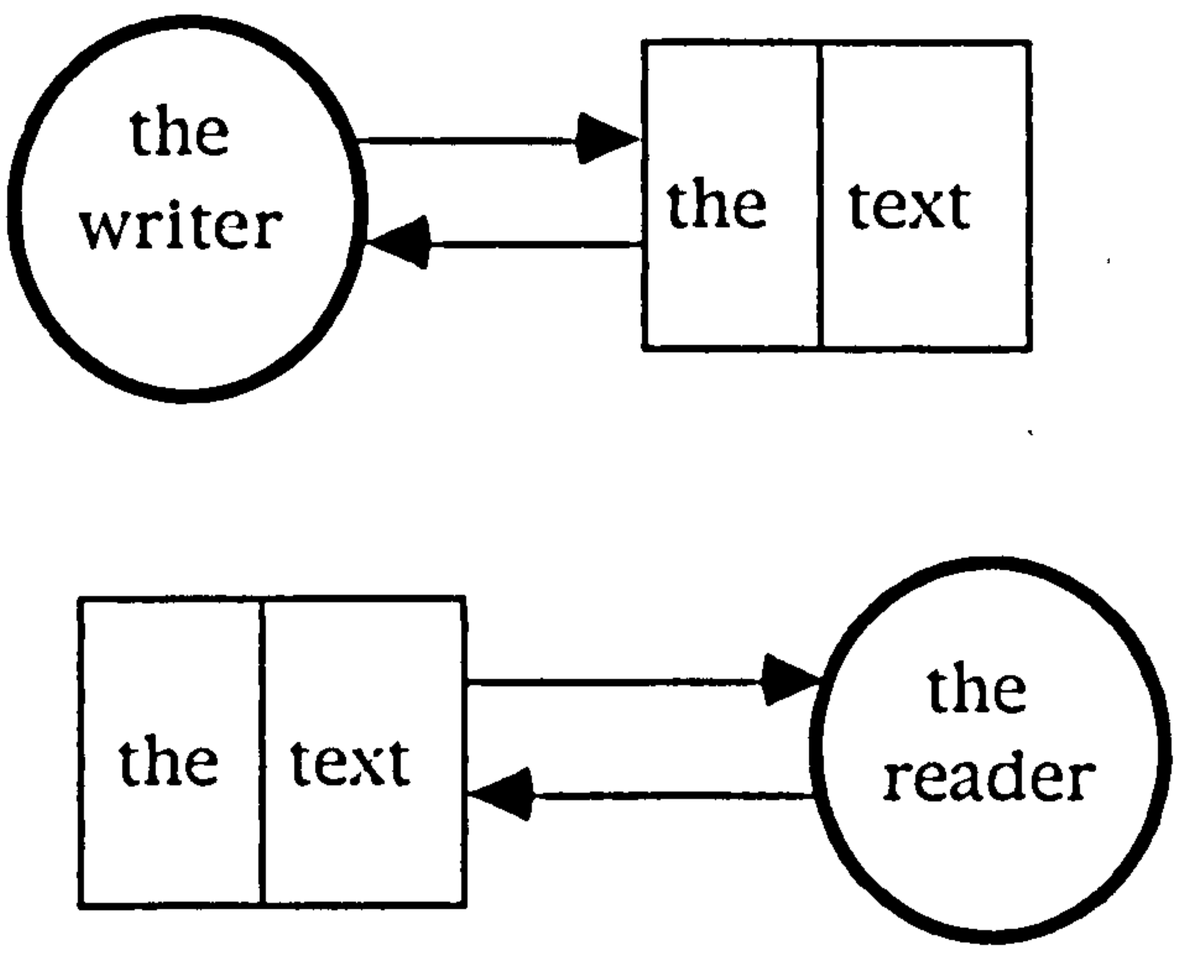


FIGURE 21: WRITERS, READERS, AND TEXTS: READING AND WRITING AS TEXTUAL INTERACTION

Discussing research into the writing behaviour of academics in chapter three, we asked the question whether there were any similarities between academic writing and fiction. From the functional point of view, we have seen that narration, description and argumentation occur not only in fictional texts, but also in other text types. Academic writing is mainly argumentation, but narration and description also have a role in argumentation, as Cooper and Matsuhashi indicate (Cooper & Matsuhashi 1983). However, from the point of view of reading, these textual functions are placed in some kind of context, such as those represented by Figures 18 or 19.

The context of reading is another aspect of the inter-textuality that was mentioned in chapter seven, another factor that influences the creation of meaning in reading. In Figure 19, reading may be influenced by instructions on how to read certain texts. In Figure 18, reading is influenced by the packaging of a commodity, which might also include instructions on how to read. For example, this is William Williams introducing *A Book of English Essays:*

> "The English Essay has a multitude of forms and manners, and scarcely any rules and regulations. A minimum definition would be to say that the Essay is a piece of prose, usually on the short side, which is not devoted to narrative. The essayist may use anecdotes to make his point; he may even take a leaf out of the novelist's book and create characters to illustrate his own opinions. But his chief interest is not that of the story-teller."
> (Williams 1980, p.11)

However, while "the essayist's usual role is that of the social philosopher, the critic, or the annotator" (Williams 1980, p.11), some of the essays in this collection, such as those of Oliver Goldsmith or Charles Lamb's *In Praise of Chimney-sweepers,* are largely devoted to narrative. On the other hand, the Penguin edition of the *Complete Tales and Poems of Edgar Allan Poe* contains some tales that are largely devoted to argumentation and were first published as essays.

In these examples, textual functions are contextualised by the presentation of a commodity: a book of essays, or a complete Poe. Here, it is the publication or the commodity that defines the text type, and determines whether a text be read as an essay or a tale. Culler describes genre as an aspect of intertextuality, one way "in which a text may be brought into contact with and defined in relation to another text which helps to make it intelligible" (Culler 1975, p.140). However, the above examples show that genre, or intertextuality, is not merely a property of the text. Discussing genre in the cinema, Steve Neale writes:

> "The cinema is not simply an industry or a set of individual texts. Above all, it is a social institution... Not only a set of economic practices or meaningful products, cinema is also a constantly fluctuating series of signifying processes, a 'machine' for the production of meanings and positions, or rather positionings for meaning; a machine for the regulation of the orders of subjectivity. Genres are components in this 'machine'. As systematised forms of the articulation of meaning and position, they are a fundamental part of the cinema's 'mental machinery'. Approached in this way, genres are not to be seen as forms of textual codifications, but as systems of orientations, expectations and conventions that circulate between industry, text and subject."
> (Neale 1980, p.19)

The world of the publication, like the cinema, is a social one, and in both cases, genre and intertextuality are aspects of the production of commodities. One purpose of genre is to introduce some kind of homogeneity in diversity, to establish a relationship of familiarity between the consumer and the product. In the context of unknown commodities, genre serves the purpose of naming, an activity which is also essential in reading and writing.

9.3 READING, WRITING, AND NAMING

Naming, the "process of nomination", is, according to Barthes in *S/Z*, "the essence of the reader's activity" (Barthes 1990, p.92):

> "... to read is to struggle to name, to subject the sentences of the text to a semantic transformation."
> (Barthes 1990, p.92)

Yet, while the reader appears to be poised on the edge of another logical transformation in the manner of Chomsky, this struggle to name is not as successful:

> "This transformation is erratic; it consists in hesitating among several names..."
> (Barthes 1990, p.92)

In this account of reading, the struggle to find a name is an activity that Barthes applies to events - the terms of the proairetic code:

> "Actions (terms of the proairetic code) can fall into various sequences which should be indicated merely by listing them, since the proairetic sequence is never more than the result of an artifice of reading: whoever reads the text amasses certain data under some generic titles for actions (*stroll, murder, rendezvous*), and this title embodies the sequence; the sequence exists when and because it can be given a name, it unfolds as this process of naming takes place, as a title is sought or confirmed; its basis is therefore more empirical than rational, and it is useless to attempt to force it into a statutory order; its only logic is that of the 'already-done' or the 'already-read'..."
> (Barthes 1990, p.19)

In a similar fashion to Genette's treatment of narrative as the expansion of a verb, Barthes refers to the code of events as the unfolding or expansion of a name, here a verb or a noun. Folding, on the other hand, is the contraction of a series of events, the classification of a sequence according to a name:

> "What is a series of actions? the unfolding of a name...Inversely, to establish the sequence is to find the name: the sequence is the currency, the *exchange value* of the name."
> (Barthes 1990, p.82)

Barthes describes the essence of the reader's activity, the struggle to find a name, as a cycle of folding and unfolding. The search for a name, "the possibility of a metaname" (Barthes 1990, p.82), is a search that dominates Barthes' account of the proairetic code:

> "... to read... is to proceed from name to name, from fold to fold; it is to fold the text according to one name and then to unfold it along the new folds of this name. This is proairetism: an artifice (or art) of reading that seeks out names, that tends toward them: an act of lexical transcendence, a labor of classification carried out on the basis of the classification of language - a *maya* activity, as the Buddhists would say, on account of appearances, but as discontinuous forms, as names."
> (Barthes 1990, p.83)

In Barthes' activity of folding the text according to a name, reading is a process that involves summarising or contracting a sequence of events into a smaller unit; in this context, naming is comprehending. In the subsequent activity of unfolding the text, reading is also a process of interpreting the text in the light of this name. Culler explains this process of folding and unfolding by describing a response to the opening sequence of Joyce's short story *Eveline:*

> "Is she 'waiting' for something in particular? Is she 'refusing' to do something? Is she 'thinking' or 'making a decision'?"
> (Culler 1975, p.221)

Barthes' essence of reading, his cycle of folding and unfolding, is this hesitation among names *(thinking, waiting, refusing)*. In this account of reading, a name is a hypothesis which is established by classifying a sequence of events, and tested by interpreting subsequent events according to this classification.

This notion of reading as hypothesis testing is similar to the notion of reading as problem solving that we discuss below. Culler also describes reading as a process of hypothesis testing (Culler 1975, p.92), and in *S/Z*, Barthes describes the essence of reading as a problem solving activity: the reader's problem is to find a name; in this context, naming is equivalent to problem solving. According to representational theories of problem solving (Gick & Holyoak 1980), "stories or problems can be represented at many different levels of abstraction" (Kahney 1986, p.78). In Kintsch and van Dijk's representational model of text production and comprehension (Kintsch & van Dijk 1978), storing events in long-term memory is a process of "abstracting out the essential content, or 'gist' of a situation" (Kahney 1986, p.78). In Kahney's summary:

> "Kintsch and van Dijk have proposed a number of processes for constructing abstract representations of the events we hear or read about, including deletion, generalization and construction."
> (Kahney 1986, p.78)

In this representational theory of text comprehension (Kintsch & van Dijk 1978), generalization is a process that generates schemata in long-term memory, while construction is a process of abstraction through classification, the process that Barthes describes as folding the text, or naming.

However, while naming is a feature of representational models of comprehension and Barthes' account of reading, in the latter, reading is also a process of hypothesis testing, of testing the name by the subsequent interpretation of the text. In Barthes' model, reading is a process of textual interaction, an activity that involves a bottom-up process of naming or folding, and a top-down process of unfolding or interpreting according to the assumed name. Barthes' model therefore takes us back to the interactive models of human information processing that we discussed in chapter six, while Culler concludes his *Structuralist Poetics* by trying to decide whether reading is a top-down or a bottom-up process (Culler 1975, p.235).

But in Barthes' model of textual interaction, does the struggle to name ever succeed? Towards the end of *S/Z*, Barthes writes:

> "Soon all the proairetic sequences will be closed. The narrative will die. What do we know about them? That they are born of a certain power of the reading, which tries to give a sufficiently transcendent name to a series of actions, themselves deriving from a patrimonial hoard of human experiences; that the typology of these proaireticisms seems uncertain or that at least they can be assigned no logic other than that of the probable, of empirics, of the 'already-done' or 'already-written', for the number and the order of their terms vary, some deriving from a practical reservoir of trivial everyday acts (*to knock at a door, to arrange a rendezvous*) and others from a written corpus of novelistic models (*the Abduction, the Declaration of Love, the Murder*); ... ; that by their typically sequential nature, simultaneously syntagmatic and organized, they can form the favored raw material for a certain structural analysis of narrative."
> (Barthes 1990, pp. 203-204)

On the one hand, Barthes refers to a sequence of events as the unfolding of a name. On the other hand, the folding and unfolding of the text refers to the reader's activity of naming a sequence of events and interpreting the text in accordance with the assumed name. The contraction of events is a metonymic operation that the reader applies to the proairetic code. However, the reciprocal operation of expanding a name is a metonymic operation that has more relevance to writing than to the reader's interpretative activity of hypothesis testing. If a sequence of events is the expansion of a name, then Barthes' notion of the transcendent name, sought but not found by the reader, suggests that were such a name to have an existence, it is to be found in the mind of the author. The transcendent name is then the name out of which an entire narrative unfolds; this name remains a secret name that the text does not disclose, a secret that provides an insoluble riddle for the reader.

Barthes' hesitation among names leads to his describing reading as a "metonymic skid" which is "the very movement of meaning" (Barthes 1990, p.92):

> "... the meaning skids, recovers itself, and advances simultaneously; far from analyzing it, we should rather describe it through its expansions, lexical transcendence, the generic word it continually attempts to join: the object of semantics should be the synthesis of meanings, not the analysis of words. In a way, this semantics of expansions already exists: it is called Thematics."
> (Barthes 1990, pp.92-93)

Now, according to one guide on how to write novels, "Theme is often confused with Plot" (Doubtfire 1982, p.1). While the plot is "the action of the story" (Doubtfire 1982, p.1) or Barthes' proairetic code, "the theme is the *subject* of the novel (eg. loneliness, revenge, betrayal, self-discovery) and can usually be expressed in one word, or at least in one sentence" (Doubtfire 1982, p.1). This last qualification is not uncontroversial, as the sentence is more frequently used as a metaphor for the plot rather than the theme. According to Culler, for example, Greimas uses the structure of the sentence as a model for the plot in his *Semantique Structurale* (Culler 1975, p.82), while in Barthes' view, "the hermeneutic narrative is constructed according to our image of the sentence" (Barthes 1990, p.76). However, if the plot can be represented as a sentence, the theme is the subject of the sentence - the theme is its name.

Thematics, the discussion of themes, is therefore a quest for the name behind the story, the name out of which the narrative unfolds, the answer to the question: what is the story *about*? From the writer's point of view, one way to approach fiction writing is to decide on a name and then to expand it, as the above example shows. On the one hand, this may not be such an easy task, as Doubtfire points out:

> "Sometimes it is difficult to formulate a theme at the outset, but so long as you have a rough idea of the story you want to tell, and feel deeply about it, the theme will clarify as the

> book evolves... The theme may not be uppermost in your mind when you first begin to conceive the idea for your story but I think you should cherish and nurture it as the book progresses... You must tell an absorbing tale but you should also preserve your theme, however well concealed." (Doubtfire 1982, p.3)

On the other hand, medieval fictions provide examples of narratives which are the expansions of names. In addition, the names in these examples are not names that the author wants to conceal. Chaucer's *Canterbury Tales* include several moral tales that illustrate one of the seven deadly sins or one of the corresponding virtues. In these examples, the entire narrative (narration and description, events and scenes) is the expansion, unfolding, or illustration of a name. For example, *Pride* is expanded in the *Nun's Priest's Tale, Greed* in the *Friar's Tale, Gluttony* in the *Pardoner's Tale,* and *Lechery* in the *Physician's Tale.* In the *Second Nun's Tale,* a sermon on *Sloth* is followed by an expansion of the corresponding virtue *Fortitude.* More virtues are unfolded in the *Clerk's Tale (Patience)* , the *Tale of Melibeus (Prudence)* , the *Franklin's Tale (Constance* or *Patience)* , and the *Man of Law's Tale (Constance* or *Fortitude).* In the *Tale of Melibeus, Prudence* is also personified in Dame Prudence, and in the *Man of Law's Tale, Constance* is also personified in the leading character Constance.

With this last example, we are now on the verge of what Barthes calls Thematics. In the *Man of Law's Tale,* Constance is a personification of constancy in the Christian faith and an example of *Fortitude.* In the *Franklin's Tale* however, Dorigen personifies constancy in marriage and exemplifies *Chastity* in the face of *Lechery* - or is it *Patience* and *Forbearance* in marriage, or perhaps *Fortitude* in the face of *Sloth?* Even with a limited number of sins and virtues, the possibilities for thematic discussions are endless.

Moreover, just as the struggle to name is a continuous feature of reading according to Barthes, a grammatical approach to language suggests that naming is also a continuous feature of

writing. According to traditional accounts of syntax and sentence topics (Phythian 1980, Witte & Cherry 1986), a writer initially names the sentence by choosing the grammatical subject, a process that is repeated for each sentence. Here we have a microcosmic reflection of the macrocosmic operation of choosing the theme or the global name. In addition, the function of narration is to "name events", as Cooper and Matsuhashi point out (Cooper & Matsuhashi 1983, p.17). In traditional grammar, it is the active verb that names events, so that a writer is also naming every time he chooses a verb.

However, it is only in traditional grammar that writing involves choosing an event, followed by a name for the event. In that case, language is the nomenclature that is criticised by Saussure - a list of names corresponding to things in the external world. In Saussure's view of the linguistic sign, ideas are inseparable from words, and a sign is a link between a sound pattern (the signifier) and a concept (the signified). In this case, names are signifiers, rather than elements in an inventory of things.

In fiction writing, remembering events and scenes is not dependent on language; in this context, remembering can be visualising, as Beaugrande and Dressler point out:

> "The results of ideation and development need not yet be committed to particular natural language expressions. They might, for instance, be composed of mental imagery for scenes or event sequences."
> (Beaugrande & Dressler 1981, p.40)

However, by itself, visualising does not generate writing. In order to write, a writer must also remember linguistic signs. In a similar fashion to traditional grammar, Chomsky's dualism suggests that writing is a process of thinking about things in the external world followed by the remembering of names. Here, we are suggesting that although remembering can be visualising in the context of events and scenes, writing also requires the remembering of linguistic signs, rather than names or signifiers.

In the basic model of writing represented by Figure 5, the remembering of signs is therefore the thinking that cannot be dissociated from writing, the thinking that occurs automatically whenever a writer is generating text. However, there are occasions in writing when the signifier becomes detached from the signified. A process of remembering names or signifiers suggests that the signified exists in thought but the signifier has been forgotten; this provides the sensation of having the word on the tip of one's tongue. The signifier also becomes detached from the signified in the process of reflecting on the sign; that is, when the signifier or the signified become objects of scrutiny. This provides the sensation of doubting whether one has chosen the right word.

However, this meta-linguistic activity of reflecting on the sign is not restricted to the occasions when a writer uses a dictionary to verify meaning or a thesaurus to find alternative signifiers; reflecting on the name or the signifier is a necessary process in argumentative writing. Fielding's *Joseph Andrews* and *Tom Jones* provide examples of argumentative writing in fictional texts. In the opening chapters of each volume, the omniscient narrator digresses from narration or description into argumentation, and these chapters often consist of reflections on names or signifiers. Book One and Book Three of *Joseph Andrews* both begin with a discussion of biography: "Of writing Lives in general" and "Matter prefatory in Praise of Biography". In *Tom Jones,* reflections on signifiers take up the opening chapters of Books Four to Eighteen. These signifiers include histories, the serious, the comic, the marvellous, critics, authors, plagiarism, virtue, and prologues. In the opening chapters of Books Ten and Eighteen, the signifier is the reader.

If we assume Saussure's notion of the linguistic sign, naming in writing is not a continuous process but refers to the specific process of imagining names or signifiers. Argumentative writing sometimes results in a conclusion that produces a textual sign; a textual sign is invented by defining a signified and then attaching a signifier to this definition. One purpose of inventing a sign is to

enable a writer to make subsequent references to a signified without describing it. In this case, a writer's thinking includes imagining a name, a search for a signifier that can be attached to a signified. Here, the process of writing involves a process of abstraction through naming that is similar to Barthes' notion of "folding the text" in reading. However, the invention of signs is not restricted to argumentative writing. This is an extract from the first chapter of *Wolf Solent*, a novel by John Cowper Powys:

> "The first thing he did was to attempt to analyse a mental device he was in the habit of resorting to - a device that supplied him with the secret substratum of his whole life. This was a certain trick he had of doing what he called 'sinking into his soul'. This trick had been a furtive custom with him from very early days. In his childhood his mother had often rallied him about it in her light-hearted way, and had applied to these trances, or these fits of absent-mindedness, an amusing but rather indecent nursery name. His father, on the other hand, had encouraged him in these moods, taking them very gravely, and treating him, when under their spell, as if he were a sort of infant magician.
>
> It was, however, when staying in his grandmother's house at Weymouth that the word had come to him which he now always used in his own mind to describe these obsessions. It was the word 'mythology'; and he used it entirely in a private sense of his own. He could remember very well where he first came upon the word..."
> (Powys 1964, p.19)

Here we have the description of a signified, the attachment of a signifier ("mythology"), and the invention of a sign ("Wolf's mythology") that recurs throughout the novel.

However, it is partly a question of interpretation whether Powys is inventing signs or merely imagining signifiers. In a biography of Powys, Jeremy Hooker claims that "it is a strength of the book that Wolf's 'mythology' can only be apprehended imaginatively, through metaphors, and not described reductively in 'scientific' psychological terms" (Hooker 1973, p.35). Discussing Lawrence's *The Rainbow*, Anne Fernihough refers to Derrida's argument that "it is in the nature of apocalyptic writing that it promises revelation, a sight of the signified, but leaves us instead

with the shape of the signifier" (Fernihough 1995, p.xxxi). On the one hand therefore, the question appears to be whether the signified is sufficiently defined in the case of *Wolf Solent* to justify the reference to "Wolf's mythology" as a sign, while Lawrence's "rainbow" remains an empty signifier.

On the other hand, a functional analysis that compares "Wolf's mythology" with Lawrence's "rainbow" shows that we are dealing here with a difference between sign and symbol, in which the latter refers back "to one (or several) unrepresentable and unknowable universal transcendence(s)" (Kristeva 1980, p.38). In *Wolf Solent,* "Wolf's mythology" first occurs in the first chapter. Here, the signified is described before the signifier is attached to it. Subsequently, "Wolf's mythology" occurs frequently throughout the novel, and is used as though it were a sign; that is, as though the signified had been sufficiently described. Lawrence's "rainbow" occurs five times: once as the title of the novel, twice when the narration is focused on Anna, and twice when focused on Ursula. Anna is likened to Moses on Pisgah mountain and sees a "faint, gleaming horizon, a long way off, and a rainbow like an archway, a shadow-door with faintly coloured coping above it" (Lawrence 1995, p.181). Later on the same page: "Dawn and sunset were the feet of the rainbow that spanned the day, and she saw the hope, the promise". Ursula listens to a sermon on Genesis, and hears: "I do set my bow in the cloud, and it shall be a token of a covenant between me and the earth" (Lawrence 1995, p.302). Finally, the novel closes with a scene in which Ursula, "as she sat at her window", sees "the stiffened bodies of the colliers" and "a dry, brittle, terrible corruption spreading over the face of the land" (Lawrence 1995, p.458):

> "And then, in the blowing clouds, she saw a band of faint iridescence colouring in faint colours a portion of the hill. And forgetting, startled, she looked for the hovering colour and saw a rainbow forming itself."
> (Lawrence 1995, p.458)

A "vast rainbow" forms and Ursula's vision closes the novel:

> "And the rainbow stood on the earth... She saw in the rainbow the earth's new architecture, the old, brittle corruption of houses and factories swept away, the world built up in the living fabric of Truth, fitting to the over-arching heaven".
> (Lawrence 1995, p.459)

In *Wolf Solent,* "Wolf's mythology" has a similar function to the sign in argumentation; the signified appears before the signifier, and "Wolf's mythology" is used iteratively. In *The Rainbow,* the signifier appears and reappears on five occasions before the signified, whose appearance is deferred until the apocalyptic conclusion, where it is equated with a "Truth" that is contrasted with the "Falsity" of industrial civilisation. While "Wolf's mythology" is described in the text of the novel, Lawrence's "rainbow" not only has Biblical connotations but, given that Lawrence's thinking was influenced by Nietzsche, points to Nietzsche's Zarathustra, who prophesises: "I will show them the rainbow and the stairway to the superman" (Nietzsche 1969, p.52). Lawrence's interest in symbolism is manifest in his critical writings (Lawrence 1962); however, it is the Jungian notion of the symbol, and the Jungian notion of "individuation", that seem to be the dominant influence on Lawrence's notion of symbolism.

So, thinking processes in fiction writing include imagining names or signifiers. In this context, names include the titles of short stories, novels, and chapters, and the names of places and characters. Imagining names also includes the invention of signs for argumentative purposes. Both "Wolf's mythology" and Lawrence's "rainbow" are the result of imagining names, but the first occurs in the text and functions as a sign, while the second is also the title of the novel and functions as a symbol. In the latter case, the process of imagining appears to be influenced by intertextuality and by Lawrence's notion of the symbolic.

According to Barthes, it is the proper name that provides a focal point for what he calls "semes" or "connotative signifiers" (Barthes 1990, p.17). Semes are signifiers of person, place, or object. For example, *Sarrasine* is the title of a short story by

Balzac; at the initial stage of Barthes' reading, the title is a mystery - who or what is *Sarrasine?* But "the word *Sarrasine* has an additional connotation, that of femininity, which will be obvious to any French-speaking person, since that language automatically takes the final "e" as a specifically feminine linguistic property" (Barthes 1990, p.17). "Sarrasine" is therefore a seme or a connotative signifier of femininity; according to Barthes, "the proper name acts as a magnetic field for the semes" (Barthes 1990, p.67):

> "The proper name allows the person to exist outside the semes, whose sum nonetheless constitutes it entirely. As soon as a Name exists (even a pronoun) to flow toward and fasten onto, the semes become predicates, inductors of truth, and the Name becomes a Subject: we can say that what is proper to narrative is not action but the character as Proper Name..."
> (Barthes 1990, p.191)

From Barthes' perspective on reading, "Sarrasine" is a signifier of femininity because of its lexical properties; this is an example of Saussure's associative relations in the process of reading. However, "Sarrasine" is also the title of Balzac's story, and, as the story later reveals, the name of a leading character. From a writing perspective, "Sarrasine" is once again the result of imagining a signifier. In this case, the signifier is both the name of a character, and the title of the story, but we cannot make the inference that the connotative associations of Barthes' reading are the same associations that informed the process of imagining.

In Barthes' account of reading, naming is not restricted to naming a sequence of events, the terms of the proairetic code. The proairetic code is one of five codes or categories according to which Barthes classifies "textual signifiers" (Barthes 1990, p.19); codes are therefore meta-names, or names of signifiers. Semes form the terms of the semic code. The other three codes are the symbolic, the hermeneutic, and the cultural. As we discussed in the last chapter, the symbolic code is a code of antithesis, and in Barthes' account is created by description; the hermeneutic code is

a code of enigmas or mysteries, and this is discussed below. On the cultural code, Barthes comments:

> "... the cultural codes are references to a science or a body of knowledge; in drawing attention to them, we merely indicate the type of knowledge (physical, physiological, medical, psychological, literary, historical, etc.) referred to, without going so far as to construct (or reconstruct) the culture they express."
> (Barthes 1990, p.20)

Barthes introduces more codes in his analysis of Poe's tale, *The Facts in the Case of M. Valdemar* (Barthes 1981). These are codes of communication, chronology, and narrative or rhetoric. On the one hand, the new codes that Barthes discovers by this textual analysis are absorbed by Genette's notion of narrative discourse (Genette 1980). On the other hand, Barthes describes these codes as "sub-codes of the general cultural code" (Barthes 1981, p.155):

> "Although all the codes are in fact cultural, there is yet one, among those we have met with, which we shall privilege by calling it the cultural code: it is the code of knowledge, or rather of human knowledges, of public opinions, of culture as it is transmitted by the book, by education, and in a more general and diffuse form, by the whole of sociality."
> (Barthes 1981, p.155)

In a model of fiction writing, these cultural codes, or codes of knowledge, are aspects of a writer's semantic memory (Cohen et al 1986), aspects of the knowledge that informs a writer's thinking processes. However, while Barthes points out that all codes are cultural, his explanation of character in terms of semes reduces the notion of character to a purely linguistic phenomenon. In his account of reading, "when identical semes traverse the same proper name several times and appear to settle on it, a character is created" (Barthes 1990, p.67). A character is therefore "a product of combinations" which are held together by the proper name (Barthes 1990, p.67). Barthes' notion of semes might explain how characters are created in the process of reading, but, as the above example shows, a semic explanation relies on an analysis of lexical properties and the associative relations that are made by

the reader. In writing, lexical properties might influence the imagining of names and a writer's preference for particular words. However, a semic account of character is inadequate to explain how characters are created in the process of writing.

Notions of character are also shaped by cultural traditions, and are also inseparable from notions of the human. According to the medieval cosmogony of earth, air, fire and water, humans are compounded of four humours that correspond with the elements: melancholy, blood, choler and phlegm (Tillyard 1972, p.76). An imbalance leads to the temperaments of melancholia, sanguinity, and so forth; thus "the intertwining of the humours was the cause of character" (Tillyard 1972, p.77). In Forster's discussion of character, a "flat" character is an unchanging type with one distinctive trait, a notion that reflects the medieval notion of humours, while "round" characters undergo a change as a result of their experiences (Forster 1962). According to Genette, the classical attributes of character, such as the proper name, physical appearance, and moral "nature", have all disappeared from the contemporary novel, to be replaced by a more complex notion of "personality" (Genette 1980, p.246). According to Dseagu, African novelists tend to have a notion of character which reflects ideals of communalism and group solidarity, rather than individuality (Dseagu 1992, p. 596). In Watt's view of the English novel, the notion of character is inseparable from notions of individuality and growth or change in the individual, and the development of these notions parallels the development of capitalism (Watt 1972); thus Defoe's *Robinson Crusoe* reflects the colonial aspirations of an expansive and optimistic eighteenth century capitalism.

In a similar fashion, one could argue that the demise of the individual parallels the falling rate of profit; thus the nostalgic and apocalyptic tendencies of the post-war English novel (Bergonzi 1972) reflect the pessimism of a senile capitalism that offers warfare as the only means of survival. At the same time however, another major influence on notions of the human has been the discoveries of Darwin and Freud. In Lawrence's case, *The Rainbow* reflects his claim to have abandoned "the old stable ego of

character" and his turn to the ego of Jungian psychology, to what Fernihough calls the preconscious (Fernihough 1995, p.xxvii). In this case, Jung's notion of the growth of the psyche and Nietzsche's notion of the will to power lead to a zenith in the rise of the individual, where individual growth "is achieved at great cost; there is always the danger that the overweening 'I' will devour the 'not-I', that its own expansion will turn into appropriation, becoming the will-to-power in a negative sense" (Fernihough 1995, p.xxviii).

The example of Lawrence shows how a writer's thinking about character is influenced by specific schemata for human behaviour and human psychology, in real worlds and in textual worlds. Yet if the negative aspect of Nietzsche's concern with the will is the will to power and devouring the 'not-I', the positive aspect is that "willing is creating" (Nietzsche 1969, p.223). In chapter seven, we argued that it was through their realisation of character that fiction writers exercise the omnipotence of thoughts, and we used the term focusing the imagination to describe the process of "becoming someone else" and allowing characters to drive the plot. Focusing the imagination on syntax is to ask, "If I were someone else, how would I speak (outer speech), think (inner speech), or write?". Focusing on the event or the scene is to ask, "If I were someone else, what would I think about the events in which I am involved or the scenes with which I am confronted?".

The above discussion indicates a further way of focusing the imagination, which is to focus on the name or the signifier. From a perspective of text types, focusing on events, scenes or syntax produces a narrative with internal, variable or multiple focalization in Genette's typology, depending on whether there is a change of focus and whether the same events or scenes are perceived by more than one character. In any case, simplifying this typology we can say that focusing on the scene or the event produces a focalized descriptive or narrative text. Focusing on the name or the signifier therefore creates a focalized argumentative text. In chapter five we referred to the notion that planning

argumentative texts involved the management of polyphony (Coirier et al 1994, p.80), which might involve imaginary conversations, or a dialogue with an imaginary protagonist. Students may also engage in these sort of verbal rehearsals when anticipating tests, exams, interviews and so forth.

Writing fiction might involve a similar process, a process of creating characters by imagining their thoughts and opinions about specific issues, topics, names, or signifiers. To focus on the signifier is to engage in focused argumentation, to create a character by asking, "If I were someone else, what would I think about this particular signifier?". As an example of focused argumentation, we return to Lawrence's *The Rainbow,* where Ursula is debating with Winifred on the subject (or signification) of religion; Winifred "wanted to bring Ursula to her own position of thought":

> "They took religion and rid it of its dogmas, its falsehoods. Winifred humanised it all. Gradually it dawned upon Ursula that all the religion she knew was but a particular clothing to a human aspiration. The aspiration was the real thing - the clothing was a matter almost of national taste or need. The Greeks had a naked Apollo, the Christians a white-robed Christ, the Buddhists a royal prince, the Egyptians their Osiris. Religions were local and religion was universal. Christianity was a local branch. There was as yet no assimilation of local religions into universal religion.
>
> In religion, there were the two great motives of fear and love..."
> (Lawrence 1995, p.317)

In conclusion, this discussion has brought to light further processes in fiction writing: reflecting on signifiers, imagining signifiers, and focusing the imagination on signifiers. In addition, the remembering of signs was identified as the sort of thinking that occurs automatically in writing. We have also shown that naming in writing is not the same process as naming in reading, which Barthes describes as the reader's principal activity. This activity of naming was also described above as a form of hypothesis testing or problem solving, and we now discuss the notion of problem solving in more detail.

9.4 READING, WRITING, AND PROBLEM SOLVING

In their studies of reading, psychologists have developed story grammars to represent story structure, to measure story comprehension, and to investigate the remembering of stories (Rumelhart 1975, Thorndyke 1977, Mandler & Johnson 1977, Mandler 1978, Mandler & DeForest 1979, Johnson & Mandler 1980, Mandler 1982). In the last chapter however, we referred to disagreements between story grammarians and AI researchers concerning story understanding. Before we discuss the notion of problem solving in the context of reading and writing fiction, we need to return to those disagreements.

Criticism of the story grammarians' approach to explaining comprehension was initiated by Black and Wilensky (1979). In chapter six, we showed how Chomsky's transformational grammar provided a model for attempts to represent story structure in terms of a grammar. On the one hand, Black and Wilensky use Chomsky's (1965) arguments to point out the inadequacies of story grammars that are not transformational grammars. On the other hand, they also point out the irony that two developmental psychologists (Mandler and Johnson) should try to develop a transformational grammar of stories when research has shown that transformational grammars are unlearnable; hence such a grammar would not aid developmental psychology (Black & Wilensky 1979, pp. 219-220).

In their evaluation of story grammars, Black and Wilensky perform what they call an empirical test:

> "The evaluation technique we use here is to invent texts, then ask whether the various grammars accept them as stories. Ideally, a story grammar should be a set of rules which generates all the texts that are stories but no texts that are not stories. Thus, if we find a story that a grammar does not generate, that story is empirical evidence against the grammar. In addition, if we find a nonstory text that a grammar generates, that also is empirical evidence against the grammar."
> (Black & Wilensky 1979, p.220)

Having invented the stories and nonstories that provide the empirical evidence on both of these counts, Black and Wilensky then show how the grammars are inadequate as models of comprehension. This inadequacy is due to the separation of syntax and semantics, a separation that we noted in Chomsky's model of sentence comprehension. According to Black and Wilensky, the main reason why "syntactic rules are not particularly helpful in story understanding is that the syntactic classes they presuppose cannot be defined independently of the semantic relationship between the sentences" (Black & Wilensky 1979, p.225). In particular, they note that "inference procedures are based upon the semantics of the story" (Black & Wilensky 1979, p.226), and therefore must operate independently of the syntactic rules developed, for example, by Rumelhart (1975). Black and Wilensky conclude that "the important issue for investigation is the nature of understanding, not grammaticality", and therefore advocate what they call a content oriented rather than formal approach, an approach that explores "the kinds of knowledge that people use in story understanding" (Black & Wilensky 1979, p.228).

However, the discussion in chapter six showed that knowledge can also be formalised and represented by grammars. In Frederiksen's model of discourse comprehension for example, content knowledge is formalised by the use of frame grammars (Frederiksen 1986). On the one hand, disagreements about story understanding reflect the different goals of developmental psychologists studying human memory, and AI researchers modelling human knowledge. In the first case, the purpose of a story grammar is to investigate story schemata, and, as we have seen, while Mandler defines a story schema as "a kind of mental structure or processing mechanism", she also points out that this mental representation is not the same as the grammar, which serves to represent story structure (Mandler 1982, p.207). In the second case however, the aim is to design machine intelligence, and it is frequently claimed that such a system embodies or represents human intelligence (Winograd & Flores 1986). In that case, it must also be claimed that the representations used in the

system are equivalent to the mental representations used by humans. On the other hand, disagreements about story understanding are concerned with domains of representations, as we have noted. In their reply to Black and Wilensky, Mandler and Johnson note a failure to take into account the domain over which their theories range. They point out that "we have explicitly limited our grammar to stories from the oral tradition" (Mandler & Johnson 1980, p.306), and their explanation of this limitation was discussed in the last chapter.

However, there does not appear to be a consensus among story grammarians regarding the domain of their theories. In his reply to Black and Wilensky, Rumelhart claims:

> "Most story grammars are based around the observation that many stories seem to involve a sort of problem solving motif... Such stories have roughly the following structure: First, something happens to a protagonist which sets up a goal that must be satisfied. Then the remainder of the story is a description of the protagonist's problem solving behavior in seeking the goal coupled with the results of that behavior."
> (Rumelhart 1980, p.313)

According to Rumelhart, the domain of the story grammar is limited to stories that begin with a problem and unfold with a description of the protagonist's problem solving activities.

Black and Wilensky's evaluation of story grammars is continued by Black and Bower, who also make the connection between story grammars and problem solving: "we believe that the core intuitions underlying story grammars relate to the planning or problem-solving knowledge that readers use when comprehending both stories and procedural expositions" (Black & Bower 1980, p.231). In their theory of story understanding as problem solving, Black and Bower go further than Rumelhart and define all stories in terms of problems: "A narrative simply relates a temporal sequence of events; a story relates a causal sequence of events relevant to a protagonist pursuing a goal or resolving some problem" (Black & Bower 1980, p.226).

According to Black and Bower, "stories have several features that commend their use as research material" (Black & Bower 1980, p.226). One of those features enables Black and Bower to study inference procedures:

> "... dramatic stories are interesting so that readers use their "implicit personality theories" to interpret the actions of the storybook characters, and that allows us to trace the inferences, attributions, and distortions of the text that readers typically display. In this regard, we view story understanding and recall as similar to the processes by which people understand and recall events in their social world. Readers are social-inference machines, and when reading stories they probably use the same inferential routines for interpreting actions, for conjecturing motives, and assigning blame as they do in their social interactions." (Black & Bower 1980, p.226)

Here, Black and Bower make the inference that, because dramatic stories are interesting, readers interpret them in a similar way to how they interpret life in general. Their assumption seems to be that stories resemble the real world, which is always interesting. However, stories may also be interesting because of what Beaugrande and Dressler call "a principled *alternativity* relationship to the accepted version of the "real world"" (Beaugrande & Dressler 1981, p.185). Black and Bower do not make any distinction between textual worlds and real worlds, and if one adopts this perspective, there is no need to postulate separate story schemata for human memory, as Greene remarks (Greene 1986, p.48). This would be a positive feature if one's aim is to design machine intelligence, because the number of representations in the system can then be trimmed. In Frederiksen's model of comprehension, stories can be interpreted by referring to more than one frame; problem frames are a separate feature from event frames for example (Frederiksen 1986, p.248). However, Black and Bower argue that "if stories are the traces of the problem solving activities of the characters, then the representation of story structure should be similar to the representation of problem solving" (Black & Bower 1980, p.236). In that case:

> "All that is necessary is an understanding of people's goals and motivations in real-life situations. Since stories are about people, they will naturally describe people's usual behaviour."
> (Greene 1986, p.48)

This usual behaviour is outlined by Black and Bower:

> "The reader assumes that the central character will follow a rational plan to reach his goal, that he will use standard techniques of planning, and that he will use standard methods (actions) allowed in that setting as instruments in achieving that goal."
> (Black & Bower 1980, pp. 244-245)

Black and Bower use their theory to make hypotheses about the best remembered parts of stories. However, just as Black and Wilensky perform an empirical evaluation of story grammars by inventing the texts that provide the required evidence, Black and Bower also invent the texts that are used to test their predictions. In Black and Bower's experiments, a story is a short text that describes a problem and the actions taken to resolve the problem. For example:

> "John was looking for a book for a university class he was taking. First he went to look in the library...."
> (Black & Bower 1980, p.236)

According to Black and Bower's theory, the best remembered parts of this story will be the events that bring about a successful result; that is, the actions that result in John's acquisition of the book. Although these predictions are confirmed by Black and Bower's experiments, it remains an unanswered question whether similar results could have been obtained by alternative representations of story structure.

The story grammarians do not make any claims for their grammars as models of reading. Black and Bower, however, claim that a theory of problem solving also explains the process of reading:

> "Our desired process theory would view a story as though it were the literate, "thinking aloud" protocol of a verbose character solving an interesting problem; and the reader would be viewed as an interested observer-scientist trying to make sense of the story character's problem-solving protocol. The reader has an implicit theory of planning and problem-solving comparable, say, to the General Problem Solver (GPS) of Newell and Simon (1972), and he is applying his GPS interpreter to the character's protocol line by line to construct a model of that character's problem-solving plan and how his actions relate to it. It is this conjectured *trace* of the character's problem-solving activities (and their associated states) that is alleged to be the story's representation in the reader's memory."
> (Black & Bower 1980, p.244)

Beaugrande and Miller also classify story units or episodes in terms of problems, claiming that this provides a better method of identifying episodic boundaries than the story grammarian's designation of an episode as an event plus a reaction (Beaugrande & Miller 1980, p.188). In Beaugrande and Miller's case, the problem solving approach provides a model of children's story comprehension (Beaugrande & Miller 1980).

Criticisms of attempts to model reading have pointed out that laboratory conditions and experimental tasks do not reflect real reading situations or the goals of readers; moreover, the remembering of simple stories does not reflect the process of reading literary texts (Dillon 1980, Ide & Veronis 1990, Ide & Veronis 1991). Dillon, for example, argues that "the conventions governing laboratory experiments ... are rather unlike those governing many situations in which literature is read" (Dillon 1980, p.164):

> "Literariness ... resides in the readers' decision to read a work as a work of literature, a decision usually warranted by its being offered to them as such by publisher, cataloger, or other authority. Insofar as this reading is governed by conventions peculiar to the literary situation, the conventions may be said to be literary conventions and to be constitutive of 'literature'." (Dillon 1980, p.164)

Attempts to model reading assume a "normalization or idealization of reading", whereas "particular readers may have special interests and purposes which may lead them to process texts in ways the model does not predict" (Dillon 1980, p.165). The process of reading literature is a process of evaluating and interpreting as well as remembering (Dillon 1980, p.169), and interpretation involves top-down and bottom-up processing (Dillon 1980, p.170). This notion of interpretation as an interactive process is similar to Barthes' notion of reading as a cycle of folding and unfolding - a cycle of formulating hypotheses by naming, and testing them by interpreting.

While the original purpose of story grammars was to study human story memory, they have since been used as the basis for designing computational tools to assist story writing (Yazdani 1989, Parthemore 1991). The representation of stories by the problem solving approach is an alternative method of designing machine intelligence, and one which, as we have pointed out, has computational advantages. In their criticism of models of reading developed by artificial intelligence researchers, Ide and Veronis, like Dillon, consider these models from the perspective of reading literary texts (Ide & Veronis 1990, Ide & Veronis 1991):

> "The reader's goals, and the strategies for reaching these goals, are different for literary texts than for other texts. For a literary text these goals and strategies are likely to be considerably more complex than for, say, a newspaper story, where the goal may be only to 'get information' - a goal implicit in current AI strategies for story understanding, which include procedures to construct static structures representing a sequence of events."
> (Ide & Veronis 1990, p.57)

While different readers might pursue different goals, the reader of literary texts might have multiple goals which can also vary in the process of reading (Ide & Veronis 1990, p.57). While AI researchers have been concerned with modelling the plans and goals of characters in stories (Schank & Abelson 1977), Ide and

Veronis point out that modelling the plans and goals of readers is a similar process:

> "Modelling the goals and plans of the reader involves processes identical to those involved in modelling the goals and plans of characters within a story... The kinds of goals that are attributed to characters in a story and the plans and planning strategies that are assumed to achieve these goals, are not limited to modelling the behaviour of fictional characters but instead model human behaviour in general. Thus the same procedures currently used in AI systems to model the goals and plans of the characters of a story can be applied to model the reader himself."
> (Ide & Veronis 1991, p.171)

However, would AI researchers disagree with these comments? We pointed out above that Black and Bower do not make any distinction between textual worlds and real worlds (Black & Bower 1980, p.226). According to their theory of story understanding, readers make the same inferences about fictional characters as they do about people in the real world, and both the fictional protagonist and the reader are engaged in the same activity, that of problem solving. On the other hand, the reader's problem is merely one of recognition: "the problem for the reader is to ... recognize the plan of the protagonist of the story" (Black & Bower 1980, p.245). Presumably then, when the protagonist's plan has been recognised, the reader's problem is resolved.

But do protagonists always have plans, can they always be recognised, and when they are recognised, does the reader lose the motivation to continue reading? According to Black and Bower, readers make the same set of rationalistic assumptions about fictional characters as they themselves make about readers (Black & Bower 1980, pp. 244-245). The theory that many human activities involve problem solving was developed by Newell and Simon (Newell & Simon 1972), and their theory is another aspect of the rationalistic tradition criticised by Winograd and Flores (Winograd & Flores 1986):

> "Simon's decision-making theories developed into more general theories of 'problem solving' as he and others made

the first attempts to build intelligent computer programs. Rather than concentrating on the kinds of decisions that managers make, researchers studied tasks (such as proving logic theorems and solving simple puzzles) that could be viewed as problems of search in a space of alternatives. The task is characterized in terms of a 'problem space'. Each 'node' of the space is reached by some sequence of actions, and has some consequences relevant to the structure of the task. The computer program searches for a solution in this potentially huge space of possibilities, using 'heuristics' to guide the search and to provide valuations..."
(Winograd & Flores 1986, p.22)

Winograd and Flores describe four key elements in Newell and Simon's view of problem solving. These are the task environment, internal representation, search, and choice (Winograd & Flores 1986, pp. 22-23):

"First, we characterize the problem in terms of a 'task environment' in which there are different potential 'states' of affairs, 'actions' available to the problem solver to change the state, and 'goals' from which rational actions can be derived."
(Winograd & Flores 1986, pp. 22-23)

For Flower and Hayes, the process of writing is a problem solving activity (Flower & Hayes 1980a, Flower & Hayes 1980b, Hayes & Flower 1980b), and the task environment is a key element in their model of writing (Figure 2). What Black and Bower refer to as two common methods of problem solving feature in Flower and Hayes' accounts of writing; these are the problem reduction method and means-ends analysis (Black & Bower 1980, p.236). In one account (Flower & Hayes 1980a), the writer's problem is the large number of constraints that must be satisfied simultaneously. In this case, one solution is to ignore some constraints altogether; this is the problem reduction method. Another solution is to plan; this is the method of means-ends analysis. Discussing this model of planning in chapter five, we concluded that a student's plan "To Do" something is an internalised instruction to perform a speech act. In this context, the writer's problem is to satisfy a rhetorical goal, and an *internal representation* of the problem is given by the

assignment. A plan "To Say" something results from a memory *search* for possible content, while a writer's *choice* of material is constrained by the rhetorical problem. It is this rhetorical problem that the writer must solve in Flower and Hayes' further accounts of writing as problem solving (Flower & Hayes 1980b, Hayes & Flower 1980b).

However, the analysis of planning in chapter five led to the separation of cognitive, meta-cognitive, and motivational activities. While writing might be considered as a problem solving activity, these different kinds of thinking processes are activated by different kinds of problems. While the rhetorical problem is tied to a writer's motivation, the problem of choosing a writing strategy is a meta-cognitive one. From a cognitive perspective, the fiction writer's problem is the task of writing a story. According to the rationalistic view of problem solving, a story is a sequence of events, and a writer's problem is a metonymic one of describing the sequence of events that culminate in some kind of achievement. The literature describes different methods of problem solving that we can apply to this specific problem (Newell & Simon 1972, Kahney 1986). Yet when applied to fiction writing, these methods are merely different ways of pursuing sequential and associative relations.

Kahney's three common methods of solving problems are the heuristic method, means-ends analysis, and the analogical method (Kahney 1986). The heuristic or "rule-of-thumb" method of writing a story would be to follow a well-used formula or schema, one that a writer has used before or one that is enforced by the conventions of genre. In Kahney's summary, "means-ends analysis works by determining *differences* between a current state of a problem and a goal state ... and selecting operators known to be useful in reducing such differences" (Kahney 1986, p.45). In this case, a writer knows the beginning of a story and its conclusion, and pursues sequential relations in working out how to reach the end. To solve a problem by analogy is to make use of a strategy that would be used to solve a similar problem (Kahney 1986, p.68). In this case, the problem solver looks at the current

problem and tries to find similarities with familiar problems. Adopting this method, a fiction writer would pursue associative relations in searching story memory for events and scenes that can be adapted to fit the current story.

Can we reach a different view of reading as problem solving by applying a similar distinction between thinking processes? In Forster's *Aspects of the Novel,* the reader's motivation to continue reading, having started, is the urge to know what is going to happen next (Forster 1962, p.35). This urge to know the forthcoming sequence of events is what might be called the metonymic drive in reading fiction. In Barthes' account of reading, the principal activity of the reader is naming. Here the question is not so much what is going to happen next, as what is going on? The question of what is going on, the struggle to name, is what we might call the reader's urge or drive for comprehension. The reader may lose the motivation to read when the metonymic drive is not sustained, or when the drive for comprehension is perpetually frustrated. This loss may then be overruled if the purpose of reading is not only for entertainment but also to satisfy a task set by a teacher or figure of authority.

While the meta-cognitive aspects of reading would include measuring quantities (pages, duration, and so forth), for the cognitive aspects we need to turn once more to sequential and associative relations. In reading fiction, sequential relations encompass the code of events, Barthes' proairetic code. As the drives for knowledge and understanding are bound up with metonymy, it appears that, in fiction reading, cognition and motivation are difficult to disentangle. On the other hand, the semic, symbolic and cultural codes, codes that "establish permutable, reversible connections, outside the constraint of time" (Barthes 1990, p.30), are all encompassed in the notion of associative relations.

However, there are two codes that "impose their terms according to an irreversible order" (Barthes 1990, p.30). The first is the code of events, and the second is the hermeneutic code, the

code of enigmas or mysteries. In Barthes' classification of textual signifiers, the hermeneutic code includes "all the units whose function it is to articulate in various ways a question, its response, and the variety of chance events which can either formulate the question or delay its answer; or even, constitute an enigma and lead to its solution" (Barthes 1990, p.17):

> "Under the hermeneutic code, we list the various (formal) terms by which an enigma can be distinguished, suggested, formulated, held in suspense, and finally disclosed (these terms will not always occur, they will often be repeated; they will not appear in any fixed order)."
> (Barthes 1990, p.19)

In the rationalistic view of problem solving, problems are metonymic phenomena defined by tasks, goals, and plans - the code of events - and the reader's problem is to comprehend events within a rationalistic framework. In Barthes' view, to comprehend is to name, and naming is an activity that the reader also applies to the code of events. From both points of view, the reader's drives for knowledge and understanding are tied to metonymy. However, the satisfaction of the first may deliberately be deferred, while the second may deliberately be frustrated. In either case, the reader now encounters a different kind of problem. To defer is to leave the reader in suspense, to hold something in reserve, to guard a secret, while to baffle produces a similar result: the creation of a mystery.

These two mysteries are both mysteries of the event: What's going to happen next? What's happening? If enigmas are questions that confront the reader in the process of reading, then we can attempt a classification of mysteries merely by listing the interrogative pronouns: what, who, whose, whom, which, when, where, how, why? The verb taken by the interrogative will either indicate a mystery of the event, or a mystery of identity (the verb "to be"). In addition, if the fictional text is a mixture of narration, description, and argumentation, then we can also classify mysteries by these textual functions.

The first type of mystery is created in the process of narrating. Mysteries of the event can be subdivided according to Genette's chronological analysis of narrative discourse (Genette 1980). One kind of mystery surrounds events that have occurred prior to the narrative begins, while a second kind is the mysterious event that occurs during the narrative. A third variety concerns future events. While the most frequent question here is "What's going to happen next?", other variations are "How is the event going to happen?", "Who will perform the event?", and "When will the event occur?" In these cases, the reader knows an event is going to happen, but the question is how, who, or when? With a change of tense, the same questions might be raised by the other varieties of mysterious events: "What happened?", "How?", "Who?", and "When?". In addition, events of the past tense might also invoke the question "Why (did the event occur)?"

The second type of mystery is created by description. If we consider description as an expansion of the verb "to be", then mysteries of the scene are also mysteries of identity. Mysteries of the scene include "Who is X?" (the "woman in white" of Collins' novel, the narrator in Robbe-Grillet's *La Jalousie),* "What is X?" (the contents of the box in Poe's *Oblong Box),* and "Where is X?" (Poe's *Purloined Letter).*

From Barthes' point of view however, mysteries of the event are also mysteries of identity: for example, "*Who* performed the event?" and "*What* was the event that occurred?" On the one hand, the event or its perpetrator are mysterious in these examples because of their *omission* from the narrative. In a mystery of the scene on the other hand, someone, somewhere or something is notable for its *presence* in the narrative, while the description fails to reveal some vital aspect of this person, place or object. Both types of mystery are therefore mysteries of identity, because the narrative deliberately fails to provide a name that will assist the reader's purpose of identification. The inability to name creates the problem for the reader, and the missing name is supplied by the interrogative pronouns.

Conversely, a narrative may supply a name that is itself a mystery. In Barthes' account of reading a short story by Balzac, the title of the story poses a question:

> "The title raises a question: *What is Sarrasine?* A noun? A name? A thing? A man? A woman? This question will not be answered until much later, by the biography of the sculptor named Sarrasine."
> (Barthes 1990, p.17)

However, some of these questions can be answered without further reading. We know that *Sarrasine* is a name, because titles are the names of stories. Moreover, titles are usually nouns. Here, then, we have another mystery of identity (who or what is Sarrasine?), but one that is created by the title of the story. In his analysis of fictional titles, Dillon points out that the titles of short stories are often enigmatic:

> "Here there is a special class of titles which refer to some crucial image or detail in the story: they function as a mystery pointer until the detail is reached and then highlight its importance (though not always its meaning)."
> (Dillon 1980, p.171)

Names can be mysterious for two reasons, in a similar fashion to the difference between mysteries of the event and mysteries of the scene. In the first case, the mysterious name is a vital piece of knowledge that someone is seeking, and the name may remain undisclosed by the text. This name may be secret, unknown, forgotten, taboo, or repressed. In Borges' tale *Undr,* a secret name is the object of a quest. In Anglo-Saxon riddles and the Welsh *Triads,* a secret name is hidden in the text. In *Tom Sawyer* and the tale of Peredur in the *Mabinogion,* the refusal to disclose a name is the cause of a fight. However, from the point of view of cognitive processes in fiction writing, the name is no different in these examples from other objects of quests (the pot of gold, the Holy Grail) or other causes of fights; a writer still has to imagine the events and scenes of the quest, in which the pot of gold, grail or name is the object.

In the second case, the mysterious name is a name that is supplied by the text, but the name is mysterious because its *meaning* is obscure, forgotten, repressed, or unknown. A search for meaning could supply yet another version of the quest, but when the search for meaning is a feature of argumentation, the mysterious name provides a third type of mystery. For our first example, we return to the beginning of Milan Kundera's novel, *The Unbearable Lightness of Being:*

> "The idea of eternal return is a mysterious one, and Nietzsche has often perplexed other philosophers with it: to think that everything recurs as we once experienced it, and that the recurrence itself recurs ad infinitum! What does this mad myth signify?"
> (Kundera 1985, p.3)

Here we have, not a mystery of identity (What is X?), but a mystery of the signifier (What does X mean?). Kundera's novel begins with argumentation, a discussion of the signifier "eternal return", and an attempt to discover its signification or meaning. Similarly, Fielding's preface to *Joseph Andrews* begins (p.25 of the Penguin Classic edition):

> "As it is possible the mere English reader may have a different idea of romance with the author of these little volumes; and may consequently expect a kind of entertainment, not to be found, nor which was even intended, in the following pages; it may not be improper to premise a few words concerning this kind of writing, which I do not remember to have seen hitherto attempted in our language."

Here we have another example of a novel that begins with argumentation. In this case, the mysterious signifier is "romance", and Fielding pursues a discussion of its signification. In *Tom Jones,* Fielding begins with another exercise in problem solving, but the mystery is less concerned with signification than with definition and identity again, a mystery of the scene where the scene is the book itself: What's the menu? (the menu being the subject or the contents of the book). Book Two begins likewise with another mystery of identity, this time given by the question: What's a

history? In comparison, Book Two of *Joseph Andrews* begins with a mystery of the event, where the event is writing: Why do authors divide their books into chapters?

As a final example of the mysterious signifier, here is an extract from Salman Rushdie's *The Satanic Verses:*

> "Consider this fallen man. He sought without remorse to shatter the mind of a fellow human being; and exploited, to do so, an entirely blameless woman, at least partly owing to his own impossible and voyeuristic desire for her. Yet this same man has risked death, with scarcely any hesitation, in a foolhardy rescue attempt.
>
> What does this mean?"
>
> (Rushdie 1992, p.467)

Here we have, not a mystery of the event, but a mystery of the signifier, where the signifier is "the sequence of events that have just been narrated". While a mystery of the event, as formulated by the reader, is "Why did the event occur?", here the events themselves are subject to a commentary by the narrator, in a similar fashion to the narrator's digressions in Fielding's novels.

In Barthes' account, the hermeneutic code is an irreversible one, presumably because once an enigma is resolved or disclosed, it is no longer an enigma. However, there is a fourth type of mystery or problem that the reader may encounter in fiction, and one that may never be entirely resolved. This is the beginning of James Joyce's tale of "The Mookse and the Gripes" from *Finnegans Wake:*

> "Eins within a space and a wearywide space it wast ere wohned a Mookse. The onesomeness wast alltolonely, archunsitslike, broady oval, and a Mookse he would a walking go (My hood! cries Antony Romeo), so one grandsumer evening, after a great morning and his good supper of gammon and spittish, having flabelled his eyes, pilleoled his nostrils, vacticanated his ears and palliumed his throats, he put on his impermeable, seized his impugnable, harped on his crown and stepped out of his immobile *De Rure Albo* (socolled becauld it was chalkfull of masterplasters and had borgeously letout gardens strown

with cascadas, pintacostecas, horthoducts and currycombs) and set off from Ludstown *a spasso* to see how badness was badness in the weirdest of all pensible ways."
(Joyce 1975, p.152)

In this example of what might be called a re-invention or re-discovery of language, a number of readings will fail to exhaust the associative relations prompted by the text. While Joyce strings together words and parts of words from English, French, German, Latin, Dutch, Greek, Finnish, and so on, Russell Hoban invents a type of slang in *Riddley Walker:*

"On my naming day when I come 12 I gone front spear and kilt a wyld boar he parbly ben the las wyld pig on the Bundel Downs any how there hadnt ben none for a long time befor him nor I aint looking to see none agen."
(Hoban 1982, p.1)

In both of the above examples, the reader encounters a problem of a different order to mysteries of the event, the scene, or the signifier. Here, the problem is one of syntax, where syntax is not so far removed from conventional English as to be totally incomprehensible, but is sufficiently different to make the reader constantly aware of language. The problem of syntax extends from the beginning of the text to its end. While the syntactic problem is a problem for the reader, to write this kind of novel also presents a particular type of problem to the writer, that of inventing a language with its own kind of internal consistency. *Riddley Walker* took five and a half years to write, while *Finnegans Wake* took twenty.

We began this discussion of problem solving from the reader's perspective, and showed how the notion of story understanding as problem solving is informed by a rationalistic view of problem solving, a view that also informs Flower and Hayes' notion of writing. We then reconsidered the notion of problem solving by considering the reader's drives for knowledge and understanding, and suggested that these drives may be deliberately impeded in order to create suspense and mystery. We then considered cognitive processes in reading fiction from the

perspective of sequential and associative relations, and, using Barthes' hermeneutic code as a point of departure, looked at the range of questions formulated by the reader. We suggested a taxonomy of mysteries by textual function: narration (mysteries of the event), description (mysteries of the scene), and argumentation (mysteries of the signifier).

In addition, a verbal approach to interrogatives results in a distinction between mysteries of the event and mysteries of identity. According to Barthes however, reading is a kind of hypothesis testing in which naming is equivalent to problem solving. From this perspective, mysteries of the event are also mysteries of identity because the narrative fails to provide an appropriate name. Discussing the mysterious name, we then distinguished between a mystery of the signifier created by argumentation and a mystery of identity created by a title.

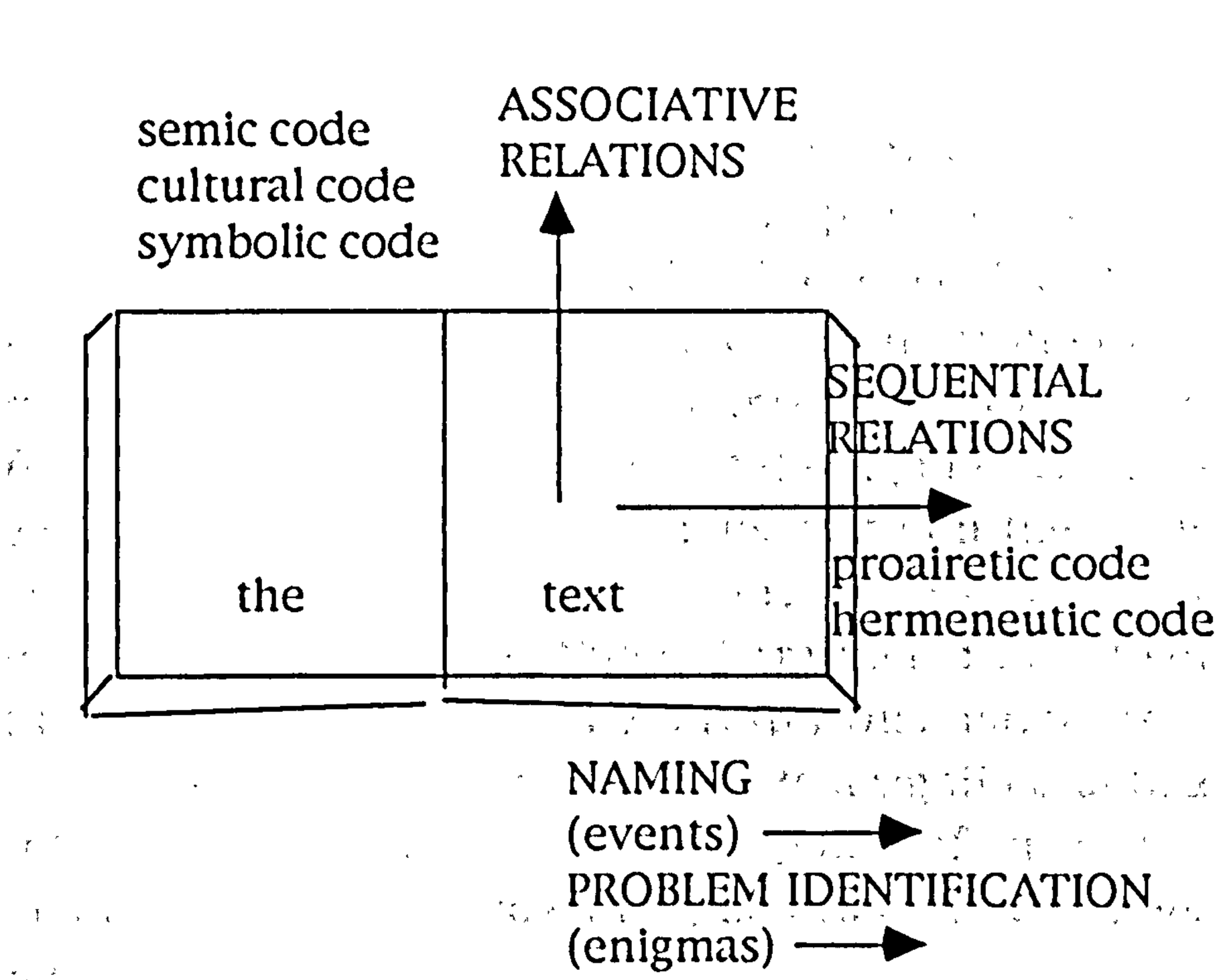


FIGURE 22: A MODEL OF READING ACCORDING TO BARTHES

Barthes' account of reading is summarised in Figure 22. The principal activity of the reader is naming, an activity that is applied to the proairetic code. A secondary activity is problem identification, in which the reader formulates the sort of questions discussed above. Like the proairetic code, the hermeneutic code is an irreversible one, and the unravelling of enigmas an aspect of metonymy or sequential relations.

Let's now reconsider the notion of problem solving from the fiction writer's perspective. As we pointed out above, the problem of syntax is not only a problem for the reader but one for the writer. On the other hand, the rationalistic methods of problem solving are not the only methods of solving this problem. Russell Hoban describes the process of writing *Riddley Walker* as a kind of possession by the muse: "What happened was that something took hold of me and didn't let go until it got itself onto paper in the way that it wanted to be" (from the frontispiece of Hoban 1982). While it is the character who drives Moggach's plots, it appears that, for Hoban, syntax itself can function as a metonymic driver.

Are the other problems and mysteries that we have identified from the reader's perspective also problems for the writer? The problem of meaning is a cue for discursive thinking, a process that occupies writers who are involved in argumentation. A fiction writer might decide to incorporate this kind of discussion within the fictional text, so that a mystery of the signifier can also be a problem for the writer. The mysterious name on the other hand is a problem that confronts the reader, and a problem of deferral rather than signification ("Who is Sarrasine?" rather than "What does Sarrasine mean?"); the mysterious name is a disembodied signifier that cannot be attached to a signified until a later part of the text. From the writer's point of view, the mysterious name is a result of imagining names or titles rather than problem solving.

Mysteries of the event were classified above according to the sort of questions that might be raised in reading. But while

these questions provide mysteries for the reader, they also appear to be questions that a writer might formulate in developing a story: What's going to happen next? When will the event occur? However, in chapter seven we showed how metaphor and metonymy governed the remembering and imagining of events and scenes. We also pointed out that some kind of temporal ordering is inherent in these processes, so that a "linearization of content" (Passerault & Coquin 1994, p.139) appears to have little relevance to fiction writing. We also suggested above that, when applied to the problem of writing a story, the most frequent methods of problem solving are merely different ways of pursuing sequential and associative relations. In addition, a metonymic drive in writing fiction is tied up with a writer's motivation and the unconscious, so that rationalistic methods of problem solving appear to have limited application to fiction writing.

So, if thinking processes in fiction writing are more akin to primitive logic than discursive thinking, do the range of questions concerning events and scenes include any that present problems for the writer, and is the notion of problem solving as a discursive process relevant to their solution? The most likely candidate for a fiction writer's problem is the question: What's going to happen next? Discursive thinking is one way of solving this problem, but what about questions of temporal order, motivation and means? While events are linearised in their remembering or imagining, a writer may rearrange this temporal order in order to create suspense and mystery for the reader. Means and motivation might be concealed for a similar purpose. In that case then, problem solving for the writer is the creation of problems for the reader, the reordering of a temporal order, for example, rather than a linearisation of chaos. So, for the writer, problem solving can be applied to events and scenes, and can be a discursive process, a process in which mysteries are formulated, or metonymic blocks are overcome.

Having formulated a mystery, a writer has to work out where an enigma is first suggested in the text, how it is held in

suspense, and when it is finally disclosed. It follows that one method of problem solving in this context is means-ends analysis. Beginning with the solution to an enigma, and knowing how and when the solution becomes apparent, a writer might then work backwards to find out how the enigma should be suggested, and how held in suspense. In *Little Dorrit* for example, the idea that Clennam's origins are a mystery is first suggested towards the beginning of the novel, while the solution is not revealed until the end. In *Great Expectations,* the mystery of Pip's benefactor is held in suspense throughout the novel, while its explanation refers to events that occur at the beginning. In both cases, beginnings and ends are mutually dependent.

In summary, the notion that writing is a kind of problem solving has certain relevances to fiction writing. However, like naming, problem solving in writing is not the same as problem solving in reading. According to Barthes, reading fiction is a process of hypothesis testing in which naming is equivalent to problem solving, while the absence of names produces enigmas. As a discursive process in fiction writing, problem solving can be applied to events and scenes in order to create mysteries for the reader, or to overcome a writer's metonymic block. Problem solving can also be applied to signifiers when a writer is engaged in argumentation. When applied to syntax, problem solving is concerned with the invention of language.

9.5 CONCLUSION

In this chapter we returned to the suggestion made at the end of chapter six. There we said that to develop a model of fiction writing that made use of Saussure's observations on language, we would need to look at semiological accounts of reading, as models of reading are more developed than models of writing. Our discussion concentrated on Barthes' (1990) account of the process of reading, in which he classifies textual signifiers. Our assumption was that avenues of meaning for readers can also be avenues of meaning for writers.

Barthes describes reading as a process of hypothesis testing, in which naming is equivalent to problem solving. We explored the role of naming in reading and writing. Following Saussure, we argued that names are signifiers, rather than elements in an inventory of things. Assuming Saussure's notion of the linguistic sign, we identified the recall of signs as the thinking that occurs automatically whenever a writer is generating text. We argued that naming in writing is not the continuous process given by rationalistic accounts of language, but refers to the specific process of *imagining names* or *signifiers.* We concluded this section by adding signifiers to the objects of thought in fiction writing, and showed how the processes we have already identified (remembering or reflecting, imagining, and focusing the imagination) apply to this object.

Following this discussion of naming, we explored the role of problem solving in reading and writing. We discussed an account given by AI researchers of story understanding as problem solving. We argued that characters in fictional texts do not necessarily obey the codes of behaviour assumed by rationalistic accounts of problem solving. We returned to the distinction between motivation, metacognition and cognition, in order to discuss the ways in which writing can be described as problem solving. We showed how, in the context of fiction writing, methods of problem solving can be described in terms of sequential and associative relations. We compared rationalistic accounts of

problem solving with Barthes' account of the hermeneutic code - a code of enigmas or mysteries - and we showed how mysteries in fictional texts can be classified according to event, scene, signifier, and syntax. We argued that in the context of fiction writing, problem solving includes the creation of enigmas for the reader.

In summary, we can now add *problem solving* to the thinking processes involved in fiction writing, and we can add *names* or *signifiers* to the objects of these processes. Our model of fiction writing now consists of the processes of remembering and reflecting, imagining, focusing the imagination, and problem solving. Each of these activities can be applied to events, scenes, syntax, and names or signifiers.

However, in this chapter we have not considered different strategies of reading. In addition, if our aim is to construct a hypertextual aid for fiction writers, we need to look at hypertext in more detail - especially as some have argued that, when compared with the linearity of printed text, hypertext involves a different kind of reader. These are the questions we pursue in the next chapter.

CHAPTER TEN:

THE HYPERTEXTUAL READER

10.1 INTRODUCTION

In the last chapter we pursued the suggestion made at the end of chapter six. There we said that to develop a model of fiction writing that made use of Saussure's observations on language, we would need to look at semiological accounts of reading, as models of reading are more developed than models of writing. Our discussion concentrated on Barthes' (1990) account of the process of reading, in which he classifies textual signifiers. However, we did not consider the different strategies that readers pursue in reading. We also pointed out that if our aim is to construct a hypertextual aid for fiction writers, then we need to look at hypertext in more detail. We explore hypertext in this chapter, and in the course of this discussion we also look at strategies of reading.

Some argue that, when compared with the linearity of printed text, the non-linearity of hypertext involves a different kind of reader. We discuss these arguments, looking firstly at the ways in which printed texts are said to contain non-linearity. We find that accounts of non-linearity in printed texts emphasise simultaneity and associative relations, but ignore the temporal or sequential aspect of reading. We discuss texts that are said to exemplify such non-linearity, such as Borges' *Ficciones* and McLuhan's *Gutenberg Galaxy*. We also discuss the view of hypertext as a vital part of a constructivist learning environment, in which the non-linearity of hypertext provides an alternative to the linear authority of traditional text books.

We then consider the different uses of hypertext. We find that the notion of a hypertextual reader does not take into account this range of applications, but assumes that a non-linear structure necessitates a different kind of reader. We argue that readers of hypertexts are no different to readers of linear texts, in that all readers pursue a range of strategies in reading. The choice of strategy depends on the task that readers are engaged in. Research has shown that the most popular strategy for reading hypertexts is browsing. We discuss the argument that there is a

close relationship between browsing and "associationism" - the pursuit of ideas by following associative thought. We argue that browsing involves the pursuit of paths through a textual database, rather than the pursuit of ideas through associative thought.

Some argue that hypertext mimics the associative networks of human memory. We discuss this notion and identify the differences between associative and semantic networks. We show how a semantic network can be used to design a hypertext, and also explain why this is not always feasible. We argue that there can be no general answer to questions about hypertext structure, design, and authoring - these questions must address the purpose of the hypertext and the purpose of its readers.

Some argue that hypertext represents a semantic space through which readers navigate. We discuss this notion and find that the analogy between navigating in a physical environment and navigating in an information space has a limited application. We suggest an alternative explanation for the phenomenon of getting lost in a hypertext - it may be that the reader lacks a purpose in browsing, and the design of the hypertext may not encourage purposeful reading. We conclude that notions of the hypertextual reader suffer from a particular form of contiguity disorder - the reader pursues associative but not sequential relations, reading has a spatial but not a temporal dimension, and the reader's goals and tasks are not taken into account.

10.2 LINEARITY AND NON-LINEARITY

As we mentioned above, the models of reading developed by AI researchers have been criticised from the perspective of reading literary texts (Dillon 1980, Ide & Veronis 1990, Ide & Veronis 1991). However, does the observation that readers pursue diverse goals not apply equally to the readers of any sort of text? Moreover, if models of reading assume a "normalization of reading" (Dillon 1980, p.165), does this criticism not also apply to Barthes' account? Perhaps Barthes identifies naming as the reader's main activity because his own goal in *S/Z* is to name, to identify the codes or metanames according to which one can classify textual signifiers. If generalisations about reading are based on a specific story by Balzac, might not more codes be discovered by reading more texts, as indicated by Barthes' analysis of a Poe story and by Culler's claim that "doubtless further additions are necessary" (Culler 1983, p.33)? On the other hand, as Genette points out:

> "This is the paradox of every poetics, and doubtless of every other activity of knowledge as well: always torn between those two unavoidable commonplaces - that there are no objects except particular ones and no science except of the general - but always finding comfort and something like attraction in this other, slightly less widespread truth, that the general is at the heart of the particular, and therefore (contrary to the common preconception) the knowable is at the heart of the mysterious."
> (Genette 1980, p.23)

The notion that different readers pursue different goals was discussed by Seneca in his letters, where, so it seems, the reader first appears in literary criticism. In letter CVIII, Seneca discusses interpretation, and shows how a passage from Virgil's *Georgics* may be interpreted, firstly, by a literary scholar and, secondly, by a philosopher. For Seneca, "it is the person with philosophy in his mind who takes these words in the way they are meant to be taken" (Seneca 1969, p.208); that is, who interprets correctly. He concludes however:

> "There is nothing particularly surprising about this way which everyone has of deriving material for his own individual interests from identical subject-matter. In one and the same meadow the cow looks for grass, the dog for a hare and the stork for a lizard."
> (Seneca 1969, p.210)

Expanding on this topic, Seneca examines the different directions which the historian, the literary scholar and the philosopher might pursue in studying Cicero's *The State*. Here, although Seneca still prioritises the philosophical enquiry, it is not so much a question of which interpretation is the correct one, but more a question of pragmatics; Seneca acknowledges that different readers have different needs and will use a text for different purposes.

The consideration that readers use texts for different purposes also concerns the designers of hypertexts or hyper-documents. A hyperdocument is an electronic document that consists of *nodes* , or chunks of information; nodes are connected to other nodes by *links* that enable a user or a reader to pursue various paths through the document:

> "The concept of hypertext is quite simple: Windows on the screen are associated with objects in a database, and links are provided between these objects, both graphically (as labelled tokens) and in the database (as pointers)."
> (Conklin 1987, p.17)

When writers describe hypertext by comparing its features with those of printed text, they tend to characterise the first as non-linear and the second as linear. For example:

> "Most of us think of books or articles as documents to be read straight through from start to finish. This viewpoint was challenged in the late 1970s by a self-proclaimed visionary named Ted Nelson, who realised that text in electronic form could be much more fluid than printed matter. The computer, he said, could give us the capability to control the access and display of information in new ways. We need not be bound by the linear or sequential appearance of the written word. Instead the computer could give us the capability of connecting remote passages of a

> document and calling up one passage from another. These electronic links could also be used to bridge from one document to another to create new networks of knowledge. Nelson called the new concept hypertext."
> (O'Bannon 1987, pp.94-95)

Whalley has described the linearity of printed text as a myth, referring to the "complex relational structures" created by writers, and the "non-linear pattern of associations in the reader's mind" (Whalley 1993, p.9). However, in challenging the notion that printed text is linear, Whalley fails to mention a crucial feature of the claims made for hypertext, a feature that, one could argue, is more misleading than the claim for its non-linearity.

This feature is particularly evident in discussions of "interactive fiction", the term used to describe a fictional text designed as a hypertext, in which the reader chooses one of many paths that traverse the nodes of the text (Howell 1990, Howell & Douglas 1990, Moulthrop 1991, Douglas 1991, Douglas 1992). While stressing the non-linearity of hypertext, writers on "interactive fiction" also point to certain kinds of experimentation in print as exemplars of non-linearity: for example, Sterne's *Tristram Shandy,* Joyce's *Finnegans Wake* and the stories of Borges, particularly *The Garden of Forking Paths.* There are four ways in which a printed text may become an exemplar of non-linearity. Discussing the "evolution of interactive fiction", Howell and Douglas point to Sterne's departure from a conventional temporal ordering of events:

> "Instead, Sterne makes use of associative links - the leaps of thought suggested by similar sounds or by the triggering of memory which were to form the bedrock of the representation of the 'stream of consciousness' introduced in the modern novel; and causal links, where action in a particular narrative strand is interrupted to trace its cause or to examine the repercussions of an event yet to occur."
> (Howell & Douglas 1990, p.94)

In this account, *Tristram Shandy* exemplifies non-linearity by its temporal disorder and associativity. However, according to Bolter,

Joyce's *Ulysses* and *Finnegans Wake* are hypertexts (and therefore non-linear) because of their intertextuality; *Ulysses* is both a "pattern of allusions and references to previous literary and cultural texts" and a "self-referential text" (Bolter 1991a, p.135). Thirdly, a work such as Pavic's *Dictionary of the Khazars,* which is arranged like a dictionary, has a non-linear structure that forces the reader to formulate their own reading scheme (Howell & Douglas 1990, p.100). According to Bolter, hypertext enables "multiple reading", and this feature is common to the non-linear narratives of Sterne, Joyce, Borges, Saporta and Cortazar (Bolter 1991a, pp.142-144). However, the work of Borges also illustrates a fourth way in which a printed text may become an exemplar of non-linearity. In this case, a story such as *The Book of Sand* does not enable multiple reading because of a non-linear structure, as in the case of Pavic or Saporta, but rather describes a text that allows such reading.

Borges' "Book of Sand" is an ever-changing book that always opens at a new page. Compared with the fluidity and mutability of electronic text, print is unchangeable and the printed text is fixed for all time. According to Bolter, Borges' stories exemplify non-linearity by their refusal to endorse this fixity and closure; thus Borges anticipates the possibilities of an electronic writing space (Bolter 1991a, pp.137-139). Similarly, Moulthrop writes: "Though they come from a time long before the advent of electronic textuality, Borges' stories frame fundamental questions about the limits of narrative as a representation of time, questions that inform hypertextual fiction" (Moulthrop 1991, p.119).

Like *The Book of Sand,* Borges' story *The Garden of Forking Paths* entertains the notion of an infinite book:

> "In all fictional works, each time a man is confronted with several alternatives, he chooses one and eliminates the others; in the fiction of Ts'ui Pen, he chooses - simultaneously - all of them. *He creates*, in this way, diverse futures, diverse times which themselves also proliferate and fork. Here, then, is the explanation of the novel's contradictions... In the work of Ts'ui Pen, all possible

outcomes occur; each one is the point of departure for other forkings..."
(Borges 1970a, p.51)

The "Garden" is not only a book but an image of the universe:

"*The Garden of Forking Paths* is an incomplete, but not false, image of the universe as Ts'ui Pen conceived it. In contrast to Newton and Schopenhauer, your ancestor did not believe in a uniform, absolute time. He believed in an infinite series of times, in a growing, dizzying net of divergent, convergent and parallel times. This network of times which approached one another, forked, broke off, or were unaware of one another for centuries, embraces *all* possibilities of time. We do not exist in the majority of these times; in some you exist, and not I; in others I, and not you; in others, both of us..."
(Borges 1970a, p.53)

It is this denial of temporal continuity that one could argue is the *theme* of many Borges' stories, or the underlying proposition that his stories serve to illustrate (Borges 1970f). Moreover, it is the denial of time that makes the work of Borges, above all others, an exemplar of non-linearity and a "prototype of interactive fiction" (Howell & Douglas 1990, p.99).

According to Howell and Douglas, the attempt to represent simultaneity is common to *Tristram Shandy,* the work of Borges, and Robert Coover's story *The Babysitter,* but this discovery is due to the non-linearity of hypertext:

"Now that we have before us the possibility for non-linear writing which can convey simultaneity more easily than the printed word, we can see Sterne's efforts toward juggling numerous narrative strands as a precursor for the likes of Robert Coover's story 'The Babysitter', where a half dozen mutually exclusive representations of the babysitter's evening are set before the reader sequentially on the printed page but which occur simultaneously in narrative-time."
(Howell & Douglas 1990, p.95)

While the work of Sterne and Borges anticipates the non-linearity of hypertext, neither writer can represent simultaneity within the constraints of the printed page:

> "Furthermore, the printed page constrains a narrative environment where simultaneity and the particular variety of non-linear chronology sought so strenuously by Sterne is not possible. This was first explored then demonstrated by Jorge Luis Borges in *The Garden of Forking Paths* : the post-modern narrative most overtly the successor to Sterne's novel."
> (Howell & Douglas 1990, p.97)

Using a characterisation of Borges' work by John Barth as the "literature of exhaustion", Bolter claims:

> "For Borges literature is exhausted because it is committed to a conclusive ending, to a single storyline and denouement. To renew literature one would have to write multiply, in a way that embraced possibilities rather than closed them off. Borges can imagine such a fiction, but he cannot produce it. The *Ficciones* are themselves conventional pieces of prose, meant to be read page by page. Yet the works he describes, the novels of Herbert Quain or the *Garden of Forking Paths*, belong in another writing space altogether. Borges himself never had available to him an electronic space... He could not see that the literature of exhaustion in print by no means exhausts the electronic medium."
> (Bolter 1991a, p.139)

From this sort of technological perspective, innovative writers using the medium of print were held back by unavailable technologies; if only they had had access to today's technology of hypertext, their visions could have been achieved. As if to demonstrate this claim, Moulthrop re-writes *The Garden of Forking Paths* as a hypertext, and investigates the response of students (Moulthrop 1991). However, he has to acknowledge that "no hypertextual product can realize the 'strictly infinite labyrinth' of Borges' fantasy" (Moulthrop 1991, p. 129). The basic problem is that Borges envisages not only multiple reading, but multiple reading *simultaneously*, and even with the electronic medium and the non-linearity of hypertext, only one path can be

chosen at any one moment. Despite this problem, hypertext is presented as a medium in which simultaneity is possible (Howell & Douglas 1990, Dickey 1991, Bolter 1991a, Bolter 1991b). The misleading feature of the claims made for hypertext is the notion that, because hyperdocuments have a non-linear structure, then the reader's activity must be non-linear; compared with print, reading in the electronic medium is somehow different - the new medium has given birth to the hypertextual reader.

But however one describes the structure of printed text, or hypertext, the process of reading requires duration; like speech, it has a sequential or linear aspect. In the case of speech, Saussure points out that the linguistic signifier has a temporal dimension (Saussure 1983, p.69), and that "linearity precludes the possibility of uttering two words simultaneously" (Saussure 1983, p.121); one can apply the same observation to reading and writing. In chapter six, we referred to Rousset's notion that the reader must defeat time in order to perceive the book as a simultaneous network of reciprocal relationships; thus "simultaneity is the myth of the total reading or description" (Derrida 1978a, p.24). We have seen that Borges' denial of time is shared by Howell and Douglas, who claim that an aspiration to simultaneity is common to Sterne, Borges and other experimental writers. Like Dickey's notion that hypertext provides "an effective illusion of the simultaneity of experience" (Dickey 1991, p.144), Bolter's notion of multiple reading or multiple writing takes no account of the temporal aspects of reading or writing (Bolter 1991a, pp.142-146). In the context of literary criticism, Derrida finds that "the search for the simultaneous explains the capacity to be fascinated by the spatial image" (Derrida 1978a, p.24); in Bolter's "topographic" accounts of writing, reading and writing are activities that occur in space but not in time (Bolter 1991a, Bolter 1991b).

It appears, therefore, that the hypertextual reader, as portrayed in the literature, suffers from an acute form of contiguity disorder: reading is the pursuit of associative relations (the intertextualities of Joyce, the associativities of Sterne), but not sequential ones; reading occurs in space, but not in time; and

the reader's goal is simultaneity or multiplicity. Yet Bolter's claim that hypertextual fiction enables multiple reading is not substantiated by the reading experiences described by Howell and Douglas (Howell & Douglas 1990, Douglas 1992). Interactive fiction does not allow different readings of the *same* text; rather, the reader is presented with a *different* text on each reading, and is not encouraged to develop any sort of global view of the fiction.

In the case of Michael Joyce's *Afternoon* for example, Howell and Douglas point out that "the reader searching for any over-riding structure will be frustrated - it deliberately hides the internal structure through esoteric mechanisms" (Howell & Douglas 1990, p.104). While Bolter likens interactive fiction to a computer game (Bolter 1991a, p.130), the difference is that players of games are given a clear objective, a set of rules, and are aware that they are playing a game. In comparison, the reader of *Afternoon* "often feels completely out of control, in a whirlwind of text that progresses by with no apparent rhyme or reason, reducing the reader's choices to seemingly meaningless seeds fed to some literary random number generator" (Howell & Douglas 1990, p.104). Here, Howell and Douglas are discussing reactions to the same hypertextual fiction that, according to Bolter, "offers a narrative that encompasses contradictory possibilities" and, therefore, encourages the reader to "read multiply" (Bolter 1991a, p.143).

In comparison, the print exemplars of non-linear structure, such as the *Dictionary of the Khazars,* enable the reader to see the entire text and develop their own reading scheme. Another exemplar of non-linear structure is Saporta's *Composition No.1,* a fiction that consists of one hundred and fifty loose sheets of unnumbered pages, where the reader is asked to shuffle the pack and read at random (Bolter 1991a, p.140). Here again the reader has the entire text at their disposal; this is not possible with the electronic fictions which disclose their texts according to the mysterious rules of their authors.

Above we discussed the metonymic drives in reading fiction, and here is a situation where, so it seems, those drives cannot be sustained. With the examples of interactive fiction cited in the literature, the reader's drive for knowledge - the urge to know what is going to happen next - is perpetually baffled, while the drive for comprehension is perpetually frustrated. Moreover, the reader's inability to name is not complemented by the sort of problem solving entailed in reading printed fiction; that is, the formulation of questions that are resolved by the unravelling of a hermeneutic code. Yet while the reader's metonymic drives are not sustained, according to Moulthrop the hypertextual reader's activity is still one of problem solving, and the reader still pursues a metonymic objective.

Moulthrop refers to Brooks (Brooks 1984), who, drawing on Jakobson and others, argues that reading narrative is a process of moving from metonymy to metaphor:

> "According to this idealist view, readers move from the confusion and multitude of narrative syntax to the shining wholeness of ending, where all parts achieve a satisfying integration. We negotiate the perplexities of the middle in order to reach the promised revelation of the end; metonymy precedes and enables metaphor. This theory is admirably suited to the interpretation of conventional narratives (not surprisingly, since it evolved mainly from readings of nineteenth century fiction); but it probably does not hold for hypertext."
> (Moulthrop 1991, pp.126-127)

Brooks' argument is therefore based on a metonymical notion of metaphor, in which metaphor is the "promised revelation of the end". However, Moulthrop uses Brooks' argument that "metonymy precedes and enables metaphor" to suggest that "hypertext drastically alters - perhaps even inverts - the relationship between metonymy and metaphor in conventional narrative" (Moulthrop 1991, p.128). Discussing student responses to his hypertextual version of Borges' *Garden of Forking Paths*, he claims that students begin by using the function keys presented on the screen as a "primary conceptual framework" or map; this map

"represents the text as totality or metaphor" (Moulthrop 1991, p.128). Using the map, students hope "to discover a design which... might prove to be buried or scattered in the text" (Moulthrop 1991, p.128); this design is the "plot", the metonymic goal that readers were trying to uncover. In this case then, metaphor apparently precedes and enables metonymy.

However, the function keys presented on Moulthrop's screen indicate four possible movements: "Up, Down, Left, and Right" (Moulthrop 1991, p.128). Using Moulthrop's observations then, we could argue that his readers are not starting from a "metaphor of the text" at all, but from spatial familiarity; readers are pursuing the spatial contiguity given by the function keys to compensate for the lack of sequential relations given by the story. One problem with Moulthrop's scenario is the inconsistent use of the term metaphor: on the one hand, Brooks' metonymic notion of metaphor as final revelation; on the other hand, Moulthrop's use of metaphor as textual totality. To this problem, we might add Moulthrop's metaphoric notion of metonymy as the "plot" that is hidden inside the story. Despite these problems, the observation that metaphor enables metonymy in the case of hypertextual fiction agrees in one sense with other accounts of the hypertextual reader (Howell & Douglas 1990, Douglas 1992, Bolter 1991a). The agreement is that hypertextual readers pursue associative relations rather than sequential ones, whether these are provided by the intertextuality of *Ulysses*, or the keywords of Michael Joyce's *Afternoon*. In the case of interactive fiction however, the reader's goal still appears to be the metonymic drive of trying to comprehend the story, and the reader's problem is the inability to obtain a global view of the text.

So far, we have discussed the hypertextual reader as a reader of hypertextual fiction. However, the argument that traditional narrative entails closure and fixity also applies to argumentation. According to Dickey, hypertext is a compositional tool that enables a "multiplicity of perspective" and "the rejection of a single rhetorical authority" (Dickey 1991, p.144). According to Bolter, the electronic writing space frees the writer from forcing

text into a "single line of argument" (Bolter 1991a, p.146). What are the implications of these comments for the hypertext designer and the hypertextual reader?

While the printed text provides examples of "non-linearity" in experimental fiction, it also provides examples of "non-linearity" in the presentation of arguments. According to McLuhan, the adoption of a fixed "point of view" is a feature of the Renaissance and one of the effects of print technology (McLuhan 1969, p.72). As a book, *The Gutenberg Galaxy* is written in a way that attempts to reflect its argument. McLuhan writes:

> "*The Gutenberg Galaxy* develops a mosaic or field approach to its problems. Such a mosaic image of numerous data and quotations in evidence offers the only practical means of revealing causal operations in history.
>
> The alternative procedure would be to offer a series of views of fixed relationships in pictorial space. Thus the galaxy or constellation of events upon which the present study concentrates is itself a mosaic of perpetually interacting forms that have undergone kaleidoscopic transformation - particularly in our own time."
> (McLuhan 1969, p.7)

However, it is this method of presentation that makes *The Gutenberg Galaxy* a difficult book for Jonathan Miller to summarise, and also to criticise:

> "In fact it is rather difficult to summarise the sprawling arguments of the *Gutenberg Galaxy*. Not only is the range of its cultural reference wider than anything that can be encompassed by a single critic, but the discussion is organised in strict obedience to the main thesis, in a fashion that actually forbids straightforward linear precis. This is no accident on McLuhan's part. He has deliberately laid out the evidence in what he calls a mosaic fashion, placing ideas and quotations side by side in suggestive juxtaposition, leaving the reader to draw his own conclusions as to their mutual significance. In doing this he has unfairly anticipated our consent to his claim that imaginative truth is distorted by explicitly linked arguments."
> (Miller 1971, p.8)

Miller adds that he remains "unconvinced by McLuhan's reasons for eschewing a linear arrangement of his ideas" (Miller 1971, p.8). In a similar fashion, Umberto Eco adds to a precis of McLuhan's ideas that "this collage of quotations summarizes McLuhan's position and, at the same time, exemplifies his techniques of argumentation, which - paradoxically - are so illustrative of his thesis that they undermine its validity" (Eco 1987a, p.230).

As an advocate of the *modus ponens* (Eco 1987b, p.130), Eco cites McLuhan's writings as an example of *cogito interruptus*, which is marked by the absence of terms such as "therefore" or "whereas" that indicate Western ideals of logic and reasoning (Eco 1987a, pp.221-222). In the case of *The Gutenberg Galaxy*, Eco points out that the absence of "therefores" in the juxtaposition of two sometimes contradictory ideas is filled in by the reader, despite McLuhan's insistence that the reader looks at the co-presence of arguments as a mere co-presence and not as a logical succession:

> "But the trouble is that, secretly, McLuhan *wants* us to put in that 'therefore', also because he knows that, out of Gutenbergian habit, as we are reading the two data lined up on the printed page, we will be forced to think in 'therefore' terms."
> (Eco 1987a, p.231)

According to Eco, in his later work McLuhan wants to promote a discourse which abandons the "chains of logic" and aims to present "unreasoned data" before the reader; in McLuhan's vision of a post-Gutenberg future, the book will be replaced by the "non-book", of which *The Gutenberg Galaxy* is a prototype (Eco 1987a, pp.231-232). Yet Eco describes an ambiguous situation in which, on the one hand, "McLuhan cannot elude the requirement of rational clarification of the process we are witnessing" (the emergence of the global village in the electronic era), while, on the other hand, "when he surrenders to that demand for cogito he is bound not to interrupt it" (Eco 1987a, p.232). Thus:

> "He doesn't just line up disconnected data and make us swallow them as if they were connected. He also makes an effort to present us with data that seem disconnected and contradictory while he believes them to be connected by logical operations, but he is ashamed of showing these operations in action."
> (Eco 1987a, p.232)

To demonstrate this ambiguity, Eco quotes an extract from *The Medium is the Massage* and suggests that the insertion of terms such as "in fact", "nevertheless", and "on the other hand" creates a reasoned argument (Eco 1987a, p.232).

However, the above discussion of the hypertextual reader suggests that there are two ways of viewing *The Gutenberg Galaxy*. On the one hand, viewing the book from the perspective of conventional argumentative texts, we can criticise McLuhan for his omission of the rhetorical devices that create a "cohesive" text (Halliday & Hasan 1976), thereby leaving the reader to infer causation by the spatial contiguity of quotations, assertions, observations, and so forth. In this case then, McLuhan's text raises the problems described by Miller and Eco. On the other hand, viewing the book from the perspective of hypertext, we might cite *The Gutenberg Galaxy* as another exemplar of non-linearity in printed texts. In this case, the hypertextual reader is a reader who once again pursues associative relations in making the connections omitted by McLuhan's "cogito interruptus". From a hypertextual perspective we might argue that, as a collage of quotations, the *Galaxy* represents a hypertext in print format, and if McLuhan had had access to today's technology, he would no doubt have designed his book as a hypertext, just as Borges would have re-written *The Garden of Forking Paths*. Unfortunately, the reader is constrained by the linearity of print to read the *Galaxy* from start to finish, and is unable to pursue alternative paths through the text, an option that hypertext now makes available.

If we adopt this latter perspective, how might we re-design *The Gutenberg Galaxy* as a hypertext? One problem is that the book is not solely a collage of quotations, as Eco indicates. Not only

are the quotations selective, but their arrangement indicates some sort of sequential ordering, and are intercut with McLuhan's comments; in other words, as Eco points out, the *Gutenberg Galaxy* is presented as an argument.

A hyperdocument was defined above as an electronic document that consists of nodes; nodes are connected to other nodes by links that enable a user or a reader to pursue various paths through the document. The simplest way of turning McLuhan's *Galaxy* into a hypertext is to treat each page of the book as a node, and treat each turning of the page as a link. We then create a hypertext that repeats the sequential ordering of the original, and restricts the reader to one path through the document. However, this would merely re-invent the scroll, as Whalley comments (Whalley 1993, p.9), and moreover, the reader would be unable to skip to earlier or later pages of the text without flipping every page. Yet even this apparently simple operation faces the problem that a page of text is too large for the average screen size, into which a node must fit. A node will have to be smaller than a page, so perhaps we should limit a node to a paragraph of text? These questions indicate some of the difficulties in creating hyperdocuments, particularly when the intention is to construct a sustained argument, as Whalley points out:

> "A line of argument will almost certainly make up more than a single paragraph. To reduce the presentation of text to the paragraph, or an arbitrary small number of paragraphs, is to make it more difficult to present a coherent view. However, the alternative of creating the 'electronic scroll', as has happened in many hypertext systems, is to completely defeat the ergonomic gains of rapid component access."
> (Whalley 1993, p.9)

Whalley discusses Nash's views of the paragraph in the context of designing prose (Nash 1980), and concludes that "to dispense with paragraph structure is to lose one of the most important techniques of composition available to the writer, and means that

hypertext is only likely to be suited to encyclopaedic or fragmented forms of knowledge" (Whalley 1993, p.9).

So it appears that we have several problems in turning *The Gutenberg Galaxy* into a hypertext. If we attempt to preserve its argument, this can only be achieved by re-inventing the scroll, and would serve no ergonomic purpose. But as the *Galaxy* is a non-linear text, surely we can afford to dismiss its line of argument, and create a hyperdocument from its source material? In that case, even if we restrict our purpose to creating a collage of quotes, the reader still faces the ergonomic problems of reading from the screen that were noted in chapter three, and we still have to fragment the quotes into nodes. In addition, how are we going to link these quotes together? The ultimate hypertext is one in which each node is connected to every other node, but the practical problem of displaying all these paths is difficult to resolve. But perhaps it is too authoritarian for the designer to control the linking of nodes, so should we not allow the reader to sort out this problem?

This approach is advocated by those who view hypertext as an essential part of a constructivist learning environment (Cunningham, Duffy & Knuth 1993). A constructivist view of learning:

> "... holds that instruction is less a process in which knowledge is communicated to learners, and more a matter of nurturing the ongoing processes whereby learners come to understand the world in which they live. In this view, knowledge is an active process of construction, not the receipt of information from external sources. The role of textbooks and other instructional media shifts from one which seeks to maximise the communication of fixed content and/or skills to one in which students engage in the knowledge construction process ..."
> (Cunningham et al 1993, pp.20-21)

From this constructivist perspective, "the primary feature of traditional textbooks is that they are geared to knowledge telling rather than knowledge construction" (Cunningham et al 1993,

p.30). Just as McLuhan claims that the medium of print enforces a unilinear perspective, Cunningham and colleagues claim that the textbook "typically provides a consistent, unified point of view" and "serves as an authority on a topic" (Cunningham et al 1993, p.30). If the traditional textbook is used as the sole resource for learning, "learning simply becomes a matter of receiving and accepting the specified questions or point of view" (Cunningham et al 1993, p.30). Having discussed the advantages of *Intermedia*, a hypertextual learning environment at Brown University (Landow & Delany 1991, Yankelovich, Meyrowitz & van Dam 1991, Yankelovich 1991), these authors predict that:

> "... the textbook of the future will be a construction of the learner, drawing upon the database and authoring, linking and customising tools provided. Instructional software will be of a different type: instead of selecting, organising and presenting content, software will provide tools that enable students to select, construct, organise and customise information from a variety of sources and representational modes."
> (Cunningham et al 1993, p.45)

While one might applaud the aims of a constructivist perspective, the notion of the textbook of the future does raise some practical problems. The nodes of a hypertext must be linked in some way at the design stage, because if there are no links whatsoever, then there is no way of accessing the nodes, and no way of knowing what sort of information is contained in the hypertext. However, one aspect of hypertext research is the use of AI techniques to assist authors or users in the construction of links (Knopik & Ryser 1990, Boyle & Snell 1990, Nicolson 1990, Mayes, Kibby & Anderson 1990, Kibby & Mayes 1993). Using these techniques, the construction of links may be deferred by designing software that decides what links to construct each time the hypertext is used. In this case, the links are not permanently fixed. Kibby and Mayes describe such a design, which "demonstrates that fixed links between objects such as individual graphics or fragments of text are not necessary to generate a hypertext system" (Kibby & Mayes 1993, p.143). In their design, links are generated at run time by an "automatic computation of

'relatedness' between nodes", where nodes are related by "conceptual connectivity" or "semantic proximity" (Kibby & Mayes 1993, p.138).

These techniques have been used to design a learning environment in which the learner is encouraged to learn with concepts and structure their own learning (Mayes et al 1990, p.126). However, although the links are not generated until the system is running, it is the software rather than the learner that selects a node and constructs a link, using information supplied by the learner. The system relies on the use of AI techniques to represent knowledge. Knowledge is represented as attributes (George, Rada & Beer 1991), and up to sixty attributes are used to encode each node of text. When the system is running, it asks the learner to specify a number of attributes, and the software chooses an appropriate node. As envisaged by the designers, part of the learning process therefore lies in working out why such a node was chosen by the system; thus "the kind of query system approach embodied in *StrathTutor* turns hypertext on its head" (Mayes et al 1990, p.126). The designers explain that "instead of the nodes being thought of as the units of content, the attributes in this implicit network can be thought of as the nodes and the links as the attaching of these attributes to individual frames" (Mayes et al 1990, p.126).

From the perspective of the hypertext designer, McKnight and colleagues point out that this system:

> "... might be thought to offer an 'automatic' approach to linking. However, the decisions involved in linking are merely replaced by the necessity to rate each card of the document on 60 dimensions. As Kibby and Mayes point out, the approach becomes less tenable as the size of the document increases."
> (McKnight, Richardson & Dillon 1993, p.119)

From a constructivist perspective on learning, one might also criticise the system because the learner is not provided with the means of constructing their own links. From either point of view, this method of structuring hypertext by the use of AI techniques

of concept representation is not without its problems. Moreover, one could argue that the constructivist notion of an unstructured hypertext represents a sort of hermeneutic circle for the designer. On the one hand, some kind of linking is necessary in order to access the nodes in the hypertext; otherwise, the contents of the hypertext cannot be made available to the learner. On the other hand, the purpose of disclosing the contents was to enable the learner to construct their own links, and the links have now been constructed by the designer. The problem is not resolved by the use of AI techniques to construct links at run time, as it removes decision making from the learner to the software, and with Kibby and Mayes' approach, the learner has no way of knowing what nodes are contained in the hypertext.

Kibby and Mayes' approach also assumes that the nodes of a hypertext are representations of concepts (Roth & Frisby 1986). To apply AI methods of representing knowledge to the authoring of hypertext, we must assume that a hypertext is some kind of knowledge base, and that these methods are equally relevant whatever the domain of knowledge (Koh, Loo & Chua 1990, Jonassen 1990, Jonassen 1993, Storrs 1993, Duncan 1993, Beer & Diaper 1991, Knopik & Ryser 1990, Boyle & Snell 1990, Nicolson 1990). However, the use of hypertext to construct a knowledge base is only one of the many uses of hypertext.

10.3 STRATEGIES OF READING

The above discussion has highlighted two general approaches to the use of hypertext. The first was to consider the translation of an existing text in print format into an electronic format. In this case, our design will need to take into account Seneca's observations that different kinds of readers will pursue different kinds of goals. Designing a hypertextual structure therefore raises two questions. The first concerns the node: How should we segment a given text (encyclopaedia, instruction manual, novel), or construct a database consisting of multiple texts? The second concerns the link: How should we construct reading paths through

the nodes that will enable different readers with different needs to pursue their own paths through the database? The second approach is to consider the design of new texts or materials that make use of hypertext to present or structure information in a way that would be inconceivable in print format; for example, John Cayley's use of hypertext to present "hyperpoems" (Cayley 1993). This approach may incorporate the first, for instance when constructing knowledge bases that incorporate existing texts.

In either case, designing a hypertextual structure raises the two questions of defining nodes and links. A further question is whether to anticipate all possible reading paths and construct links accordingly, or whether to give the reader as much flexibility as possible. In addition, we need to ask whether and how the hypertext can be amended, and whether its creation or amending will be performed by multiple users (Rada 1989). General guidelines on these questions can only be given at the cost of specificity; for example, by assuming that a hypertext is a hyperdocument, database or knowledge base. Turning to specificity then, a hypertext can be:

- an "interactive fiction" (Howell & Douglas 1990);
- a literary text (Delany & Gilbert 1991, Slatin 1988);
- a corpus of texts (Crane & Mylonas 1991, Kahn 1991, Friedlander 1991);
- a manual on the laws and regulations governing social security payments (Storrs 1993);
- a university prospectus (Nicolson 1990);
- a guide to "What's on in Edinburgh?" (Edwards & Hardman 1993);
- a re-invented book (Benest 1990);
- a polished on-screen document (Rahtz, Carr & Hall 1990);
- a designer's notepad (Sommerville, Haddley, Mariani & Thomson 1990);
- a hyperpoem (Cayley 1993);
- a learning support environment (Allinson & Hammond 1993);
- an open learning system for writers (Williams 1991b);
- a semantic network (Jonassen 1990, Jonassen 1993);

- a tool for collaborative writing (Trigg & Suchman 1993);
- an electronic journal (Brondmo & Davenport 1990).

Conklin describes "four broad application areas" in his overview of hypertext (Conklin 1987, p.20): macro literary systems such as large on-line libraries, problem exploration tools "to support early unstructured thinking on a problem when many disconnected ideas come to mind", browsing systems or micro literary systems, and general hypertext technology such as the *Intermedia* system developed at Brown University (Landow & Delany 1991, Yankelovich, Meyrowitz & van Dam 1991, Yankelovich 1991).

This diversity in the use of hypertext is reflected in definitions of the node. For example, in translating a veterinary reference manual into a hyperdocument, "each section in the reference manual becomes a hypertext node" (Boyle & Snell 1990, p.33), but in using a general knowledge analysis tool to translate a social security reference manual, a node is a paragraph of text (Storrs 1993, p.130). In Kibby and Mayes' method of learning by conceptual orientation, a node is the representation of a concept, but also a fragment of text, a frame or a screen (Kibby & Mayes 1993, p.138). In their frame-based hypermedia system, Koh and colleagues choose "to equate a primitive node to a basic media object" (Koh et al 1990, p.159), while a further application of AI to assist hypertext design uses two types of node: concept and text (Knopik & Ryser 1990, p.226).

Given this diversity in the use of hypertext, in what sense can we refer to a "hypertextual reader"? Is the hypertextual reader a different kind of reader to the reader of printed texts, as Bolter suggests (Bolter 1991a)? In Bolter's generalisations on reading, there appears to be five kinds of reader: the passive reader, the naive reader, the reader who reads for entertainment, the critical reader, and the hypertextual reader. According to Bolter, "passive reading" occurs when "the reader 'loses himself' in the world of the story" (Bolter 1991a, p.155):

> "Losing oneself in a fictional world is the goal of the naive reader or one who reads for entertainment. It is particularly

> a feature of genre fiction, such as romance and science fiction. The capacity of electronic text ironically to comment on itself keeps the reader from falling too far or too long into passivity. The reader of "Afternoon" is forced every turn to reflect on the experience of reading."
> (Bolter 1991a, p.155)

So the passive reader, the naive reader, and the reader who reads for entertainment all pursue the same goal: "the goal of passive reading is to forget oneself by identifying with the narrative world presented" (Bolter 1991a, p.228). In comparison, the hypertextual reader is exemplified by the reader of interactive fiction, particularly *Afternoon,* and is a critical reader. As passive reading is "antireading" (Bolter 1991a, p.228), we can summarise Bolter's generalisations on readers by the two term typology: readers and antireaders.

According to Culler's account of reader-response criticism, theories of the reader present a problem in that "the reader" alternates between a reader who is manipulated by the text, and a reader who "actively takes charge" (Culler 1983, p.71). We face a similar problem with Bolter's notion of the hypertextual reader. According to Bolter, the electronic medium *forces* the hypertextual reader to be a reflective reader; thus the hypertextual reader has no choice but to be a critical reader. Likewise, the narrative world in which the passive reader gets lost is that presented by genre fiction or televised soap operas: "In all these cases the reader assumes a passive role, enters into the text, and loses any real critical distance" (Bolter 1991a, p.228). According to Bolter therefore, readers can be identified by what they read; it is the medium or the type of text that enforces some kind of reading activity, and creates the type of reader. Moreover, Bolter displays the sort of ethical view of media and text types that we described at the beginning of the last chapter. It is not only genre fiction and broadcast television, but also virtual reality, virtual museums and simulated environments that discourage reflective thinking, because "viewers are encouraged to lose themselves (and therefore their critical judgement) in the simulation" (Bolter 1991a, p.231). In comparison, hypertext represents the way forward: "A

museum of the electronic age should be seeking to turn artifacts into elements of a hypertextual book, not a simulated environment" (Bolter 1991a, p.231).

While interactive fiction enforces a critical distance, interactive movies also encourage this loss of self (Bolter 1991a, p.229). It appears, therefore, that interactive television creates the same sort of viewer as broadcast television:

> "Under computer control, televised images can be joined with verbal text and graphics to form a rich, hypertextual structure. However, current television programs are not designed to be 'read' in any such hypertextual fashion. They are meant to be viewed linearly, in order to keep the viewer glued to one channel even through the commercials. Television programs and commercials together are designed to create a perceptual world that merges with the viewer's living room or bedroom. They invite viewers to lose themselves, not to stand back and analyze critically."
> (Bolter 1991a, p.228)

So, media and text types are to be judged in terms of the types of viewers or readers that they create. While certain media are criticised for their seductive properties, the computer, and hypertext above all, are to be appreciated for their distancing properties. Yet on the other hand, the computer must possess some mystical property that makes it intrinsically superior to other media, because although Bolter criticises the loss of self when viewing television or reading genre fiction, he also claims:

> "Surely there has never been a better text in which to lose oneself than the electronic library realized by the computer... The computer as hypertext is the newest in a long line of candidates for the universal book. And like all the previous candidates, the computer makes the seductive promise to break down the barrier between thought and writing, to join the mind and writing surface into a seamless whole."
> (Bolter 1991a, p.206)

The notion that hypertext promises to dissolve the barrier between thought and writing would appear to make hypertext no

different to the virtual reality that seduces its "viewers" into losing their critical detachment.

Applying Genette's observations above to the specificity of hypertext, it would seem that the range of its use is too diverse to make generalisations about a hypertextual reader, particularly generalisations that are based on the reader of interactive fiction. As Seneca points out, "the object which we have in view, after all, makes a great deal of difference to the manner in which we approach any subject" (Seneca 1969, pp.209-210). It is not only the readers of literary texts who have diverse goals, but the readers of hypertexts, and, as we noted in chapter three, the electronic medium has no inherent tendencies to create readers or antireaders. In order to model the process of writing, we looked at writing strategies rather than writers; so, let's look at strategies of reading rather than readers. What sort of objectives do users of hypertext have in view - to what purpose does the hypertextual reader read?

According to Wright, models of reading have confined themselves to the processes of constructing meaning (Wright 1993, p.139); some of these models were discussed in chapter six. In addition, "most research studies are concerned with similar reading purposes", such as comprehension and recall (Wright 1993, p.139). The result is that despite "the sizeable research literature on the psychology of reading processes", the problems of reading strategies have been relatively ignored, and strategy selection has been omitted as a component in models of the reading process (Wright 1993, pp.138-139). She identifies three kinds of reading activities - linear reading, browsing and deliberate searching - and discusses the influence of information design, such as glossaries and overview diagrams, on information-seeking strategies when using print and hypertext.

McAleese argues that browsing is the main activity of hypertext users (McAleese 1993). Browsing is to be distinguished from deliberate or direct searching, in which the user knows what they are looking for but not where to find it. Monk calls this direct

searching "exploratory navigation", and makes a distinction between this activity and "directed navigation", in which the user not only knows what they are looking for but also where to find it (Monk 1990, p.20). Compared with direct searching (or both types of Monk's "navigation"), browsing is a more general search for information, with varying degrees of purpose. McAleese discusses three types of browsing: a "specific" browsing, in which the user searches for information within certain parameters, a "general" browsing, in which the user does not create any boundaries to their search, and a "serendipitous" browsing, in which the user "roams" or "wanders" with no purpose (McAleese 1993, pp.8-10). Further types of reading strategies are identified by research into database usage: "scanning", a linear version of direct searching, and "exploring", in which the user finds out the extent of the information base (McAleese 1993, pp.9-10).

While McAleese argues that browsing or undirected searching is the main activity of hypertext users, he also argues that there is a close relationship between this activity and "associationism" (McAleese 1993, p.6). The link between hypertext and "associationism" derives from a paper written by Bush (1945), who many claim to be the inventor of hypertext:

> "Many authors trace the origins of hypertext back to a paper in 1945 written by Vannevar Bush. In this paper, Bush conceived of an information storage and retrieval system - the 'memex'. In the memex, items were associatively linked in a manner which, to Bush, paralleled the 'association of ideas' characterisation of memory."
> (McKnight, Dillon & Richardson 1993, p.5)

According to Conklin, Bush's memex "contained a very large library as well as personal notes, photographs, and sketches" (Conklin 1987, p.20). Using microfilm and photocells, Bush designed the facility to establish "a labelled link between any two points in the library" (Conklin 1987, p20). Bush describes his purpose as follows:

> "The human mind ... operates by association. Man cannot hope fully to duplicate this mental process artificially, but

> he certainly ought to be able to learn from it. One cannot hope to equal the speed and flexibility with which the mind follows an associative trail, but it should be possible to beat the mind decisively in regard to the permanence and clarity of the items retrieved from storage."
> (Bush 1945, cited in Conklin 1987, p.20)

According to Conklin, Bush's aspiration was "to mechanize the scientific literature system" and "to support more natural forms of indexing and retrieval" (Conklin 1987, p.20).

While Bush's concern was the indexing and retrieval of information, he was aware that a machine could not replicate the speed and flexibility of associative thought. However, McAleese claims that users of machines now expect instant access to information:

> "The central notion of a hypertext system is of linking chunks of information together... Users of such systems browse or scan or search or trace ideas from one element to another. Further, they expect rapid access to the information required. Information is only a 'mouse movement' away. Users have expectations that when their intellectual window is open on a particular topic they will be able to find out what they do not know 'immediately'..."
> (McAleese 1993, p.6)

According to McAleese, it is widely accepted that "the ability to browse quickly in a hypermedia system is critical to its usability" (McAleese 1993, p.6). After claiming that "'instant' access to information is important in developing ideas", McAleese adds that "the ability to follow an idea quickly is an ingredient in browsing" (McAleese 1993, p.6).

However, there are two problems with this account of browsing. The first concerns a user's expectations about hypertext. If, as we are frequently told in the literature, a hypertext is some kind of database, then our expectations about hypertext will be influenced accordingly. In addition, an expectation of rapid access is partly a consequence of the user's purpose, and partly of the conditions in which the software is used, as we explained in

chapter three. This expectation will be greater if the user knows what they are looking for. If the user is "exploring", then, by definition, they are merely finding out what is contained in the database, rather than looking for specific information.

The second problem concerns the close relationship between browsing and associationism. On the one hand, McAleese claims that instant access to information is important for developing ideas; on the other hand, it is not instant access to information, but "the ability to follow an idea quickly" which is "an ingredient in browsing" (McAleese 1993, p.6). Here we have what seems to be a case of "cogito interruptus", where we have to make an equation to fill in the gap between two sentences - accessing information instantly is equivalent to following an idea quickly. He continues:

> "To follow an idea is to use an 'associationist approach'... That is, one bit of information triggers an association with another bit of information... "
> (McAleese 1993, p.6)

Here, McAleese appears to be referring to the associative relations of human memory that we discussed in chapter seven, so that "information" refers to items in memory. However, he then claims that "browsing is where an idea is followed using the linking mechanism of the hypertext elements (eg cards, windows, nodes)" (McAleese 1993, p.6). Here, McAleese is now referring to hypertext rather than human memory - but in that case, it is not "ideas" but "information" in the form of texts that are linked together. Finally, the close relationship between hypertext and "associationism" appears to be one of equivalence, because, in searching for information, browsing is "using associations (or links) to determine the next item to be accessed" (McAleese 1993, p.7). Thus ideas are equivalent to information, so that hypertext appears to replicate human memory.

Bush however, as the above quote makes clear, pointed out that a machine could not compete with the speed of associative thought, and his aim was not to *duplicate* this mental process. He was more concerned with an alternative method of information

indexing and retrieval, which enabled the user to construct links between items of data. One problem with the above discussion of browsing and associationism is the omission of this activity; types of browsing are identified by observing how users search for information in databases, where links have already been inserted. To browse is to follow a path through a database. A user's activities would also include link construction and writing in the case of *Intermedia* (Landow & Delany 1991), for example, which is a writing environment as well as a database. A student writing an essay on a literary topic would have access to an electronic library with fixed links, a space for writing, and the facility for constructing their own links between reference materials.

In chapter four, we noted the criticism of the "consensus model of writing" for its lack of distinction between "mental structures and analogous ones on an external medium" (Sharples & Pemberton 1992, p.326):

> "For example, the phrase 'ideas organising' is commonly used to describe the activity of creating and modifying symbols or words organised as an associative network on some external medium. But physical marks are not ideas; the networks have the status of an 'intermediate representation', a bridge between mental structures and text, with some of the properties of each."
> (Sharples & Pemberton 1992, p.326)

By a similar confusion of an "idea" with "information", McAleese argues that there is a close relationship between browsing and "associationism". But the first is contained in the head, while the second is contained in a database. When someone is browsing through a database, it is not "ideas" that are pursued but paths through the database which link chunks of information.

While McAleese makes the equation between associative thinking and pursuing paths through a database, Jonassen goes further in claiming that the *structure* of hypertext reflects the *structure* of human memory:

> "Many writers have asserted that hypertext mimics the associative networks of human memory... Bush (1945), who developed the first hypertext prototype, believed that since the human mind operates by association, our machines for storing and accessing information should also reflect those associative structures."
> (Jonassen 1990, p.142)

According to Jonassen, hypertext is different from other database technologies in that "the logical control mechanism for accessing or manipulating information... is primarily associative, enabling users to navigate through an associative network of ideas" (Jonassen 1990, pp.143-144). He argues that "the instructional process may be thought of as the mapping of subject matter knowledge (usually that possessed by the teacher or expert) onto the learner's knowledge structure" (Jonassen 1990, p.144):

> "Hypertext structures can be designed to reflect the semantic structure of a subject matter expert. If instruction is the mapping of the teacher's knowledge structure on the learner and if hypertext is an effective instructional medium and if the node-link structure of the hypertext reflects the semantic structure of the expert, then there is good reason to believe that the expert's logic may be mapped directly onto the novice browser. This hypothesis obviously demands empirical verification which is currently being carried out."
> (Jonassen 1990, p.144)

Jonassen argues that in order to design hypertexts "that reflect the semantic structure of the expert", we need to "assess and map the expert's knowledge structure" (Jonassen 1990, p.145). He then describes how to use the technique of free word association to construct a "semantic map of ideas that comprise a knowledge domain"; a semantic map is a "spatial map that reflects the semantic distances between ideas" (Jonassen 1990, p.145). A second technique is pattern noting, in which lines are added to a central idea, again using free association, and related ideas are connected to those lines (Jonassen 1990, pp.146-147). Both techniques therefore involve the sort of "brainstorming" that Sharples and Pemberton describe as a technique in writing (Sharples & Pemberton 1992, pp.324-325).

Jonassen then describes how a semantic map can be applied to hypertext design. Assuming that hypertext structure reflects expert knowledge structure, he remarks that "the three most difficult problems in designing a hypertext are how to get started, what nodes should the hypertext contain, and how should they be linked" (Jonassen 1990, p.149). According to Jonassen, solving each of these problems can be assisted by the two techniques of knowledge-mapping described above. A semantic map can then be used to define a structure of nodes and links, or to design a graphical browser, which is the most direct way of mapping an expert's knowledge structure onto hypertext. A user or learner clicks on the topics displayed on a graphical browser to visit the node (Jonassen 1990, pp.149-150).

To investigate his hypothesis, Jonassen carries out three empirical studies, in which he assesses "the effects of semantically structured hypertexts on learners' knowledge structures" (Jonassen 1993, p.157). This in turn requires methods of assessing and measuring learners' structural knowledge (Jonassen 1993, pp.157-158). However, the results of the empirical studies are disappointing, as the effects appear to be insignificant, and Jonassen concludes "that merely providing structural cues in the user interface of a hypertext will not result in significant increases in structural knowledge acquisition" (Jonassen 1993, p.164). For one explanation of these results, he turns to Whalley's observation on the "mistaken notion... that the arbitrary 'webs' of facts in hypertext systems have much semantic significance" (Whalley 1990, p.63), and adds:

> "What matters most in learning is the construction of personally relevant knowledge structures. It appears that arbitrarily imposed semantic nets may not be adequate to overcome personal ones or at least not directly map onto learners' knowledge structures. So, merely showing learners structural relationships, without a purpose for doing so, is probably not sufficient to result in meaningful encoding of that information. When structural knowledge outcomes are required, learners apparently do attend to the structural

information and encode it into memory."
(Jonassen, 1993, p.164)

Both McAleese and Whalley identify browsing as the main strategy of reading hypertext (McAleese 1993, Whalley 1990, Whalley 1993). However, Jonassen agrees with Whalley that browsing is a strategy which is inappropriate for many forms of learning. The students in Jonassen's studies "lacked a clear purpose for studying the hypertext" (Jonassen 1993, p.164), and he comments:

> "The question is the extent to which unconstrained browsing can support instructional goals, especially without a clearly established purpose for studying... Learning from hypertext must rely on externally imposed or mediated learning tasks - merely browsing through a knowledge base does not engender deep enough processing to result in meaningful learning."
> (Jonassen 1993, p.164)

Jonassen's observations that browsing must be purposeful to result in meaningful learning agrees with the constructivists' comments on the cognitive context of learning. Claiming that "cognition is situated in experience", Cunningham and colleagues argue that how we as learners impose order on our learning environment is largely determined by our purpose: "the cognitive context which is imposed or in which we place ourselves" (Cunningham et al 1993, p.23). This in turn provides an argument for "situated leaning":

> "More specifically, the relevance of information, the interrelationships in that information environment, and the potential applications of that information that we see are all determined in large measure by the goals or purpose we bring to the learning environment. Hence, if the goal is to pass a test, relevance is determined by the school context of what might be tested. If, however, the goal is to use that information in some real world application then relevance and interrelationships will be determined in large measure by that real world task."
> (Cunningham et al 1993, pp.23-24)

Situating learning makes use of the observation that learners make sense of concepts by engaging in the activity that circumscribes those concepts (Brown, Collins & Duguid 1989a, 1989b). If we apply this notion to Jonassen's research into structural knowledge acquisition, then for structural knowledge to be "meaningful" to students, they themselves must be engaged in the process of creating the structures that Jonassen's hypertext merely displays.

Jonassen suggests that it was the *novelty* of hypertext for his students that prevented its effective use as a teaching tool; thus a more balanced evaluation would also consider students who are "hypertext-literate" (Jonassen 1993, p.165). The presentation of structural cues, such as graphical browsers, had no effect on structural knowledge acquisition: "the more novel the appearance of the hypertext... the more negatively the students reacted to it" (Jonassen 1993, p.165). For Jonassen, this calls into question "the ability of learners to engage in meaningful learning rather than information retrieval from hypertext" (Jonassen 1993, p.165). Yet it is difficult to see how students become hypertext-literate or engage in meaningful learning about structural knowledge if they are merely presented with a database. In the case of graphical browsers, Whalley points out that "such high-level abstractions are always going to be in danger of 'spoon-feeding' students with structures that they should be developing for themselves" (Whalley 1993, p.14). If students are not involved in the design of such novelties as associative networks or graphical browsers, then the structural knowledge that Jonassen hopes will be acquired will remain mysterious, and hypertext will remain a mere source of information.

The results of Jonassen's empirical studies therefore lead him to question one assumption of his initial hypothesis: that hypertext is an effective instructional medium. However, he does not question the other assumptions on which his hypothesis is based. We list them here in the order in which they appear above:

1. Hypertext is primarily an associative network of ideas.
2. The structure of hypertext reflects the structure of human memory.
3. Semantics can be represented as a structure.
4. Knowledge can also be represented as a structure.
5. Instruction is the mapping of an expert's knowledge structure onto a novice's knowledge structure.
6. Expert knowledge can be represented by the node and link structure of hypertext.
7. Statistical analysis of the results of free association can produce a semantic map.
8. A semantic map can be transplanted directly onto hypertext design.
9. Structural knowledge can be measured.

The first two assumptions were discussed above, where we pointed out that links in hypertext connect nodes of texts or data rather than ideas. In chapter seven we discussed how the process of remembering is governed by associative relations; here, Jonassen assumes that the structure of human memory is organised as an associative network. In chapter seven, we also referred to the distinction between episodic and semantic memory. Episodic memory is organised according to the spatial-temporal contexts of events and scenes from our personal experience, while semantic memory includes our generalised schemata for events, objects, human psychology and behaviour, and so forth. It is this "interrelated knowledge within semantic memory" that, according to Jonassen, is organised as an associative network (Jonassen 1993, p.155). The claim that the structure of hypertext reflects that of human memory therefore rests on the assumptions that semantics and knowledge can both be represented by the node and link structure of hypertext, that a semantic map can be constructed by analysing the results of free association, and that "we can map the associative knowledge structure of an expert... onto the structure of a hypertext" (Jonassen 1993, p154). These assumptions are informed by the rationalistic view of semantics discussed in chapter six.

10.4 ASSOCIATIVE AND SEMANTIC NETWORKS

Semantic networks have been developed by AI researchers as a method of representing knowledge. Conklin describes a semantic network as "a knowledge representation scheme consisting of a directed graph in which concepts are represented as nodes, and the relationships between concepts are represented as the links between them" (Conklin 1987, p.37). He points out that "what distinguishes a semantic network as an AI representation scheme is that concepts in the representation are indexed by their semantic content rather than by some arbitrary... ordering" (Conklin 1987, p.37). In cognitive science, the terms "concept" and "conceptual category" are used interchangeably "to refer to mental representations of objects, entities and events" (Roth & Frisby 1986, p.20). In cognitive science, the theory of conceptual categories assumes that concepts and ideas have an autonomous existence from language. In terms of the two approaches to language discussed in previous chapters, "concepts" and "conceptual categories" are either signifieds that require signifiers in order to exist, or names that classify things in the real world.

Conceptual category theory derives from Aristotle (Roth & Frisby 1986, p.44). Like Aristotle, Collins and Quillian use biology as a model (Collins & Quillian 1969), and propose that "concepts of living organisms are represented as a hierarchy of categories, each linked to a list of defining properties" (Roth & Frisby 1986, p.43). Quillian is also credited with the proposal for a semantic memory, in which semantic knowledge is organised along similar lines (Quillian 1968). Figure 23 shows an example of a semantic network for the conceptual category of flowering plants, in which the entities, plants, form the nodes of the net, and their defining properties form the link names or link types. For simplicity's sake, we assume a world in which there are only seven types of plant. This net has a hierarchical structure, with the class or genus of flowering plants at the top, and individual species of plant at the bottom. Such a structure is not essential to a semantic net, but whatever the arrangement of the nodes, a semantic net must have

typed links which indicate how to proceed from one node to another.

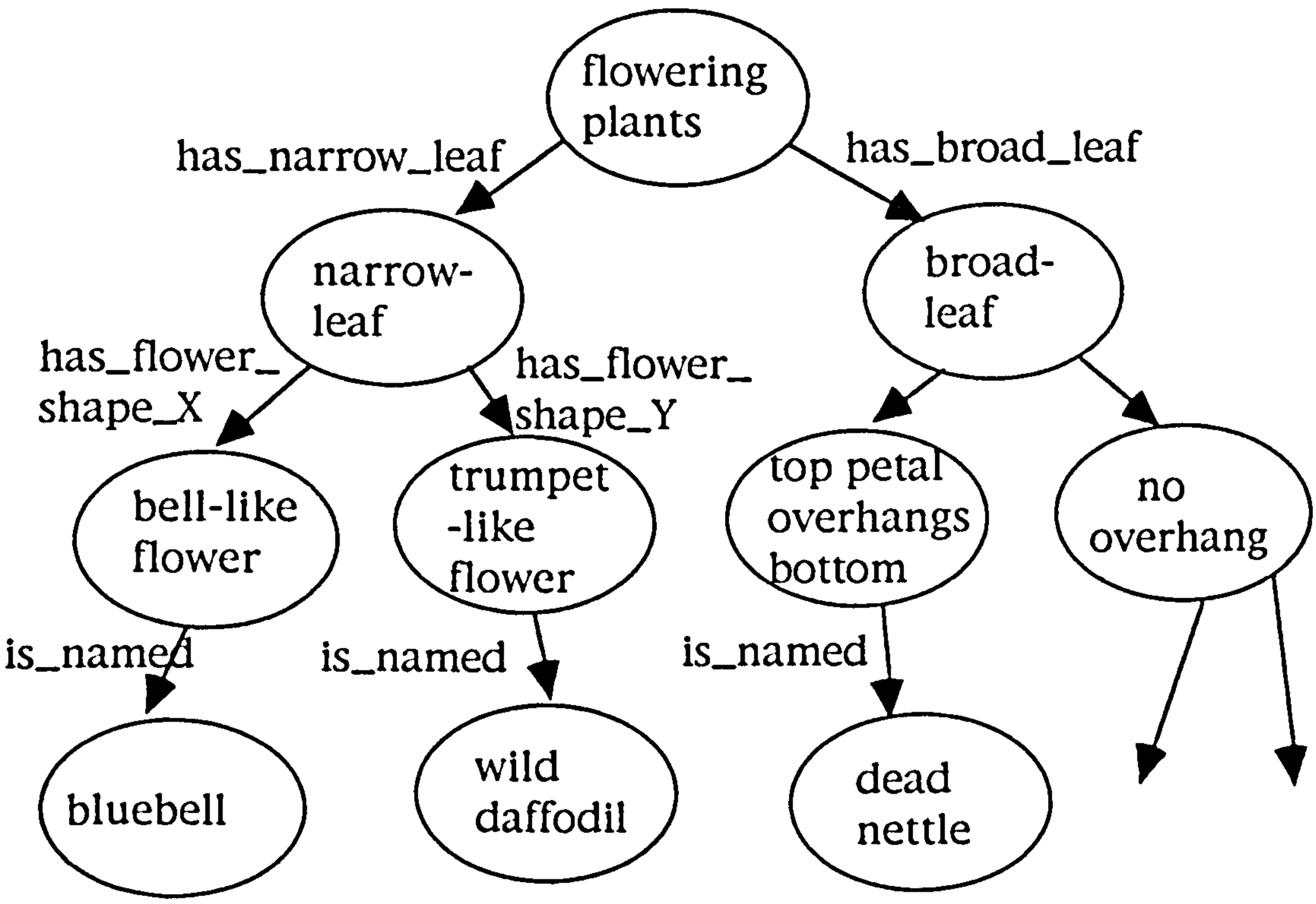


FIGURE 23: A SEMANTIC NETWORK FOR FLOWERING PLANTS

Is an associative network equivalent to a semantic network, as Jonassen suggests? To answer this question, let's use the technique of free association to create an associative network for *Sarrasine,* the Balzac tale of Barthes' analysis. Using the title as the initial prompt, we list a stream of associations in sequence as they occur. Here we give an example of four strings. The end of each string marks a pause, in which the previous strings are read before another is generated:

Sarrasine:
- Who or what is Sarrasine? » enigmas » problem solving » reading » naming

- denotation » connotation » femininity » antithesis » La Zambinella » S/Z » the axis of castration
- connotation » semes » characters
- the codes » unfolding » proairesis »vraisemblance » the real » Balzac » Flaubert

To turn this chain of associations into a network, we turn the items in the chain into nodes, and delete duplicates. Between the nodes, we draw the links given by the original chain. The result is the associative network represented by Figure 24.

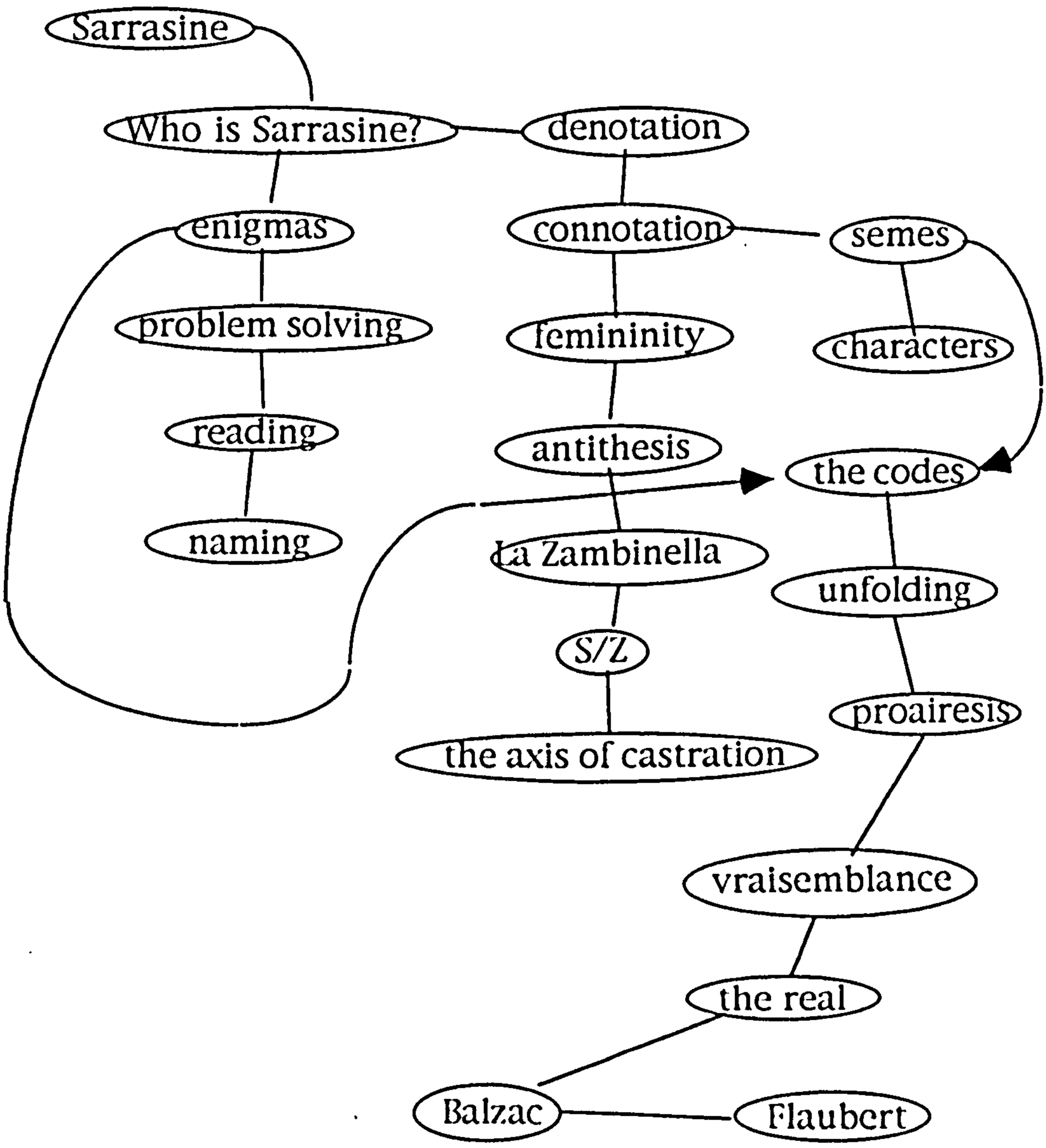


FIGURE 24: AN ASSOCIATIVE NETWORK FOR *SARRASINE*

More links could be added to this associative net where there appears to be further connections between nodes. However, to turn this associative network into a semantic network, we need to show *how* the nodes are connected: the types of link need to be identified or *named*. As the original list was the result of spontaneity, we assumed that the links between items in the associative chain were generally implicit. In the process of naming links however, some of the nodes in the associative net now turn into links in the semantic net. Further nodes and links have been inserted into the associative net to produce the semantic network represented by Figure 25. The result is a different kind of semantic network to the hierarchical one of Figure 23, but in either case, an associative network is not equivalent to a semantic network.

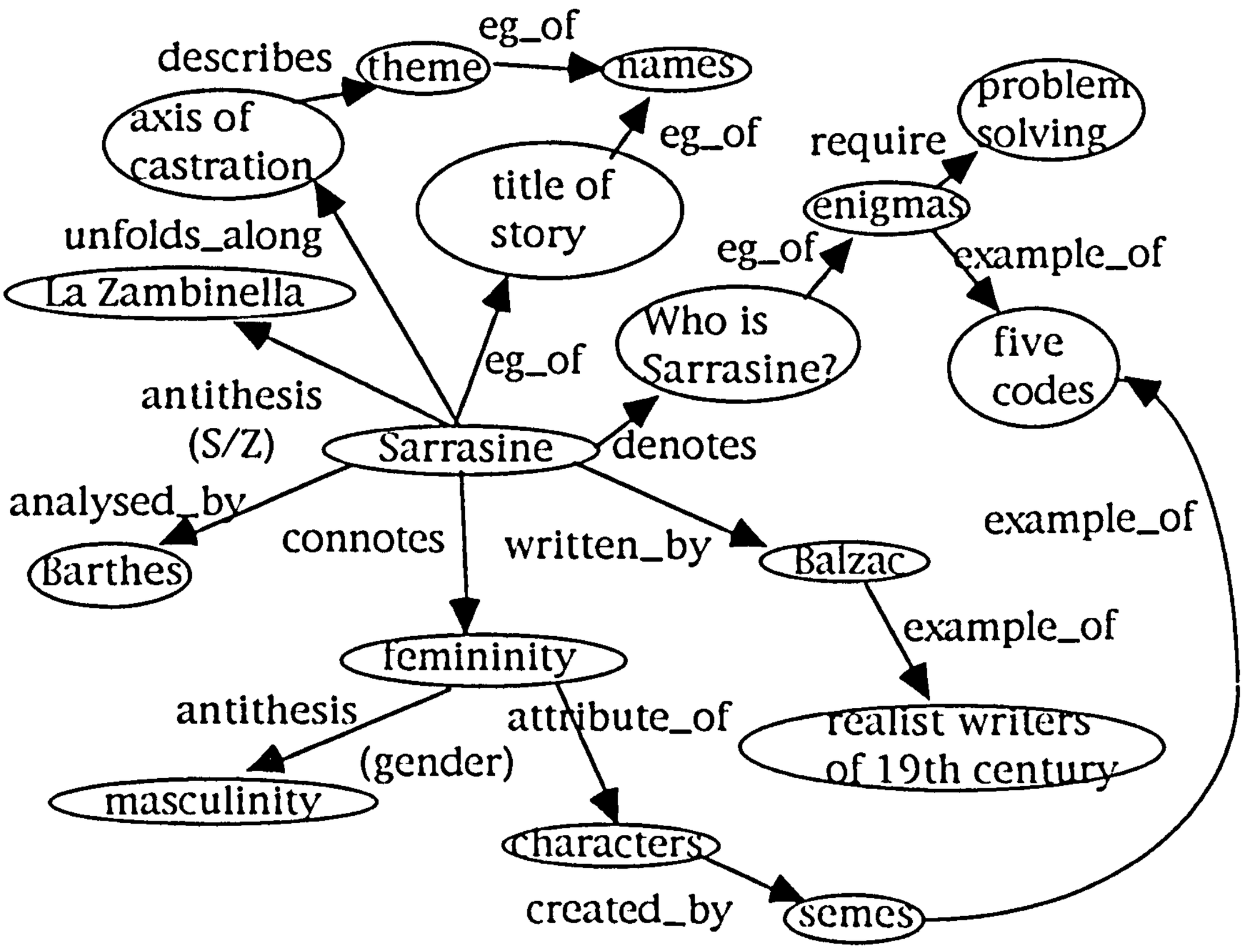


FIGURE 25: A SEMANTIC NETWORK FOR *SARRASINE*

What is the relationship between semantic networks and hypertext? Conklin describes the relation as follows:

> The analogy to hypertext is straightforward: Hypertext nodes can be thought of as representing single concepts or ideas, internode links as representing the semantic interdependencies among these ideas, and the process of building a hypertext network as a kind of informal knowledge engineering. The difference is that AI knowledge engineers are usually striving to build representations which can be mechanically interpreted, whereas the goal of the hypertext writer is often to capture an interwoven collection of ideas without regard to their machine interpretability..."
> (Conklin 1987, p.37)

Although this analogy still reflects the notion of linking ideas rather than texts, this notion of hypertext has been used to design writing software, in which writers construct their own semantic networks as an aid to developing argumentative texts (see chapter five). For example, Conklin describes the "Issue Based Information System" (IBIS), initially developed by Rittel and Webber (1973) as a teleconferencing system. The IBIS includes three types of node (*issues*, *positions*, and *arguments*) and nine types of relation to link these nodes, such as *responds_to*, *questions*, *supports*, *objects_to*, and *refers_to* (Conklin 1987, p.24). The IBIS has been adapted by Sharples and colleagues to form a tool for designing their "Writer's Assistant" (Sharples, Goodlet & Pemberton 1989, pp.30-31). However, when hypertext is used as a tool for writers - that is, as a space or a set of spaces for writing (Bolter 1991a) - the writer, or the software designer, still faces the problem of how to "linearise" the nodes of text into a sequential argument (Ghaoui, George, Rada, Beer & Getta 1992).

In these examples, hypertext is used to design a tool which writers or designers can use to construct their own semantic network. However, a semantic network can be used to guide the design of a hypertext itself, as advocated by Jonassen and others (Jonassen 1990, Jonassen 1993, Rada 1989, George, Rada & Beer 1991, Beer & Diaper 1991). Rada argues that "linear" texts such as

bibliographies or thesauruses can readily be viewed as semantic networks (Rada 1989). Therefore, some texts can be translated into hypertexts more easily if we use a semantic network as a model for designing nodes and links. However, texts such as dictionaries, encyclopaedias, thesauruses, and other works of reference are organised according to the sort of "conceptual categories" shown in Figure 23. Mapping other kinds of texts onto this type of semantic network is not feasible (Ghaoui et al 1992), and assumes the essentialist view of semantics that we discussed in chapter six.

Further problems arise with a semantic network that is derived from an associative network, such as the one shown in Figure 25. As an associative net is the result of free association, the connections between nodes might only have a personalised relevance. This feature is hopefully removed by turning the associative net into a semantic net, because the names of links are intended to have a generalised relevance. However, Holt's experiments on the structuring of hypertexts show the difficulties of establishing a consensus on link names or "relatedness" between nodes (Holt, Howell, & Gjengendal 1991).

Holt and colleagues describe a hypertext authoring system "HyperNet", which is "specifically designed as a highly interactive modelling tool for research purposes" (Holt et al 1991, p.192). With this system, the hypertext author must name every node and specify all links between nodes. However, when using the first version of the system, authors found it difficult to name the connections between nodes. This raised the question "whether it is possible to describe overtly and systematically the logical connections that an author has in mind when constructing a hypertext" (Holt et al 1991, p.194). Holt and colleagues investigate this problem by an experiment in which a node is defined as a paragraph of text. The purpose of the experiment is to find out whether a reader can describe the logical relationships between pairs of paragraphs which are "related, semi-related or unrelated" (Holt et al 1991, p.193). Participants generally found this task difficult, but one surprising result is that nearly one in five found

a relationship between unrelated paragraphs. Another result is a large variation in how paragraphs are reported as related, and Holt and colleagues can find only three general themes that may serve as link names, themes which are "vague and global in their perspective": *how_to_do_or_use*, *explains*, and *gives_examples_of* (Holt et al 1991, p.195).

One could argue that naming links between nodes of a semantic net should be easier than naming connections between paragraphs; in the former case, we are only dealing with the links between names, signifiers, or "conceptual categories". However, our argument concerns the use of a semantic net to guide hypertext design. Jonassen proposes that a semantic net represents a hypertext structure, so that nodes in the net become nodes within hypertext. The names of the former therefore indicate the names of the latter. When a node is an entire document or part of a document, then the name of the node is also the title of the document or chapter. In that case, a semantic net serves as the guide to an electronic library, in which texts are read in the same way as print. The "non-linearity" of hypertext is only apparent when jumping between documents or to different parts of a document, in which case the node is a smaller unit of text. As we have seen, this "primitive" or "atomic" node is frequently defined as a paragraph. In this case, a link between nodes is a link between paragraphs, and to use a semantic net to design these links, a paragraph must have a name.

To have a name however, a paragraph must be structured in a particular fashion. Nash discusses four varieties of rhetorical design: the step, the stack, the chain, and the balance (Nash 1980). In the case of the stack, the rhetorical pattern "is one of definition and extension" (Nash 1980, p.12); a topic is announced in the opening sentence of the paragraph, and then amplified. So, just as a sentence has a name or a topic, this kind of paragraph has a topic sentence. In this case then, the name of the topic sentence is also the name of the paragraph, and hence the name of the node. However, if every node is designed in this way, a hypertext becomes a collection of paragraphs that are only connected by the

links between their names; thus hypertext can be viewed as the "fragmented text form" of Whalley's description, a form that is not conducive to the authoring of cohesive argument (Whalley 1993, p.7). On the other hand, a cohesive argument will take up more than one paragraph, and, as Whalley also indicates, the alternative to the fragmented text form is to create the "electronic scroll" (Whalley 1993, p.9).

10.5 STRUCTURES AND NAVIGATION

The problem of structuring hypertext is therefore not only a question of design (defining the nodes and links of a hypertext structure) but also a question of authoring (writing the textual content of nodes), and these two questions are difficult to separate as both must address the purpose of the hypertext and the purpose of its readers. The use of a semantic net to design a hypertext also has implications for the hypertextual reader. One possible consequence is the notion that a hypertext represents some kind of semantic space that the reader must navigate while under the constant threat of becoming lost. The notion that a hypertext has a spatial existence is not restricted to those who view its structure in terms of semantics. It is also a consequence of an over-emphasis on structure, which, as Derrida points out, is inseparable from space. From this perspective, the interrelation of node and link forms the organic whole of hypertext structure, which has various "archetypal" shapes, such as the hierarchy, the hub-and-spokes, or the network (Figure 26). From this angle, the first question for the designer is "What structure is the most appropriate to my purpose"?

Following these assumptions, we might argue that if a hypertext is structured according to a certain pattern, this pattern can be displayed to the reader, and the reader will not get lost in the hypertext or "information space" (Beard & Walker 1990). While Bolter presents "getting lost" as a worthwhile goal to pursue in the case of the universal book, other writers on hypertext have described this phenomenon as one of the problems with hypertext

(Conklin 1987, Wright & Lickorish 1989, Wright & Lickorish 1990, Simpson & McKnight 1990, Beard & Walker 1990, McAleese 1993, Edwards & Hardman 1993, Boyle & Snell 1990, Monk 1990). For example:

> "Often the components of a problem can be arrayed on a two-dimensional information space. Sometimes the information has a visual analogue that makes the meaning of the information space clear to the user; a city map or a cat-screen medical image, for example... If the two-dimensional information space fits completely onto a display screen, there is no navigation problem. Users can point to any location using one of the computer's pointing devices. They are never lost because they can always see the complete information space."
> (Beard & Walker 1990, p.451)

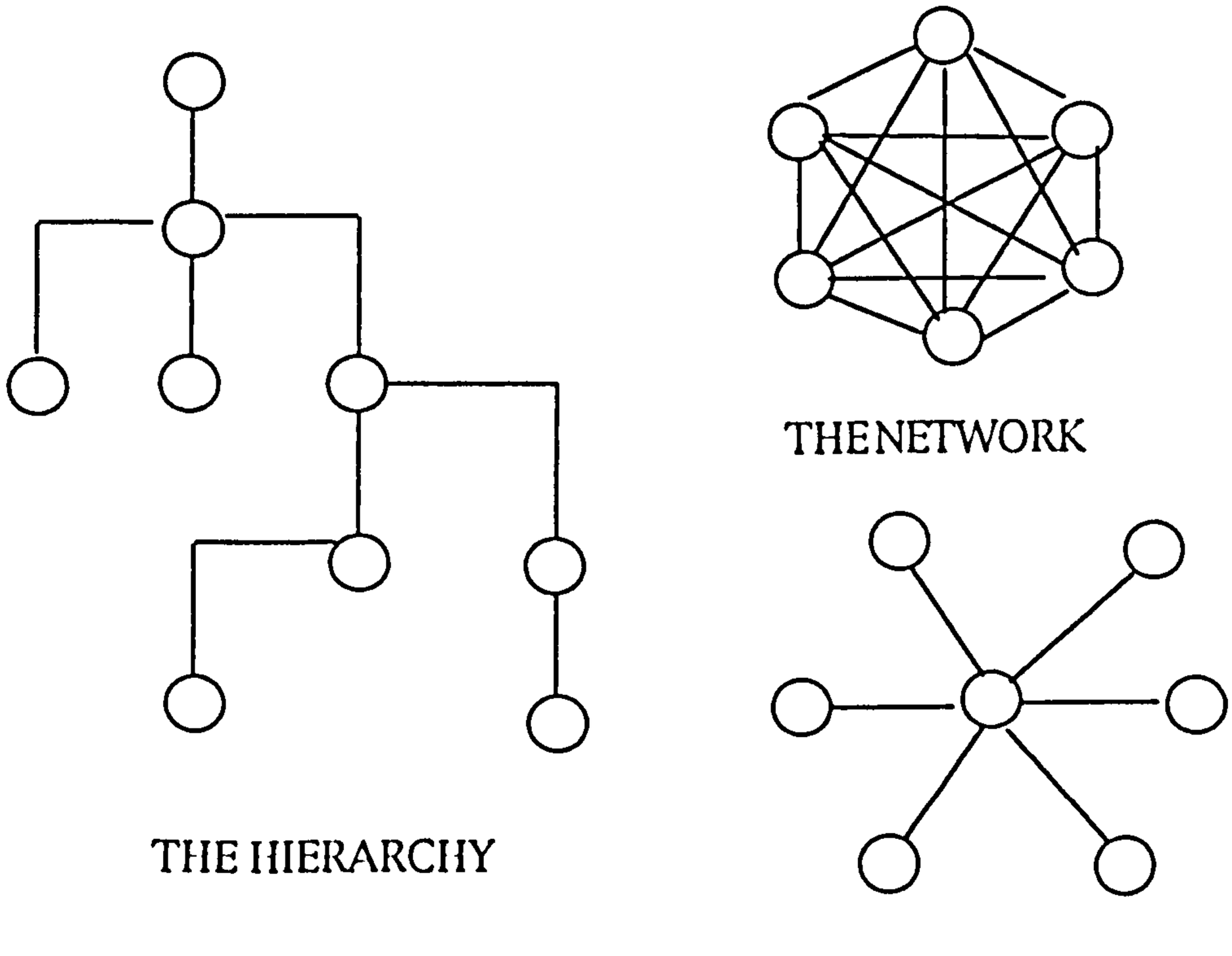


FIGURE 26: HYPERTEXT STRUCTURES

For large two-dimensional information spaces such as hypertext, Beard and Walker advocate the use of a map window to aid navigation. The information filter (Conklin 1987, p.38) and the fish-eye browser (McAleese 1993, pp.34-35) serve a similar function. Graphical browsers are advocated by Conklin (1987), McAleese (1993), and Jonassen (1990, 1993) as a means of navigation, while McAleese also advocates the nodal browser (McAleese 1993, pp.30-31). Monk (1990) argues for a personal browser to get to a reader's favourite locations. In all these cases, getting lost is viewed as a navigational problem, which can be rectified by displaying the structure of the hypertext.

The problem of finding an appropriate structure for a hypertext is alleviated when translating printed texts, if we can map the printed text onto a particular structure. Wright and Lickorish argue that hypertext structure should be viewed as a whole in terms of discourse structure, and not "simply in terms of nodes and links" (Wright & Lickorish 1989, p.118). They identify four types of discourse structure in printed texts, which are also apparent in hypertexts: the hierarchical (reference works in which the same categories of information apply to a variety of entities), the modular (many kinds of reference materials), the highly cohesive argumentative text, and the multi-thematic (hypertexts designed to instruct). Discussing the influence of discourse structure on hypertext design, they argue that different kinds of structure require different kinds of navigational aids (Wright & Lickorish 1989). In an empirical investigation of navigational aids, Wright and Lickorish compare two systems for two types of hypertext (Wright & Lickorish 1990). They find that readers preferred index type navigation for a book-like hypertext with a modular information structure, but preferred page navigation for a hypertext with a hierarchical structure. In this example, page navigation displays pages, or nodes, by names or categories rather than page numbers.

In another empirical investigation of navigation, Simpson and McKnight find that a hierarchical contents list is more efficient than an alphabetical index in enabling navigation and

information retrieval (Simpson & McKnight 1990). They also ask participants to produce a structural map of the hypertext, and find a positive correlation between the ability to navigate in the hypertext and the ability to produce an accurate map of its structure. Thus, those readers using a hierarchical contents list produced a more accurate map than those using an alphabetical index. As the hypertext used in this investigation had a hierarchical structure, these findings agree with those of Wright and Lickorish, and Simpson and McKnight also comment that "a hierarchy may not be the optimum structure for all types of text, and methods of conveying structural information for other structures are required" (Simpson & McKnight 1990, p.82).

Edwards and Hardman make an analogy between navigating in hypertextual space and navigating in a physical environment (Edwards & Hardman 1993). According to Edwards and Hardman, research into how humans orientate themselves in unfamiliar places has highlighted four stages in the construction of cognitive maps. Initially we identify specific landmarks; the next stage is to construct route maps that link them. Thirdly, we construct survey-type maps of small areas, and the fourth stage is to build larger-scale maps from these smaller-scale maps. As studies of simulated environments have produced similar results, Edwards and Hardman hypothesise that the hypertextual reader creates a "spatial cognitive map" of a hypertext (Edwards & Hardman 1993, pp.90-92).

To investigate this hypothesis, Edwards and Hardman construct an experiment that examines "the effects of different hypertext structures on users' perceptions of that document" (Edwards & Hardman 1993, p.92). Three types of structure are used in the experiment: a hierarchy, an alphabetically indexed structure, and a mixed structure that combines both features. Participants are given some information retrieval tasks to familiarise themselves with the hypertext, and are then shown a number of cards that represent information screens from the hypertext. They are asked to place them "as they imagined them to be arranged in the hypertext document" (Edwards & Hardman

1993, p.98). Edwards and Hardman hypothesise that the "mixed structure" condition will disrupt the navigator's ability to construct an accurate map, and this hypothesis is confirmed by the results. However, readers created a hierarchical representation of structure in both the indexed and the hierarchically structured conditions. Edwards and Hardman conclude that "individuals appear to be attempting to create cognitive representations of hypertext structures in the form of a survey-type map" (Edwards & Hardman 1993, p.104). The difficulties of constructing a map in the mixed condition "has implications for the way hypertext documents are structured" (Edwards & Hardman 1993, p.104). The results also provide further evidence that hypertext structure has implications for navigational aids.

However, the hypertext used in all three conditions of this experiment was "a specially constructed database containing information about various facilities offered by the City of Edinburgh and Edinburgh University in the form of a public information system" (Edwards & Hardman 1993, p.92). In this case, the content of the hypertext seems to provide an argument for the analogy between navigating hypertextual space and navigating the physical environment. Yet it seems that neither the structure of the database nor the navigational support make use of the visual analogue of a city map which, in this case, would make "the meaning of the information space clear to the user" (Beard & Walker 1990, p.451). Baird and Percival use a travel metaphor to guide navigation in a database that contains similar information about Glasgow; thus readers can go on an architectural walk, a historical journey, a shopping expedition, and various other trips (Baird & Percival 1993, p.68). Allinson and Hammond also use a travel metaphor to conduct novice users on a guided tour of their learning support environment (Allinson & Hammond 1993 p.59).

However, Dillon and colleagues question the assumption that information occupies a space through which readers travel or move, and argue that the notion of navigating electronic space can lead to confusion (Dillon, McKnight & Richardson 1993, p.171).

They point out that the results of psychological research into navigation in the physical environment cannot be directly transferred to the electronic domain. Discussing this research, they find that landmark knowledge (such as typographic cues) is more relevant than survey-type knowledge (such as structural plans) to navigation in paper and hypertext. Moreover, they argue that the issue of navigation "is clouded by the confusion of terms such as information space and semantic space and the mistaken assumption that a document's physical instantiation through a presentation medium is equivalent to the semantic space an author intended to convey" (Dillon et al 1993, p.188).

Dillon and colleagues argue that we need to distinguish between the notion of navigating through an information structure, and the notion of navigating through a semantic space. They point out that "in effect we cannot navigate semantic space, at least not in the way we navigate physical environments, we can only navigate the physical instantiations that we develop of the semantic space" (Dillon et al 1993, p.187):

> "Ultimately, we believe the idea of directly navigating semantic space has to be spurious. Semantic space is an abstract psycholinguistic concept which cannot be directly observed, only represented by way of alternative instantiations. By definition, semantic space is n-dimensional and practically unbounded. In order to visualise the semantic space it needs to be given physical representation and in so doing, it becomes at most three-dimensional (though more often two-dimensional) and physically bounded. In this form it is easy to see how concepts such as navigation appear relevant and thus we may talk of moving through semantic space in a manner equivalent to navigating physical environments."
> (Dillon et al 1993, pp.186-187)

Let's now attempt to conclude this discussion of the hypertextual reader from the perspective of hypertext design. Given the definition of a hypertext in terms of nodes and links, there are three ways of viewing the structuring of hypertext. Firstly, we can view the interrelation of node and link in its entirety as some kind of organic whole, and attempt to fit the

content of the hypertext into some ready-made pattern. For the translation of existing texts on paper, this may not be a difficult task, as shown by Wright and Lickorish's analysis of discourse structure. However, we noted in chapter three that there are ergonomic problems in reading large documents from the screen, and we have mentioned that the main strategy of reading hypertext is browsing rather than linear reading. This suggests that readers tend to use hypertext as a source of information, rather than read hypertext in order to comprehend a global discourse. According to Whalley, this observation applies not only to hypertexts designed as databases, but also to those designed as argumentative or instructional texts. Considerations such as these lead him to question the use of hypertext for learning, and he concludes that hypertext "is not a suitable medium to form the core of teaching materials" (Whalley 1993, p.17).

Secondly, we can view the structuring of hypertext by considering the types of node that it might contain. At a macro level, a node may be an entire document if we are linking texts in an electronic library. At the same level, a node may also be a name, a signifier or a "conceptual category" in a semantic network. But at a micro level we have seen that a node is often defined as a paragraph. To define a node as a paragraph is to define a node in terms of its textual content, and often assumes that a paragraph is part of a continuous text. In many cases, the paragraph is part of a continuous discourse, but here we face the rhetorical problem in designing argumentation for hypertext, the problem that Whalley describes as fragmenting cohesive text into nodes. An alternative way of defining the node is to define its function in terms of the overall purpose of the hypertext. From this functional perspective, the same type of node may contain a word, a sentence, or a paragraph.

Thirdly, we can view the structuring of hypertext by considering the types of link and the reader's activity in jumping from node to node. We have seen that Kibby and Mayes have applied AI techniques to design a system of automated or "intelligent" linking. In AI approaches to the design of authoring

systems, hypertext is viewed as a knowledge-base or database in which information can be represented by the standard AI techniques of concept or knowledge representation, techniques that are application independent. From an AI perspective, a link between nodes is not viewed in terms of the reader's activity in jumping from node to node, but is seen as a structural connection between representations of knowledge or concepts. On the other hand, links between documents are often considered from the navigational perspective. According to Landow, the rhetoric of hypermedia includes a rhetoric of departure and a rhetoric of arrival, so that his rules for authors include labelling links to clearly indicate the reader's "destination" (Landow 1991, p.97). Orientation devices such as graphical browsers serve a similar purpose of permitting readers "to determine their present location" (Landow 1991, p.86). From this perspective of hypertext as an information space, links are viewed, not in terms of the reader's activity, but as a problem for interface design.

Given the linking capability of hypertext, it is not surprising that the assumption frequently made about the reader's activity is associative thinking. A relation between texts that is encoded by the author or designer of the hypertext is viewed as a possible association made by its reader. Thus Landow writes that "the emphasis upon linking materials in hypermedia stimulates and encourages habits of relational thinking in the reader" (Landow 1991, p.83). We have seen that associative thinking and simultaneity are emphasised in discussions of interactive fiction. McAleese describes the reader's activity in browsing as associative thinking, and equates the pursuit of information with the pursuit of ideas. For Jonassen, the main activity of the hypertextual reader is also associative thinking, while the structure of hypertext is also an associative structure that reflects, parallels, or mimics that of human memory. In his case, the use of a semantic net to design hypertext structure reflects the notion of hypertext as a semantic space that is criticised by Dillon, McKnight and Richardson. In addition, to construct a semantic net from the results of free association or brainstorming is to turn sequentiality into simultaneity; the result of associative thinking is a list that is

turned into an "associative" structure. A further problem in using a semantic net as a guide to hypertext design is this foregrounding of hypertextual structure and the assumption that the reader's activity is confined to navigating within it.

In summary, we can conclude that notions of the hypertextual reader suffer from a particular form of contiguity disorder, in which the reader pursues associative relations in an informational or semantic space; reading has a spatial but no temporal dimension, and thinking is associative but not sequential. Perhaps metonymy is ignored because of its associations with linearity, compared with the non-linearity of hypertext and consequently its associations with metaphor. We have noted the use of a travel metaphor to guide navigation in a learning support environment (Allinson & Hammond 1993, p.59). Baird and Percival claim that "metaphors in general, and the travel metaphor in particular, are extremely powerful aids to navigation around complex data structures such as hypertext systems" (Baird & Percival 1993, p.68). However, their particular concern is a database designed to assist visitors to Glasgow, in which a travel metaphor seems appropriate.

In the case of hypertext structure, the concern for finding a suitable metaphor or model appears to be based on the notion of hypertextual space and the assumption that the lack of a pattern will result in the reader's becoming lost. We have seen that getting lost is viewed as a problem of navigation and the user interface, which can be rectified by displaying the structure of the hypertext. However, Dillon and colleagues claim that "the evidence for navigational difficulties is often circumstantial or inferential" (Dillon et al 1993, p.171). Moreover, guides to navigation are also viewed in the literature as guides to browsing, which suggests that getting lost is also the result of pursuing a particular reading strategy. We have noted that these range from reading for comprehension to direct search and information retrieval, while the most common strategy of browsing is pursued with varying degrees of purpose. It may be the lack of purpose that results in getting lost, and while this lack is generally attributed in the

literature to the need for direction or guidance in the use of hypertext, the hypertext may equally not be designed in a way that encourages purposeful reading.

While discussions of the hypertextual reader tend to emphasise metaphor and associative relations, the absence of metonymy and sequential relations is reflected in this general failure to consider the pursuit of goals or the linear aspect of reading. Wright and Lickorish conclude their empirical investigation of navigation with the comment that "authors need to bear in mind both the structure inherent in the content material and the tasks readers will be seeking to accomplish when they are designing navigation systems for hypertexts" (Wright & Lickorish 1990, p.93). In their discussion of discourse structure, they also point to the reader's tasks as "an important influence on hypertext design" (Wright & Lickorish 1989, p.118):

> "There can be a wide variety of such tasks (answering specific queries, learning new facts or ideas, gathering together pieces of information for use elsewhere such as consulting the hypertext during a writing or planning task). Many of these tasks will require that readers have ready access to facilities other than just jumping and reading."
> (Wright & Lickorish 1989, p.118)

Wright and Lickorish identify the facility for taking notes as a particular facility that many readers would find useful.

This discussion has highlighted the difficulties in separating the problem of systems design (designing the software that enables authors or designers to construct a hypertext) from that of authoring (writing or compiling the textual content of nodes). The first is traditionally the concern of the software expert, and the second that of the domain expert. However, the problem of defining and designing the nodes and links of a specific hypertext cannot be separated from the question of content on the one hand, and the constraints that the authoring system imposes on form on the other hand. Holt's experiments on logical structuring show some of the difficulties in establishing a consensus on link names, even within a limited domain (Holt et al 1991); yet AI approaches

to systems design assume an application and domain independence. Seneca observes that different readers use the same text for different purposes. If we are designing a hypertext to serve a specific purpose, then different domains will present their own set of problems, whose resolution may require a specific treatment and their own hypertextual structures.

Given these general observations, let's now return to the specific task of designing a writing aid for student writers of fiction. From this perspective, a reader's goal is to write a story, and their navigation through information space is not aimless but has a purpose: searching, not for ideas, but for a specific kind of information that will assist thinking and writing. In an empirical investigation of information retrieval, McKnight and colleagues find that, "for some texts and some tasks", a linear format is more efficient than hypertext (McKnight, Dillon & Richardson 1990, p.18). On the other hand, studies of "minimal manuals" demonstrate the effectiveness of activity based and goal centred learning (Ramsay & Oatley 1991, Draper & Oatley 1992). One possibility, therefore, is a minimal database for fiction writers, designed as a thinking aid, reference text or expandable notebook. However, we need a model of writing that identifies the kinds of thinking in fiction writing. Given this kind of model, a modular structured hypertext or menu based system could be designed to assist these activities. Our tasks are therefore a combination of naming and problem solving: naming the types of node and link contained in such a hypertext, and identifying the activities of its users.

10.6 CONCLUSION

In this chapter we explored hypertext in some detail. We discussed the argument that, when compared with the linearity of printed text, the non-linearity of hypertext involves a different kind of reader. We looked firstly at the ways in which printed texts are said to contain non-linearity. We found that accounts of non-linearity in printed texts emphasise simultaneity and associative relations, but ignore the temporal or sequential aspect

of reading. We discussed texts that are said to exemplify such non-linearity, such as Borges' *Ficciones* and McLuhan's *Gutenberg Galaxy*. We also discussed the view of hypertext as a vital part of a constructivist learning environment, in which the non-linearity of hypertext provides an alternative to the linear authority of traditional text books.

We then considered the different uses of hypertext. We found that the notion of a hypertextual reader does not take into account this range of applications, but assumes that a non-linear structure necessitates a different kind of reader. We argued that readers of hypertexts are no different to readers of linear texts, in that all readers pursue a range of strategies in reading. The choice of strategy depends on the task that readers are engaged in. Research has shown that the most popular strategy for reading hypertexts is browsing. We discussed the argument that there is a close relationship between browsing and "associationism" - the pursuit of ideas by following associative thought. We argued that browsing involves the pursuit of paths through a textual database, rather than the pursuit of ideas through associative thought.

Some argue that hypertext mimics the associative networks of human memory. We discussed this notion and identified the differences between associative and semantic networks. We showed how a semantic network can be used to design a hypertext, and also explained why this is not always feasible. We argued that there can be no general answer to questions about hypertext structure, design, and authoring - these questions must address the purpose of the hypertext and the purpose of its readers.

Some argue that hypertext represents a semantic space through which readers navigate. We discussed this notion and found that the analogy between navigating in a physical environment and navigating in an information space has a limited application. We suggested an alternative explanation for the phenomenon of getting lost in a hypertext - it may be that the reader lacks a purpose in browsing, and the design of the

hypertext may not encourage purposeful reading. We concluded that notions of the hypertextual reader suffer from a particular form of contiguity disorder - the reader pursues associative but not sequential relations, reading has a spatial but not a temporal dimension, and the reader's goals and tasks are not taken into account.

Having discussed hypertext in some detail, we are now in a position to represent the findings of the previous chapters. In their model of writing, Hayes and Flower (1980a) use the metaphor of information processing to represent writing operations (Figure 2). In the next chapter, we use the metaphor of hypertext to represent thinking processes in fiction writing.

CHAPTER ELEVEN:

A COGNITIVE MODEL OF FICTION WRITING

11.1 INTRODUCTION

In this chapter we present the results of our investigations over the latter course of this thesis in the form of a cognitive model of fiction writing. The model is based on the basic model of writing discussed in chapter five. We identify the principal elements of cognitive planning in fiction writing as remembering and reflecting, imagining, focusing the imagination, and problem solving. Each of these processes can be applied to events, scenes, syntax, and names or signifiers. Just as Hayes and Flower (1980a) use the metaphor of information processing to represent writing operations, we use the metaphor of hypertext to represent these thinking processes.

Discussing the model in more detail, we compare it with other models of writing, and show how it is similar to cognitive models in its concern for representation and process. We discuss the question of testing the model, and argue that empirical tests of the model in its entirety are not feasible. Some researchers suggest that a model of writing can be tested by designing and testing a software tool based on the model. We discuss this notion and conclude that the testing of models and the testing of software are separate questions. We also discuss the notion of iterative design, and the place of models of writing in this process.

Finally, we show how the model can be used in design by using it to construct a hypertextual aid for student writers of fiction. The aid is planned initially as a minimal database or minimal manual that would assist the planning of fiction writing. We discuss the structure of the tool in terms of modules, nodes and links, and we outline the incremental stages in developing, implementing and evaluating a prototype. Whether such a tool could be developed into a personalised notebook for fiction writers is a question that must await future developments.

11.2 A COGNITIVE MODEL OF FICTION WRITING

In an essay that describes the historical development and the basic assumptions of cognitive psychology, George Mandler points out that its original label was "human information processing" (Mandler 1985, p.7). From this perspective, cognition is the processing of information or representations. In Mandler's view, "representation and process are the primary foci of all the cognitive disciplines", and represent the basic foundations of a cognitive science (Mandler 1985, p.10):

> "Representation in the widest sense of the term is the central issue in cognitive psychology. The concept of representation is intimately tied to, and possibly identical with, the issue of useful theory. Representational systems are theoretical constructs that are postulated as responsible for (that cause or generate) the observable thoughts, actions, etc. of the organism. There is of course no one-to-one correspondence between an act and its representation; we do not use the term representation in the sense of a symbol that 'stands for' some other event. The representation of knowledge, in other words, is the theoretical system that is constructed in order to explain, understand, and predict the behavior of organisms."
> (Mandler 1985, p.11)

Here, Mandler uses the term representation in the context of acts or events on the one hand, and knowledge on the other. However, it is the representation of knowledge that is the traditional concern of a cognitive science:

> "If we are to have any kind of reasonable theory about human thought and action, then we must have a system that represents what the organism knows. Thus, representation becomes a necessary part of any mental theory. A commitment to the importance of representation leaves open the *kind* of representational system one wishes to use or construct."
> (Mandler 1985, p.11)

The second primary concern of a cognitive science is process:

> "Representation in a narrow sense would provide only more or less static sources of cognition; we also need the processes that shape representations and transform them."
> (Mandler 1985, p.11)

According to Mandler however, cognitive psychology cannot be equated with a psychology of thinking; nor is it exclusively concerned with the representation of knowledge:

> "Historically, the concern with representation is a concern with the representation of knowledge, and hence the identification with cognition. However, the current use of representation clearly goes beyond any narrow definition of knowledge. On the other hand, there exists another tradition that identifies knowledge with conscious knowledge and in turn identifies the latter with the term cognition. The older cognitive psychologies, which were part of that tradition, have identified cognition with a psychology of 'thinking'. But modern cognitive psychology is not concerned exclusively, or even primarily, with conscious thought processes; rather it claims that representations and processes can be developed to fit the full range of human thought and action."
> (Mandler 1985, p.18)

So, from the perspective of a cognitive science, cognition is an activity that involves the processing of representations. This notion of cognition, however, is one of the assumptions that are questioned by Winograd and Flores in their critique of the rationalistic tradition and its influence on the development of a computer science (Winograd & Flores 1986). The basis for their critique, and for an alternative understanding of computers and cognition, lies firstly in hermeneutics and the writings of Heidegger and Gadamer, secondly, in the work of the biologist Maturana, and thirdly, in the theory of speech acts developed by Austin and Searle. Winograd and Flores use these three sources to develop an alternative perspective on computer design.

In Winograd and Flores' summary, Heidegger and Gadamer argue that interpretation is an activity which is not confined to textual analysis, but is fundamental to human cognition in general. Moreover, they both reject the mind-body dualism which "accepts

the existence of two separate domains of phenomena, the *objective* world of physical reality, and the *subjective* mental world of an individual's thoughts and feelings" (Winograd & Flores 1986, p.30). According to Winograd and Flores, Heidegger argues that "the separation of subject and object denies the more fundamental unity of *being-in-the-world (Dasein)* " (Winograd & Flores 1986, p.31):

"By drawing a distinction that I (the subject) am perceiving something else (the object), I have stepped back from the primacy of experience and understanding that operates without reflection.

Heidegger rejects both the simple objective stance (the objective physical world is the primary reality) and the simple subjective stance (my thoughts and feelings are the primary reality), arguing instead that it is impossible for one to exist without the other. The interpreted and the interpreter do not exist independently: existence is interpretation, and interpretation is existence."
(Winograd & Flores 1986, p.31)

Winograd and Flores summarise Heidegger's writings to make four more claims which are relevant to design: the first is that "our implicit beliefs and assumptions cannot all be made explicit"; the second is that "practical understanding is more fundamental than detached theoretical understanding"; the third is that "we do not relate to things primarily through having representations of them"; and the fourth is that "meaning is fundamentally social and cannot be reduced to the meaning-giving activity of individual subjects" (Winograd & Flores 1986, pp.32-33). According to Winograd and Flores, Heidegger's philosophy is "based on a deep awareness of everyday life" (Winograd & Flores 1986, p.34). One example is the notion of "thrownness", according to which we are thrown into situations where actions cannot be avoided, their effects cannot be predicted, and detached reflection or rational planning is not possible (Winograd & Flores 1986, pp.34-35). A second example is the notion of "readiness-to-hand", according to which the properties of objects are not inherent, "but arise only in an event of *breaking down* in which they become *present-at-hand*" (Winograd & Flores 1986, pp.36-37).

These considerations lead to an alternative notion of cognition as an activity that, unlike 'respiration' or 'locomotion', can not "be separated from the rest of the activity of the organism" (Winograd & Flores 1986, p.70). Thinking, in particular, is an activity that is not usually performed as a detached or reflective activity:

> "In speaking of thinking as a kind of activity, we adopt a common pre-understanding that seems so obvious as to be unarguable. When you sit at your desk deciding where to go for lunch, it seems clear that you are engaged in 'thinking', as opposed to other things you might be doing at the time. . . This kind of detached reflection is obviously a part of what people do. The blindness of the rationalistic tradition lies in assuming that it can serve as a basis for understanding the full range of what we might call 'cognition'. . ."
> (Winograd & Flores 1986, p.71)

Using Heidegger's notion of "thrownness", Winograd and Flores argue that cognition is a *situated* activity:

> "We do at times engage in conscious reflection and systematic thought, but these are secondary to the pre-reflective experience of being thrown in a situation in which we are always already acting. . . Our acts always happen within thrownness and cannot be understood as the results of a process (conscious or non-conscious) of representing, planning, and reasoning."
> (Winograd & Flores 1986, p.71)

Moreover, Winograd and Flores point out that "Maturana and Heidegger both oppose the assumption that cognition is based on the manipulation of mental models or representations of the world" (Winograd & Flores 1986, p.73). Heidegger, on the one hand, sees representation "as a derivative phenomenon, which occurs only when there is a breaking down of our concernful action" (Winograd & Flores 1986, p.74). Maturana, on the other hand, describes cognition as a biological phenomenon. Winograd and Flores summarise his notion of cognition as follows:

> "As observers we can generate descriptions of the activity of living systems in either of two non-intersecting domains. One description deals with the structure of the system and how that structure determines behavior. Such a description is essentially ahistorical. It does not matter how the system came to be that way, only that it is. We can at the same time describe (as observers of a history of changes within the structure and the medium) the pattern of interactions by which the structure came to be, and the relationship of those changes to effective action. It is this second domain of explanation that Maturana calls 'cognitive'. The cognitive domain deals with the relevance of the changing structure of the system to behavior that is effective for its survival."
> (Winograd & Flores 1986, p.47)

So according to Maturana, cognition is to be explained in terms of diachrony rather than synchrony, while according to Heidegger, a synchronic explanation of cognition is not feasible because of the "thrownness" in which cognition is situated.

How are these general considerations relevant to the specific task of fiction writing? Firstly, cognition, in the context of writing, is situated by what Flower and Hayes call the "task environment" (Hayes & Flower 1980a). In the case of student writers, for example, this might include the writing assignment, the writing laboratory, and the associated problems of learning how to use unfamiliar hardware or software while coping with the pressure of working to a deadline. In this case, one can argue that a practical understanding of technology is more fundamental than a detached theoretical understanding, and that the properties of the machine become apparent by their absence; that is, they emerge when the machine breaks down. We have seen that in this situation of "thrownness", students are under pressure to generate text. Moreover, rather than step back from the primacy of experience that operates without reflection, according to Noel Williams student writers are fully absorbed in the unity of "being-in-the-world", and cannot avoid the action of generating text. In addition, thinking - in the sense of planning or textual structuring (the manipulation of mental representations) - is an activity that also occurs only in the event of breakdown; that is, when a

student is unable to generate text - the phenomenon generally known as getting stuck or writer's block.

However, the task of writing, unlike the tasks which feature as examples in Winograd and Flores' analysis, such as decision making or corporate management, is a task in which the manipulation of representations is fundamental. Describing the usability of graphic interfaces such as the Apple Macintosh, Winograd and Flores comment that "the challenge for the next generation of design is to move this same effectiveness beyond the superficial structures of words and pictures into the domains generated by what people are doing when they manipulate those structures" (Winograd & Flores 1986, p.165). But when people manipulate data structures, we can describe what they are doing in different ways. As we pointed out at the beginning of this thesis, the process of writing can be described in terms of mental activities or physical operations. The models of writing that were discussed earlier describe writing from the point of view of writing strategies, writing operations (such as planning, translating, and reviewing), or manipulating external representations. Thinking processes that are concerned with *textual* manipulation are absent from these models. The consideration of different kinds of writing strategies led to a discussion of planning, the distinction between metacognitive and cognitive activities, and the notion of cognitive planning as textual structuring.

According to Winograd and Flores, Heidegger and Maturana both argue that we must go beyond a naive view of the connection between thinking and acting, and this basic point is "critical in our anticipation of the kinds of computer tools that will be useful" (Winograd & Flores 1986, p.71):

> "In a tradition that emphasizes thought as an independent activity, we will tend to design systems to work within that domain. In fact much of the current advertising rhetoric about computers stresses the role they will play in 'applying knowledge' or 'making decisions'. If, on the other hand, we take action as primary, we will ask how computers can play a role in the kinds of actions that make up our lives . . ."
> (Winograd & Flores 1986, pp.71-72)

In the context of writing, a naive view of the connection between thinking and acting is exemplified by the notion that writing proceeds as a linear sequence of pre-writing (the detached reflective activity of thinking), drafting text, and reviewing. We attempted to go beyond this view by describing a basic model of writing as a cycle of activities rather than a linear sequence of operations, but a cycle in which a detached reflective thinking can not be excluded, if we are to take into account different kinds of writing behaviour. However, we concluded chapter five with the need to define structuring activities in fiction writing. We then considered Chomsky's approach to linguistics, the notion of syntactic structure, and the representation of textual structure by similar methods - rules and grammars. In subsequent chapters we adopted a Saussurean or semiological perspective to develop a model of diachrony rather than synchrony, a model that represents structuring activities rather than structure.

Considering texts from a functional perspective, Beaugrande and Dressler identify narrative, descriptive, and argumentative text types, among others. From this perspective, they describe the literary or fictional text as a "constellation" of narration, description and argumentation, with the additional feature of an imaginary (or non-real) relation to the real world. However, one problem with the notion that writers perform functions (narrate, describe, or argue) is that it assumes a model of writing as speech, in which writers are communicating directly to readers. Writers create texts, and to create a narrative text, for example, need to remember or imagine a sequence of events. Given the discussions of metaphor and metonymy, story memory and the symbolic, naming and problem solving, we can now fill in the blank spaces of Figure 5 to describe a cognitive model of fiction writing.

The first activity shown in the cycle is thinking, which in this context can be defined as a reflective, creative, or discursive process. The processes we have identified are remembering and reflecting, imagining, focused imagining, and problem solving. Each process can be applied to events, scenes, syntax, and names

or signifiers. In the case of events and scenes, remembering and imagining may be verbal or visual activities.

All these processes will interact with a writer's memory, and we have mentioned the distinction between a biographic or "episodic" memory and a semantic memory. Cohen and colleagues define this distinction by the sort of information represented, its organisation, and its source (Cohen et al 1986, p.47). Biographic memory contains memories of events, scenes, places, people, and so forth, derived from personal experience and organised chronologically or spatially. Semantic memory contains a general knowledge acquired by learning and reason, or by empirical observation and interaction, and includes one's spatio-temporal schemata for human behaviour and human psychology, in real worlds and in textual worlds. In addition, linguistic, cultural and scientific knowledge (or what Barthes calls the codes of human knowledges), notions of the symbolic, causality, verisimilitude, medieval world pictures, the constitution of humans, fictional characters, and so forth, can all be placed in a semantic memory. Story memory contains memories of events and scenes from textual worlds, and the kinds of story schemata discussed in chapter eight. These different kinds of memories and knowledges interact with the thinking activities which we have identified as follows:

- remembering or reflecting on events - from story memory or personal experience;
- remembering or reflecting on scenes - from screen memory, story memory, or personal experience;
- reflecting on names or signifiers - a discursive or reflective process that encompasses proper nouns, abstract nouns, titles, etc;
- remembering or reflecting on syntax - the verbal rehearsal in working memory of what has just been written or read;
- imagining events;
- imagining scenes;

- imagining names or signifiers - a discursive or creative process that encompasses proper nouns (characters, locations), titles, etc;
- imagining syntax - the verbal rehearsal in working memory of what is about to be written;
- focused imagining on events - if I were X, what would I do, and how would I interpret the events that involve me?;
- focused imagining on scenes - if I were X, what would I see, and how would I interpret what I see?;
- focused imagining on names or signifiers - if I were X, what would I think about a particular signifier, or what would I call a specific phenomenon?;
- focused imagining on syntax - if I were X, how would I speak, how would I think, or how would I write?;
- problem solving: events - what was the event that occurred, when will the event occur, who performed the event, etc;
- problem solving: scenes - who is the man carrying the yellow umbrella, what is in the black box, etc;
- problem solving: names or signifiers - what does X mean?;
- problem solving: syntax - inventing, re-inventing or discovering language.

The second activity in the cycle is generating text, in the form of notes or sentences (where syntactic closure is defined by the full stop). Although Flower and Hayes question the notion of pre-writing, they still hold a naive view of the relation between thought and language in their use of Chomsky's linguistics to define the process of "translating" - a transformational operation that involves translating logical propositions stored in memory into syntax. From the point of view of Saussure's linguistics, the activity that we call generating text involves the automatic recall of signs and their externalisation into writing. Accounts of writing behaviour show that the verbal rehearsal of syntax may be omitted altogether in the case of confessional writing, for example, or the case of writing prose without prior reflection. However, whether a writer is producing notes, sentences from notes, or sentences spontaneously without verbal rehearsal, the generation

of text does not exclude thought, and the thinking which cannot be detached from writing is the automatic retrieval of signs.

The third activity in the cycle is reading text, again in the form of notes or sentences. The model of reading shown in Figure 22 is also relevant in this context. Reading the text produced so far, a writer may pursue sequential relations to identify and develop enigmas, to construct a sequence of events from an assembly of fragmentary notes, or to imagine how an established sequence might be revised or continued. A writer may also pursue associative relations in recalling events from story memory, in finding correspondences with specific story schemata (Figure 15), in developing descriptive episodes, symbolism, characters, in retrieving knowledge from semantic memory, and so forth. If the story is already underway, then the writer's story memory now includes the writer's own text.

As shown in Figure 5, the process of writing is a cycle of thinking, generating, and reading text, and a writer's movements around this cycle establishes what Sharples has called a "rhythm of writing". The line of external representations marks a detached thinking above the line, while the overlapping zones represent strategies of writing in which all planning is on-line, or the activities of remembering and imagining occur simultaneously with text generation. Before we can fill in the spaces of Figure 5, there is one remaining problem to consider.

The different kinds of thinking activities are represented above by a list. How should we represent these activities on the model? In the last chapter, we discussed research into hypertext and cognitive mapping, in which subjects are given a hypertext and asked to produce a map of structure. What we are doing is working in a reverse direction. Our aim is to map or represent structuring activities or cognitive processes, rather than structure, knowledge, or information. The map can then be used as the basis for designing a hypertext. However, as Winograd and Flores point out, "the development of any computer-based system will have to proceed in a cycle from design to experience and back again", a

cycle often referred to as iterative design (Winograd & Flores 1986, p.171). We want to use the model to design a hypertext, but at this stage, just as Flower and Hayes use the metaphor of information processing to construct their model (Figure 2), we can use the metaphor of hypertext to represent these thinking activities. We have identified four distinct processes, each of which can be applied to four distinct objects, and all sixteen activities need to be interconnected, in that it is possible to jump from any one process to another, and from any one object to another.

If we represent the four processes (reflecting, imagining, focused imagining, and problem solving) as a set of concentric circles, all of which are contained within the circle of thought, then we can represent the objects (events, scenes, names or signifiers, and syntax) as a set of axes, all of which radiate from the centre of this circle. In this way, it is possible to visualise the inter-connections of the whole, in that one can jump from any point within the circle of thought to any other point - but the particular jumps that concern us are those from one axis to another, and those from one circle to another. We can label the jumps between axes as metonymic (a jump to events), metaphoric (a jump to scenes), abstractive (a jump to names or signifiers), and syntactic. The result is the cognitive model of fiction writing shown in Figure 27, in which the task environment, meta-cognitive activities, and "faculties" (such as reason, the will or the imagination) are omitted.

To construct their model of writing, Flower and Hayes take the strategic decision "to model the behavior of individual writers rather than the average behavior of groups of writers", a decision which they justify as follows:

> "The disadvantage of this approach is that it may be expensive. In the worst case, each individual may require a separate model. With better luck, models of individual writers will turn out to be variants of a small number of model types. The advantage of this approach is that it is

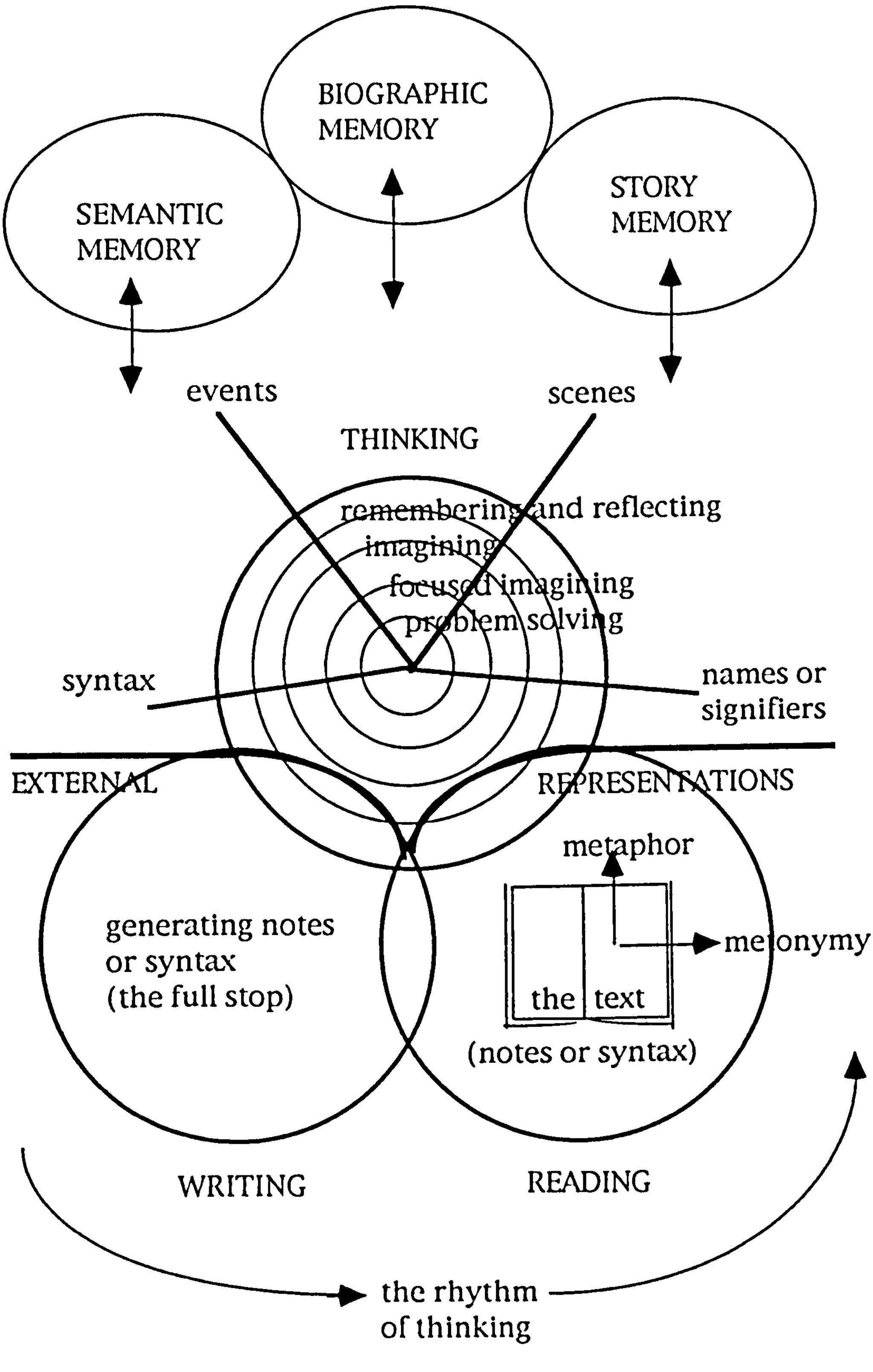


FIGURE 27: A COGNITIVE MODEL OF FICTION WRITING

> more likely than a model of the average to capture the behavior of actual (rather than idealized) writers."
> (Hayes & Flower 1980b, p.391)

The model in Figure 27 is not based on individual writers; neither is it based on an idealised average writer. In the earlier discussions of models, it was concluded that while we need to take into account reports of writing behaviour, our aim should be to model *writing* rather than *writers.* Flower and Hayes use a writer's text "to confirm or elaborate the more direct observations of process" (Hayes & Flower 1980b, p.389), observations that are derived from the intrusive method of protocol analysis. To model writing, we have used a semiological analysis of texts to infer thinking processes.

Is the result, then, a representation of writing as an idealised activity that no actual writer engages in? Does the model represent, like Casaubon's "key to all mythologies" in George Eliot's *Middlemarch,* some kind of key to the writing of all narratives, or, as Barthes describes at the beginning of *S/Z,* an attempt to see all the world's stories within a single structure:

> "There are said to be certain Buddhists whose ascetic practices enable them to see a whole landscape in a bean. Precisely what the first analysts of narrative were attempting: to see all the world's stories (and there have been ever so many) within a single structure: we shall, they thought, extract from each tale its model, then out of these models we shall make a great narrative structure, which we shall re-apply (for verification) to any one narrative: a task as exhausting (ninety-nine percent perspiration, as the saying goes) as it is ultimately undesirable, for the text thereby loses its difference."
> (Barthes 1990, p.3)

In a similar fashion, Todorov introduces the notion of a universal grammar of narrative:

> "In the very earliest reflections on language, a hypothesis appears according to which there may be discovered a common structure that transcends the obvious differences

among languages. Investigations of this common structure, a kind of universal grammar, have been pursued, with varying degrees of success, for more than twenty centuries...

But if we admit the existence of a universal grammar, we must no longer limit it to languages alone..."
(Todorov 1977a, p.108)

To see all the world's stories within a single structure is the sort of perception that Buddhists would call *Jnana* - "*Jnana* is a knowledge which, motivated by the desire for emancipation, penetrates to the real nature of things" (Conze 1959, p.15). Now, introducing his translation of Buddhist scriptures, Edward Conze explains that "Sanskrit has numerous words for 'knowledge', to which nothing corresponds in our rather impoverished language", and the most appropriate word he can find for *Jnana* is *cognition* (Conze 1959, p.15). From a Buddhist perspective then, a cognitive model of fiction writing would need to be one that can generate an infinite number of stories.

Chomsky's task was to define a finite set of resources that will generate an infinite number of sentences - an arduous task. To define a finite set of resources that will generate an infinite number of stories would appear to be even more arduous. However, there is no need to represent human resources by rules and grammars. A grammar is a device for representing structure, and Barthes and Todorov both describe attempts, not to find the human resources that will generate an infinite number of stories, but to find a universal grammar, story schema, or model of narrative structure, onto which the structures of all stories can be mapped. If we define human resources in terms of thinking processes, such as those above, then it is possible for a finite set of resources to generate an infinite number of structures. Rather than represent writing as an idealised activity therefore, the model serves to demonstrate that "some of our most complex and imaginative acts can depend on the elegant simplicity of a few powerful thinking processes" (Flower & Hayes 1981, p.386).

A universal grammar of narrative, on the other hand, suggests that the possibilities for generating new fictions are

limited to variations of set themes, novel instantiations or permutations of well-defined and pre-determined elements, or novel applications of an established set of rules. As Borges comments, "if literature were nothing more than verbal algebra, anyone could produce any book by essaying variations" (Borges 1970e, p.249). Borges claims that attempts such as Lully's "to solve all arcana by means of an apparatus of concentric, revolving disks of different sizes, subdivided into sectors with Latin words", Mill's fear "that some day the number of musical combinations would be exhausted", or Lasswitz's fantasy "of a universal library which would register all the variations of the twenty-odd orthographic symbols", all exemplify a common tendency to turn metaphysics and the arts "into a kind of play with combinations" (Borges 1970e, p.248). Contrary to Bolter's claim that, for Borges, "literature is exhausted" (Bolter 1991a, p.139), Borges himself comments:

> "Those who practise this game forget that a book is more than a verbal structure or series of verbal structures; it is the dialogue it establishes with its reader and the intonation it imposes upon his voice and the changing and durable images it leaves in his memory. This dialogue is infinite. . . Literature is not exhaustible, for the sufficient and simple reason that no single book is. A book is not an isolated being: it is a relationship, an axis of innumerable relationships. One literature differs from another, prior or posterior, less because of the text than because of the way in which it is read..."
> (Borges 1970e, pp.248-249)

Literature is not exhaustible as one book alone contains an infinite number of readings, so that a new reading is always possible in theory.

Yet elsewhere in Borges' writings, the notion of novelty or originality in thought is questioned. In *The Immortal,* Borges writes that "in an infinite period of time, all things happen to all men" (Borges 1970c, p.144), and that "every act (and every thought) is the echo of others that preceded it in the past, with no visible beginning, or the faithful presage of others that in the

future will repeat it to a vertiginous degree" (Borges 1970c, p.146). In *The Shape of the Sword,* he writes: "Whatever one man does, it is as if all men did it" (Borges 1970b, p.99). These and many other examples serve to illustrate Borges' thesis that time, as a chronological sequence of ordered moments, does not exist - a refutation that Borges claims "is found in some way or another in all my books" (Borges 1970f, p.253). In this argument, Borges claims that "each moment is autonomous", and that "each moment we live exists, but not their imaginary combination" (Borges 1970f, p.258). Noting a tendency in his own experience for certain memories to recur, Borges suspects that "the number of circumstantial variants is not infinite", so:

> "...we can postulate, in the mind of an individual (or of two individuals who do not know of each other but in whom the same process works), two identical moments. Once this identity is postulated, one may ask: Are not these identical moments the same? Is not one single repeated term sufficient to break down and confuse the series of time? Do not the fervent readers who surrender themselves to Shakespeare become, literally, Shakespeare?"
> (Borges 1970f, p.259)

Describing an experience in which he is given a moment of insight, Borges comments that "the number of such human moments is not infinite", and that "the elemental ones" (those of fear and desire, pain and pleasure) are "even more impersonal" (Borges 1970f, p.262). So, according to Borges, no thought can be described as original, or unique to an individual human - which casts doubt on the notion that the same text can generate an infinite number of readings. What makes an individual human unique, according to this theory, can be attributed to a random permutation of a finite set of thoughts, all of which, as discrete moments in a discontinuous time, have been thought by someone else.

Any claim to originality concerning our model of fiction writing would therefore need to be qualified from this idealist perspective. However, there is no need to resort to idealism to argue for the improbability of "original discoveries", because in our case there is concrete evidence that any such claim needs

qualification. In Hindu scriptures there are many references to the omnipotence of thought, and in Hindu myths concerned with the origins of the universe, to deities performing an act of creation by exercising the mind or the will (O'Flaherty 1975). Brahma in the *Upanishads* and Krsna in the *Bhagavad Gita* are both examples of *prajapatis,* deities with the mental powers of primordial creation.

Now, if we turn to the *Brihad-Aranyaka Upanishad* (1.6), recorded some time between 800 and 400BC, we find that the universe is composed of three elements:

> "THIS universe is a trinity and this is made of name, form, and action.
>
> The source of all names is the word, for it is by the word that all names are spoken. The word is behind all names, even as Brahman is behind the word.
>
> The source of all forms is the eye, for it is by the eye that all forms are seen. The eye is behind all forms, even as Brahman is behind the eye.
>
> The source of all actions is the body, for it is by the body that all actions are done. The body is behind all actions, even as Brahman is behind the body.
>
> Those three are one, ATMAN, the Spirit of life; and ATMAN, although one, is those three.
>
> The Immortal is veiled by the real. The Spirit of life is the immortal. Name and form are the real, and by them the Spirit is veiled."[1]

So, if we disregard the verbal rehearsal of syntax as a product of the phonetic alphabet and a phenomenon that is closely associated with writing, what we have defined in a model of fiction writing as objects of thought - represented by the axes of events, scenes, and names - turn out to be the constituents of the universe as recorded in the *Upanishads.*

According to the Elizabethan world picture, every human is a microcosm of the universe; according to the Hindu, not only is the universe a creation of the mind of a *prajapati,* but a spark of the *prajapati* is contained in every human. Now, according to Borges, "it may be that universal history is the history of a handful of metaphors" (Borges 1970d, p.224). One such metaphor,

---

[1] p.127 in Mascaro's translation for Penguin, 1965.

which he traces in Pre-Socratic philosophy and medieval cosmogony, is that of God or the universe as an infinite sphere, whose centre is everywhere and whose circumference is nowhere (Borges 1970d, p.224-227). If we combine this metaphor with the Hindu model, we can say that the universe is an infinite sphere, composed of events, scenes, and signifiers, which can be represented as a set of axes of infinite extension, radiating from a centre that is everywhere and therefore in the mind of every human. If we add a fourth axis to represent syntax, we can also say that every human is a potential storyteller, with a mind like the universe, and an infinite number of stories to tell.

11.3 TESTING THE MODEL

How does the model compare with other models of writing? How does it compare with models of cognitive processes? How can it be tested? How can it be used to design software? To answer these questions, we need to discuss the model in more detail.

Let's return to Mandler's argument that "representation and process are the primary foci of all the cognitive disciplines" (Mandler 1985, p.10). As Mandler points out, "historically, the concern with representation is a concern with the representation of knowledge" (Mandler 1985, p.18). Traditionally, cognition has been equated with conscious knowledge, and cognitive psychology with a psychology of 'thinking' (Mandler 1985, p.18). Mandler argues however that cognitive science is not concerned exclusively with conscious thought processes, while "the current use of representation clearly goes beyond any narrow definition of knowledge" (Mandler 1985, p.18). These two aspects of cognitive science were discussed in chapter two, where we noted the neglect of conscious thought (Griffin 1984), and the universal application of representations (Winograd & Flores 1986). Firstly then, we have to place the above model of fiction writing in the context of the more traditional view of cognition and cognitive psychology - that is, the view of cognition as conscious knowledge, and the view of cognitive psychology as a psychology of 'thinking'.

However, we have argued that *representations* are basic to the process of writing. In addition, we have argued that in order to establish what constitutes cognitive planning in fiction writing, we need to identify the kinds of *thinking processes* that produce fictional texts. The model therefore shares with models of cognitive processes, and with cognitive models of writing, a prime concern for *representation* and *process.*

The mental representations that we have identified as basic to fiction writing are *events, scenes, syntax,* and *names* or *signifiers.* The justification for these distinctions comes firstly from the linguistic approaches to writing that we discussed in chapter six. In Beaugrande and Dressler's discussion of text types, literary texts "contain various constellations of description, narration, and argumentation" (Beaugrande & Dressler 1981, p.185). These textual functions of narration, description and argumentation are the same functions that Cooper and Matsuhashi (1983) attribute to sentence roles. From Frederiksen's (1986) perspective of high-level frames, a narrative frame is composed of event structures and scene structures. From a similar perspective of framing processes, Witte and Cherry (1986) identify narrative and descriptive framing. All these accounts agree that narrating and describing are two activities that occupy fiction writers.

Narration and description are textual functions that can be identified by textual analysis. In chapter seven, we argued that iterative narration is a form of description, so that in fictional texts, description is signified by the verb "to be" and other textual signifiers such as the pluperfect tense, while narration is signified by the active verb and other textual signifiers such as "Once", "One day", and so forth. We argued that the underlying mental representations are *events* and *scenes.* The justification for this distinction lies in the inference from the textual functions of narration and description, in the semantic models developed by AI researchers and adopted by Frederiksen (1986), and in the research of cognitive psychologists studying human memory

(Cohen, Eysenck & LeVoi 1986) - events are verbal representations, while scenes are visual representations.

Events and scenes from a writer's past experience are stored in the writer's memory. Before we discuss the further representations of syntax and signifiers, let's recapitulate on the types of knowledge that are involved in fiction writing. In the model, we have followed Tulving (1972) in the distinction between episodic and semantic memory. Episodic knowledge is an autobiographical record of one's own experiences - "the events, people, and objects you have personally encountered" (Cohen et al 1986, p.46). Semantic knowledge, on the other hand, "consists of facts about the world in general" (Cohen et al 1986, p.46):

> "So you might have stored in your episodic memory personal knowledge about, for example, a particular clock in your living room at home, its appearance, habits, history, etc. You also have semantic knowledge about clocks in general, their function, mechanism, defining characteristics, and so on." (Cohen et al 1986, p.46)

These two types of knowledge are also characterised by different modes of organisation in memory:

> "Personal episodic knowledge usually includes details about the particular time and particular place in which objects and events were experienced. This is known as the *spatio-temporal context*. General semantic knowledge is not tied to a specific context in this way."
> (Cohen et al 1986, p.46)

In the model, we have used the term *biographic* to describe the episodic type of knowledge, because this autobiographical record contains scenes as well as events - the term *episodic* suggests events and a temporal ordering, rather than scenes and a spatial ordering.

Compared with the temporal and spatial ordering of episodic memory, semantic memory is organised in the form of schemata - "packets of general knowledge relating to the same topic" (Cohen et al 1986, p.47). However, there are many problems with schema

theories of human memory; these include the question of how they are acquired in the first place (Cohen et al 1986, p.30). Moreover, not all cognitive psychologists accept the distinction between episodic and semantic memory (Cohen et al 1986, p.47). We also saw in chapter nine that some AI researchers argue against the notion of story schemata, and explain story understanding in terms of schemata derived from the real world (Black & Bower 1980). In that case, there would be no need for a separate story memory, as this would be a part of semantic memory.

Despite all these disagreements, in the model we have used the labels of *semantic*, *biographic*, and *story memory* to distinguish the types of knowledge that are involved in fiction writing; for reasons that we discuss below, we have avoided the question about how this knowledge should be represented. Biographic memory contains events and scenes from a writer's personal experience. Story memory contains events and scenes from a writer's story experience; that is, from their readings of texts and their viewings of films and television. Semantic memory contains a writer's general knowledge about the world. We have argued that this category includes a writer's linguistic knowledge, and a textual knowledge of a general nature; the latter includes notions of verisimilitude, spatio-temporal schemata for the behaviour of fictional characters, and so forth.

Some of this knowledge will be specific to the individual writer, while some will be shared with others. Episodic knowledge in particular is a specific knowledge; a writer's biographic memory is their unique record, and, as we argued above, the potential source of countless stories. Semantic knowledge, story knowledge, and story schemata will be shared with other writers, in varying degrees. As we discussed in chapter two, the sort of knowledge traditionally modelled by AI researchers is semantic knowledge, rather than episodic knowledge. As episodic knowledge plays a major role in fiction writing, we argued that this was the main reason why it was not feasible to design computer programs that simulate human writers of fiction. One difference between the

above model and other cognitive models of writing is the inclusion of this personal element, and hence the acknowledgement that such a model can not be tested by designing computer software.

In the model, there is a lack of detail concerning how the types of knowledge are organised and represented in memory. One reason for this lack has already been noted: in the case of biographic memory, the details of its contents will depend on the specific writer, so that it shares with other biographic memories only the spatio-temporal ordering of events and scenes. Story schemata have been omitted in detail here, as they were discussed at some length in chapter eight. Finally, there is a lack of detail concerning semantic memory for three reasons.

The first is that models of semantic knowledge have been discussed in great detail elsewhere. As we saw in chapter six, Frederiksen's (1986) model of writing is primarily concerned with semantic knowledge. Within AI, frames, scripts and schemata are similar ways of representing semantic knowledge, and Frederiksen's frame grammars are one way of representing the knowledge that is stored in semantic memory. However, we also saw that Frederiksen's frame grammars gave a rationalistic account of events and scenes from our perspective of narration and description in fiction writing. So, while a writer's semantic memory includes a knowledge of causality and temporal ordering, it would also include a textual knowledge of how these notions are represented and subverted in fictional texts.

For example, let's suppose a writer is developing a fiction based on events from their personal experience. In chapter eight, we saw how, in the transformation of these real-life events into fictional events, a writer might apply the sequential operations of condensation, expansion, ellipsis, insertion and displacement, and the associative operations of substitution and negation (Figure 15). So, having decided what events they are going to write about, the writer faces the problem of covering up gaps in a new (fictional) ordering of events. In selecting the devices to do this, a writer may apply their knowledge of causality and chronology to invent

a character's motives, cover chronological gaps, and present a coherent narrative.

However, this knowledge has to be combined with a linguistic knowledge of how coherence is achieved through textual signifiers, such as "three days later", "one morning in September", "the trees were coming into bud when" - that is, through terms of a chronological, temporal or seasonal code. While frame grammars can represent a general schema of causality or temporal ordering, there are problems in using grammars to represent textual semantics, as we saw in chapter six, and this is the second reason why such details are not included in the model. Nevertheless, some kind of knowledge of textual signifiers needs to be included in a writer's semantic memory. In addition, we might need to add a new code to Barthes' classification of textual signifiers (Barthes 1981, 1990) - a rationalistic code, which would form a variant of the scientific code. The terms of a rationalistic code would include textual signifiers such as "therefore", "because", and so forth, which, though they are implicit in Frederiksen's event frames, are - in the context of fictional texts - more often found in argumentation rather than narration. Moreover, in writing a piece of "magic realism" (Brooke-Rose 1992), a fiction writer may decide to flout the accepted rules of causality and temporal ordering altogether, as we saw in chapter seven.

The third reason for a lack of detail concerning semantic memory is twofold. Firstly, as Mandler argues, a concern for representing knowledge would result in a purely static or synchronic view of cognition (Mandler 1985, p.11). Mandler argues that we need to identify the processes that shape and transform representations to establish a dynamic or diachronic view of cognition (Mandler 1985, p.11). As we saw above, the biologist Maturana argues that cognition is to be explained in terms of diachrony rather than synchrony, while Heidegger argues that a synchronic view of cognition is not feasible.

Secondly, in our case we also need to identify *which* representations are shaped and transformed in the process of

fiction writing. The body of linguistic knowledge stored in a writer's semantic memory could be represented by a grammar, as we saw in chapter six. We also saw how grammars have been used to represent semantics. However, we also saw that linguistic approaches to modelling writing were dominated by a concern for structure - thus a linguistic model of writing tends to describe writing in terms of synchrony rather than diachrony, in terms of a hierarchy of semantic and syntactic structures, rather than structuring activities. In this case, a model of textual structures, in which semantic structures are transformed into syntactic structures, is assumed to be a model of writing.

In our attempt to identify *which* representations are shaped and transformed in the process of fiction writing, we have argued that the body of knowledge stored in a writer's semantic memory has an influence on the process of writing. However, we have also argued that the representations of linguistic and semantic knowledge developed by cognitive scientists are not the representations that are transformed in the process of fiction writing. We concluded that these are events, scenes, syntax, and signifiers, rather than the representations of textual structures developed by linguists, and this is another reason for the omission of detail concerning semantic memory.

A further and fundamental difference between the above model and other models of writing is its departure from the linguistic assumptions of cognitive science, assumptions that are also found in current writing research. In a rationalistic view of language, words are the names of things, and naming in writing is a continuous process, as we saw in chapter nine; verbs, for example, name events. In addition, ideas have a separate existence from language, so that writing might involve an initial stage of pre-writing, in which ideas are formulated and clarified. As we have seen in the course of this thesis, rationalistic views of language are found in traditional grammar, in Chomsky's transformational grammar, in Hayes and Flower's notion of translation, in the separation of cognitive and linguistic planning, in writing software, and elsewhere.

Over the last few chapters, we followed an alternative set of assumptions based on Saussure's semiological view of language. In his account of the linguistic sign, ideas are inseparable from words, and the linguistic sign is a link between a signifier, or sound pattern, and a signified, or concept. In this case, names are signifiers, rather than elements in an inventory of things, so that naming in writing is not a continuous process, but a specific one of imagining *names* or *signifiers*. In the context of fiction writing, names or signifiers include names of characters, places, chapters and concepts, the last usually in the context of argumentation. In chapter nine, we argued that the remembering of signs is a process that is automatic in writing, the kind of thinking that occurs automatically whenever a writer is generating text. We also discussed the occasions in writing when the signifier becomes detached from the signified.

In Saussure's account of language as a system of sequential and associative relations, *syntax* is an aspect of the former. In chapter seven, we discussed a model of working memory developed by cognitive psychologists. In this model, the "articulatory loop" or inner voice organises information in a temporal and sequential fashion. In the context of writing, this component is responsible for syntactic organisation - that is, rehearsing words about to be written and organising them sequentially. Given that events are verbal representations while scenes are visual ones, we deduced that the inner voice is also responsible for organising events in the context of fiction writing, while the inner eye component of the model is responsible for scenes. By rejecting Chomsky's dualism in favour of Saussure's view of language, in which there is only one object of thought, we also deduced that events and syntax are distinct concerns.

All this recapitulation should serve to explain why we identified *events*, *scenes*, *syntax*, and *names* or *signifiers* as the mental representations that are shaped and transformed in the process of fiction writing - what we might call the preoccupations of the writer's working memory. Before we discuss the processes

that shape and transform them, we need to compare the above model with other cognitive models of writing. The model shares with Sharples and Pemberton's (1992) model of writing the distinction between internal and external representations. In Figure 27, a line marks this distinction, with mental representations above the line, and external representations below. In the model, the latter feature as notes or sentences - sentences correspond to "linear text" in the Sharples and Pemberton model (Figure 3), while notes can be any of the other items in boxes 1 to 5.

How does the model compare with the Hayes and Flower (1980a) model? Firstly, the model is based on a different set of linguistic assumptions, so that the operation that Hayes and Flower call translation disappears altogether, to be replaced by the automatic recall of signs, while we use *generating* to refer to the generation of text. Secondly, the model is also based on the distinction between motivational, metacognitive, and cognitive processes. As we discussed in chapter five, these distinctions are blurred in the Hayes and Flower model, and this was one reason for reviewing the operations of planning, translating, and reviewing. As these operations also assume a medium of writing, and are based on observations in a pen and paper medium, we argued for a basic model of writing based on the activities of thinking, writing, and reading. We showed how the Hayes and Flower model could be interpreted in this fashion, and we also showed how their operations could be re-constructed from the basic model. Taking into account reports of writing behaviour, we represented the activities of thinking, writing and reading as a cycle, to escape the linear sequence suggested by Hayes and Flower's use of the information processing metaphor.

In constructing the basic model, we also recognised the need to identify representation and process. Above the line that separates internal from external representations, the detached activity of thinking is a process that transforms mental representations into other mental representations. Below the line, thinking is attached to the generation of text, so that in this case,

thinking and writing are processes that transform mental representations into external representations. We should add that with the operations of editing and cut and paste, external representations are transformed into other external representations. Finally, the activity of reading is a process that transforms external representations into mental representations.

At that stage of our investigation, we could only identify external representations, which were provided by Sharples and Pemberton's (1992) model (Figure 3). To develop the basic model into a model of fiction writing, we needed to identify the relevant mental representations, and the processes that shape and transform them. Given the mental representations of events, scenes, syntax, and names or signifiers, the processes we have identified as shaping and transforming them are *remembering and reflecting, imagining, focusing the imagination,* and *problem solving.* The model differs from other models of cognitive processes in the terminology we have used to label these processes, and this terminology requires some justification.

As we saw in chapter two, cognitive science and models of cognitive processes have been criticised for their neglect of conscious thought (Griffin 1984). The main concern of cognitive psychology has been the basic processes of attention, perception, learning and memory (Greene & Hicks 1984). Conscious thought tends be studied in a specific context only, that of problem solving (Kahney 1986), while problem solving is often referred to in the literature as an activity that is separate from thinking. For example, Sutcliffe (1988, p.11) describes cognition as "the mental activity we describe in everyday terms as reasoning, problem solving, thinking and learning". In everyday terms then, reasoning and problem solving are seen as separate from thinking, so what is thinking?

As we pointed out in chapter two, reasoning and problem solving are activities that can be represented by symbolic logic; the use of symbolic logic to formalise thought is a feature of artificial intelligence (Kowalski 1979). There, we discussed the

argument that the designation of certain computer systems as "intelligent" is based on a rationalistic notion of intelligence:

> "The rationalistic orientation not only underlies both pure and applied science but is also regarded, perhaps because of the prestige and success that modern science enjoys, as the very paradigm of what it means to think and be intelligent. In studies of thought, emphasis is placed on the form of the rules and on the nature of the processes by which they are logically applied. Areas of mathematics, such as symbolic logic and automata theory, are taken as the basis for formalizing what goes on when a person perceives, thinks, and acts."
> (Winograd & Flores 1986, p.16)

So, cognitive science tends to concentrate on those aspects of conscious thought that can be represented by symbolic logic, such as reasoning and problem solving, because of the goal of designing "intelligent systems". Other aspects of conscious thought are seen as less of a priority, and placed in the nebulous category of "thinking".

That is why our terminology differs from the terminology used to describe basic cognitive processes. The initial question we must ask is whether the terminology exists within cognitive psychology to describe the processes we have discussed. For example, why do we use the term *remembering*, when cognitive research into human memory uses the term *recall*? Our argument is that there is a significant difference between the two. We use the term *remembering* to refer to the conscious process of remembering - that is, a process of searching long-term memory for items which are brought into short-term or working memory. We use the term *reflecting* to describe the process in which items continue to circulate between long-term and short-term memory but are not necessarily transformed into external representations. We use the term *recall* on the other hand to refer to the automatic process in which items from long-term memory jump into short-term memory. One example of the latter is the automatic retrieval of signs in the process of writing. Another example is the phenomenon of "being reminded" of something without conscious effort,

that is, when a stimulus provokes an associative or sequential relation in long-term memory.

We have argued that fiction writing involves the remembering of events and scenes from biographic memory and story memory. In chapter eight, we showed how the sequential and associative operations of condensation, displacement, and so forth - operations that are noted by Freud in his accounts of the unconscious, and by cognitive psychologists in their research into story memory - are applied in the process of fiction writing. A problem of terminology arises here because the psychologists researching into story memory use the term recall (eg Mandler & DeForest 1979). Firstly however, the experiments set up by cognitive psychologists are designed to measure accuracy. This is not necessarily the concern of fiction writers who are engaged in transforming events and scenes from story or biographic memory into the events and scenes of a fictional work - this will involve a conscious process of remembering rather than recall. Secondly, given the above distinction between recall and remembering, the experiments designed to measure accuracy are experiments in remembering, not recall. In our model, recall is an aspect of writing that is always occurring in the retrieval of signs, whereas remembering and reflecting are aspects of cognitive planning.

A similar question could be asked of our use of the term *imagining* - why do we use the term imagining when we could have used the term *planning*? In the case of imagining syntax, we have the process that is usually called sentence planning. With events and scenes, we have a process that could be called sequential planning in the former case, and visual planning in the latter. In the case of imagining names or signifiers, we have the process of naming, but we could also call this process lexical planning. However, the problem with using the term planning, as we saw in chapter five, is its equation with thinking and its use to describe all manner of activities. Our argument is that cognitive planning, in the context of fiction writing, includes all the thinking processes as shown on the model. By imagining, we are referring to a specific process of verbal or visual formulation, which may

make use of the items brought into short-term memory from biographic and story memory through the process of remembering, but would also make use of items from semantic memory. As we pointed out in chapter two, cognitive science and AI have traditionally been concerned with input processes rather than output processes, so that there is a certain lack of terminology to describe the processes involved in creative activities, and in this case, we can think of no better term to describe this process than imagining.

This observation regarding a lack of suitable terminology applies even more to the process we have called *focusing the imagination*, which has no place in models of basic cognitive processes. We have used the term to describe the process in which a writer imagines she is someone else. In chapter seven, we argued that we need some process of this sort to account for the phenomenon in which characters drive the imagination (Boylan 1993), and to account for Genette's (1980) typology of text types. Just as we inferred that writers must remember or imagine events and scenes in order to narrate or describe, we inferred that writers must focus the imagination in order to produce focused narration, description, or argumentation.

Justification for this process also comes from research into the planning of argumentative texts. Coirier and colleagues point out that the planning of arguments involves the management of polyphony by imaginary conversations (Coirier, Dellerman & Marchand 1994). In this case, the verbal rehearsal of an argument involves a debate with an imaginary protagonist, so that a focusing of the imagination is necessary in order to establish the protagonist's point of view. In chapter seven, we showed how this process of focusing the imagination could be applied to events, scenes, and syntax. In the case of syntax, the imagination can focus on inner speech (someone's thought), outer speech (conversation), or writing. In the case of names or signifiers, we have the process that produces focused argumentation.

In its terminology, the process we have labelled *problem solving* requires less justification. As we pointed out above, reasoning and problem solving are those aspects of conscious thought on which cognitive science has tended to concentrate. As we showed in chapter nine however, the generally accepted methods of problem solving can also be viewed from the perspective of sequential and associative relations in thinking. In the case of names or signifiers, problem solving is concerned with the question of meaning, while in the case of events and scenes, problem solving for the writer includes the creation of problems or mysteries for the reader.

Remembering, imagining, focusing the imagination, and problem solving - these are the processes that we have identified as basic to fiction writing, and the processes that act on the mental representations of events, scenes, syntax, and names or signifiers. Above the line, the processes transform mental representations into other mental representations in the detached activity of thinking, while below the line they transform mental representations into external representations in the activity of writing which, in this case, consists of the generation of text.

The model shares with Hayes and Flower's (1980a) model the use of a computer metaphor to represent these processes. In this case, we have used the metaphor of hypertext rather than information processing. As we saw in chapter ten, hypertext consists of *nodes* , or chunks of information, which are connected to other nodes by *links* that enable a user or a reader to pursue various paths through the hypertext. The sequence in which writers jump from one process to another is unpredictable, and we want to represent the possibility of jumping from one process to any other, and from one representation to any other. To represent this possibility presents a topological problem which, on our part, has given rise to endless doodles of grids, cylinders, spheres, and various other designs. The optimum solution seemed to be to represent the processes as a series of concentric circles, and the representations as a set of axes radiating from the centre - thus a jump from one representation to another is a jump

between axes on the model, a jump from one process to another is a jump between circles on the model, and a jump from remembering scenes to imagining events, for example, involves both a change of axis and a change of circle.

We have asserted that the sequence in which writers jump from one process to another is unpredictable, but should there not be some kind of process in the model that determines these jumps, like the monitor on Hayes and Flower's (1980a) model? Surely there must be some method of inter-process communications, because the alternative is to suggest that writers jump from one process to another in a purely arbitrary fashion? We are not suggesting that writers are driven solely by the processes shown on the model, but the question of monitoring and inter-process communications take us outside the realm of cognition and into the concerns of motivation and metacognition (Figure 4). As we have pointed out, the thinking processes shown on the model are what we have identified as the constituents of cognitive planning - motivational and metacognitive aspects of writing have been deliberately omitted from the model.

Can any more details be added to the model? Much of the detail that is omitted through the lack of space on Figure 27 has been discussed at great length in the latter course of this thesis, and it would be needless recapitulation to repeat it here. In chapter eight for example, we showed how *story schemata* can influence the process of fiction writing, and we argued that *interpretation* has a role in generating new stories. In a narrative context, interpretation is a process of finding correspondences between the events of one narrative and those of another. We showed that in the context of fiction writing, interpretation fills a gap between remembering events (either from a writer's story memory or from her personal experience) and imagining the events of her fictional work. Story schemata can influence the selection of events that will form the basis of a story, and in this context, interpretation is a process of mapping events from a writer's personal experience onto the events of the fictional work.

A lack of detail in models of writing is a feature of Holt's (1992) criticism of the Hayes and Flower (1980a) model and the Sharples and Pemberton (1992) model. Holt (1992, p.59) argues that "what are needed are task models which describe, in detail, how writing tasks are conducted". In chapter four, we also criticised those models for a lack of detail, but from a different perspective - the models did not provide us with any details concerning types of writing. However, we argued that general models are also required, and the model of fiction writing shown in Figure 27 is a general model of fiction writing. Just as Sharples and Pemberton (1992, p.329) point out that a writer may not necessarily use all the representations shown in Figure 3, we need to point out that fiction writing will not necessarily consist of all the processes shown in Figure 27.

The details of how story knowledge, semantic knowledge and biographic knowledge interact with the various processes will vary between writers and vary in the writing of different texts. Neither do we make any claims about a natural order of processes; indeed, we have asserted that the sequence will be unpredictable. However, any method of representing these processes will suggest some kind of chronological order through metonymic association - that is, a contiguity on the printed page is assumed to be a temporal contiguity. As Barthes points out, "the mainspring of narrative is precisely the confusion of consecution and consequence, what comes *after* being read in narrative as what is *caused by*" (Barthes 1979a, p.94).

So, given that our representation of axes and concentric circles is bound to be read in a narrative fashion, we have presented them in what seems to us to be a logical sequence. A reasonable order of processes would seem to be motivational and metacognitive activities in the first instance, followed by the remembering of specific events and scenes, imagining and interpreting with the use of story schemata, creating a basic text, followed by further cycles that may include focusing the imagination and problem solving. However, fiction writers are not under any obligation to follow what seems to be a logical

sequence. Novels such as Faulkner's *As I Lay Dying* and *The Sound and the Fury* for example, would seem to involve the process of focusing the imagination at the onset, while problem solving would seem to be the cue for many of James' tales, as Todorov and others (Leavis 1948) have pointed out: "the essential secret is the motive force of Henry James' tales, it determines their structure" (Todorov 1977c, p.175).

So, the question of detail raises the question of how much detail should a general model of writing contain, before it becomes a model of writing tailored to an individual writer? The conclusion to chapter three was that a model of writing should accommodate a range of behaviours if we are to use the model as the basis for designing computer software - the alternative was a tool tailored to a specific writer. To describe the above model in any more detail, we would need to describe the process of writing a specific work of fiction. This might involve the protocol analysis of a particular writer engaged in writing a fiction, perhaps an entire novel - a task that would be, as Barthes recounts, "ninety-nine percent perspiration" (Barthes 1990, p.3).

In that case then, how could this general model be tested? Could we not use protocol analysis to validate the processes that we have called the constituents of cognitive planning in fiction writing? Before we answer that question, we need to point out that testing the model will have to be a two-stage process. The model of Figure 27 is based on the basic model of Figure 5. We discussed the testing of the basic model in chapter five, and the first stage of testing the model rests on that discussion. How does the model of Figure 27 differ from the model of Figure 5? Firstly, we followed a set of linguistic assumptions in constructing the above model. Secondly, we followed the assumption that thinking processes can be inferred from written products:

> "Informing many of the studies that look beyond the level of the sentence in their examinations of written products is the sometimes explicit but usually implicit assumption that suprasentential structural patterns in written texts reflect

> thinking processes of the mind that produced the text."
> (Witte & Cherry 1986, p.119)

In making inferences from written products however, we followed a set of linguistic assumptions derived from Saussure. Moreover, the written products we have examined include not only works of fiction but also works of narratology, principally the work of Jakobson, Barthes, Genette and Todorov. Linguistic assumptions and narratological analysis have provided the context in which we have inferred processes from written products. We also need to add that this process of inference has looked to the findings of cognitive psychology for support or contradiction. The result is that we have added to the basic model the details of process and representation, a model of reading, and three types of knowledge.

As we pointed out in chapter two, the testing of models tends to reflect the source and purpose of the model, so let's look at the source of these details:

- events, scenes - linguistics, narratology, cognitive psychology, and inference
- syntax, names or signifiers - linguistics and inference
- remembering, imagining - linguistics, narratology, cognitive psychology and inference
- focusing the imagination - narratology, writing behaviour, and inference
- problem solving - linguistics, narratology, cognitive psychology, and inference
- story memory, semantic memory, biographic memory - cognitive psychology
- reading - linguistics and narratology

So, the source of the above model lies in linguistics, narratology, cognitive psychology, and inference from textual analysis - the last has supplied the examples that were used to illustrate process and representation in fictional texts. Given the diversity of sources for the model, what would the second stage of testing consist of?

The model is a general model, as we explained above. It is not only an interpretation of research in the fields of cognitive psychology and narratology, but also a construction from the results of textual analysis. The principal method of testing will therefore be a discursive one - that is, a reasoned argument that explains why interpretations of research are not permissible, or one that explains why we cannot make deductions about thinking processes on the basis of textual analysis, or one that accepts we can make deductions but finds errors in our reasoning process and the deductions and inferences we have made, or one that not only points out those errors but also provides alternative deductions and inferences, and an alternative model.

Empirical tests of the model in its entirety are simply not feasible. As we argued above, a writer will not necessarily use every process shown on the model, and we are making no claims as to a natural sequence, so any empirical testing through protocol analysis or direct observation would have to be directed at finding evidence that such processes are occurring. One problem with this kind of empirical test is that of linguistic assumptions in identifying representations and interpreting results - our identification of signifiers and syntax rests on a semiological rather than rationalistic view of language, and it is these assumptions about language that influence how the results of empirical research are interpreted. Protocols or video recordings of a writer at work need to be compared with the writer's text, so that we need to carry out a process of textual analysis in either case. In the case of direct observation, we would also need to establish some kind of criteria for mapping the writer's external gestures onto the processes of the model: for example, a scratch of the head or a frown as an indicator of problem solving, a chin held in the hand as an indicator of remembering, and so forth - in short, we would need to establish some kind of consensus in how to infer thinking processes from a writer's gestures, postures and facial expressions (eg Matsuhashi 1982).

The textual analysis of fictional texts is another method of testing the model empirically. In this case, we could work through

the text sentence by sentence, analyse the verbs to identify narration, description, and argumentation, infer the processes of remembering and imagining events and scenes, analyse the argumentative sections to identify the relevant names or signifiers, analyse the text in its entirety to identify points of view and to infer focusing, and where there is evidence of the hermeneutic code, analyse the code to infer problem solving. One problem with this kind of empirical test is that there is no one-to-one map between syntax and semantics, as we argued in chapter six, so that we cannot infer signifiers and syntax in the same way that we can infer events and scenes, and we can only infer problem solving by analysing the proairetic code, as we discussed in chapter nine. If we assumed a rationalistic model of semantics (eg Frederiksen 1986, Witte & Cherry 1986), we might have the advantage of being able to map the entire text onto a grammar, even though the task might involve "ninety-nine percent perspiration" (Barthes 1990, p.3). In our case, the absence of a one-to-one map suggests that this kind of empirical test might achieve an even greater ratio.

However, there is a further possibility regarding empirical tests. In chapter two, we argued that the testing of models tends to reflect their source and purpose. We have discussed testing in relation to the source of the model, but what about tests in relation to its purpose?

11.4 MODELS, TOOLS AND ITERATIVE DESIGN

As we saw in chapter two, Sharples (1992) argues that the test of a model of writing is whether it can be used to design computer programs that mimic human writers. However, according to Sharples and Pemberton (1992), a model of writing can also be tested by designing software tools for writers, and by testing the tools:

> "A writing tool designed on the basis of an explicit model of writing is an embodiment of the assumptions, possibilities and limitations of that model. By testing the tool with a

> variety of writers the model can be evaluated and refined... As well as offering new facilities for writers, a cognitive-based writing environment can also act as a powerful research tool with which to explore and develop further models of the writing process."
> (Sharples & Pemberton 1992, p.335)

In the first case, a model of writing is to be tested and verified, and this is achieved by designing computer software that simulates human writers. Presumably, therefore, some models may be *true*, while others may be *false*. But in the second case, a model of writing is to be evaluated and refined, rather than verified, and this is achieved by the alternative method of designing and testing software tools for writers.

Noel Williams (1991a, pp.29-31) also argues that we need to model writing in order to design more effective tools. His remarks, together with Sharples and Pemberton's comments on refining a model by testing a tool, both suggest that an explicit model of writing is a hypothesis about writing processes that can be tested by some kind of implementation of the model on a machine. The problem with this formulation, however, is how do we conduct such a test? One method is the simulation test we discussed in chapter two, with all the problems that such a method involves. The alternative method is to follow Sharples and Pemberton's suggestion, and to design and test a software tool based on the model.

Following this suggestion, how should we proceed? What is the relation between model and tool, and how do we evaluate and refine the model by testing the tool? Discussing the development of a software tool for writers, Sharples and colleagues argue that there will be a design cycle of implementation, evaluation and revision (Sharples, Goodlet & Pemberton 1989, pp.34-35), while Winograd and Flores argue that "the development of any computer-based system will have to proceed in a cycle from design to experience and back again" (Winograd & Flores 1986, p.171). If we apply this iterative cycle of design and experience to the relation between model and tool, it would appear that model

and tool are complementary - an explicit model of writing serves as the basis for designing a tool, the implementation and testing of a prototype serve to refine the model, and the refined model in turn serves as the basis for making enhancements to the tool.

However, research into human-computer interaction (HCI) has developed several ways of testing and evaluating software tools, the oldest and most frequent being an empirical test of usability (Bawa 1994). Moreover, Sharples and colleagues test their external representation model by carrying out a protocol analysis and task analysis of two writers, not by testing their tool (Sharples, Goodlet & Pemberton 1989, p.28). The problem with the above notion of a complementary relation between model and tool is how these HCI tests of the tool serve to modify the model - if the tool proves to be unusable, how do we know whether this is due to the model or due to problems with the software design? Can we establish a direct link between a model of writing and the usability of a tool based on the model? Does poor usability indicate that there is something fundamentally wrong with the model?

Evidence of such a direct link between usability and model is, unfortunately, not readily available. Let's consider the example of *outliners.* As we discussed in chapter five, the outliner is based on the data structure of the tree, a ubiquitous structure in grammars and computer science. In chapter six, we showed how this data structure can represent syntactic structure (Chomsky 1957), and pointed out its role in the compilation and interpretation of program code (Bornat 1979). In chapter five on the other hand, we discussed "Outline and Draft" as a writing strategy, and discussed outlines in the context of planning in writing. In the context of writing development, Burtis and colleagues argue that the first type of identifiable planning is that of finding content for a composition; thus a primitive plan consists of "a listing of content possibilities" (Burtis et al 1983, p.154). An outline may be as basic as this primitive plan - a table of contents only. A more detailed outline may include the main points of an argument or the synopsis of a story.

However, it is generally accepted that most outlining software is unusable (Holt 1992). As we argued in chapter six, while the data structure of the tree can represent syntactic structures, it has no correspondence with a writer's structuring activities - in particular, it bears little relation to the ways in which writers "outline and draft". So in this case, can we establish a direct link between usability and model? As Williams (1991a) points out, most writing software assumes a model of "Plan, Draft, and Revise". In the case of outliners, software designers must assume such a model of writing, in which "outlining" is seen as a form of planning, or assume that their software will assist the writing strategy of "Outline and Draft". But if the software is unusable because of its lack of correspondence with the ways in which writers "outline and draft", then it is the design, rather than the model, that lies at the root of the problem. The design of outlining software is based on a particular data structure, that of the tree, and it would appear to be its ubiquity in grammars and compilers that has given rise to its grafting and diffusion into writing software.

In this case then, we cannot find evidence of a direct link between model and usability - poor usability is a result of the design. Neither is there evidence of such a link in Holt's (1992) discussion of usability. According to Holt (1992), it is a design methodology, rather than a model of writing, that explains why so many tools for writers are poor in their usability. He argues that "computer-based tools are only partially successful in supporting writers" because of the way tools are designed (Holt 1992, p.54) - software designers must take greater account of users by changing their approach to "user-centred design" (Norman & Draper 1986). With this approach, software designers design tools *with* writers rather than *for* writers.

Before we return to the relation between model and tool, let's consider Holt's argument. According to Holt (1992, p.55), the user-centred design cycle consists of four stages: a detailed study of user requirements, a design process consisting of three phases

(conceptual design, functional design and dialogue design), prototyping of the software, and an evaluation of the prototype (Figure 28). A study of user requirements involves "four major categories of activity" (Holt 1992, p.55). These are the study of user characteristics, task analysis (this involves "obtaining an understanding of the users' goals and activities"), situational analysis, and establishing acceptance criteria (ie "what will the users find acceptable as a usable system").

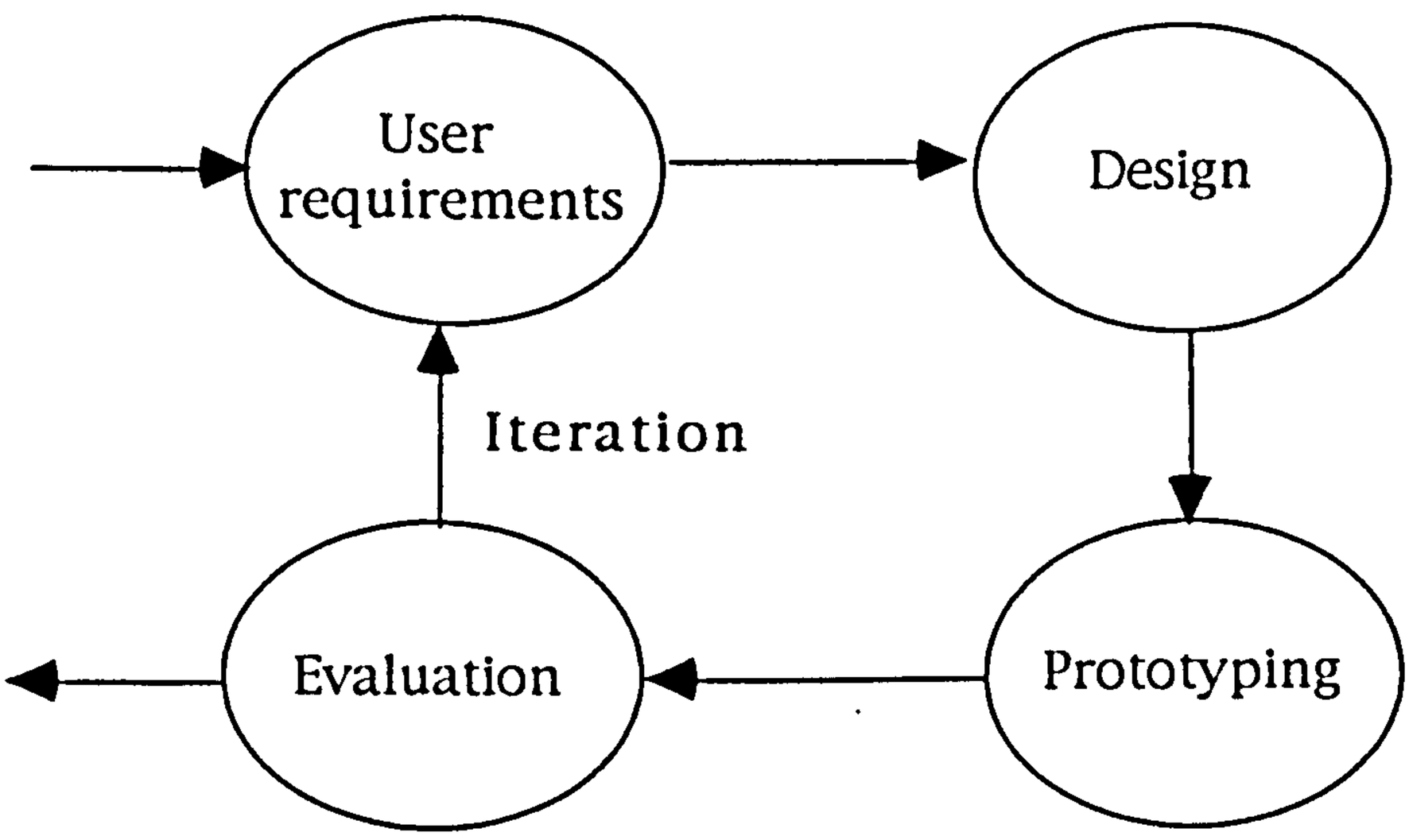


FIGURE 28: THE USER-CENTRED DESIGN CYCLE
(from Holt 1992, p.55)

A further and major feature of the user-centred design method is iteration. Holt explains that "the underlying philosophy is that no matter how hard you try, *you cannot get it right the first time*" (Holt 1992, pp.55-56). What this means in practice is that "the first prototype is evaluated and the information gleaned from the evaluation is used to change the prototype" (Holt 1992, p.56). Holt points out that "the number of iterations required depends on how good the original user requirements study was

and how well this was expressed in the design" (Holt 1992, p.56). He explains this process of iteration as follows:

> "The iteration process arises out of the evaluation and feeds into the user requirements; in other words, evaluation does not provide information for the prototyping stage or design but for the initial study of users. This needs clarification. In real terms, the evaluation concentrates on the prototype and provides information for improving it. It must however be emphasised that the prototype is an expression of the design whereas the design is a way of formalising the information gained from the users requirements study. The evaluation of the prototype is therefore enhancing the study of users and information gained from evaluation does in fact modify the user requirements and, hence, the design."
> (Holt 1992, p.56)

Now, if we substitute "model of writing" for "user requirements" in Figure 28 and in Holt's explanation of iteration, the result might explain how a model of writing can be evaluated and refined by testing and evaluating a tool. However, the above explanation is only a summary of the general methodology of "user-centred design" - how do we apply these general principles to the design of writing software, and where does a model of writing fit in?

According to Holt, "if we adopt the approach advocated by user-centred design, we must first of all ask how well we understand writers as *users* of software" (Holt 1992, p.57). He argues that what is needed is an understanding of user characteristics, formal studies of user requirements, and models of the user (Holt 1992, p.57). In his view, the problem with cognitive models of writing, such as Hayes and Flower's (1980a) and Sharples and Pemberton's (1992), is that they are too broad - although they do allow us to identify *tasks* such as planning, translating, and reviewing (Holt 1992, pp.59-60). So, what we need are more detailed *task models* - "task models are a type of cognitive model used in human-computer interaction work to model user behaviour, describing how a user carries out dialogue with a computer to complete a specific task" (Holt 1992, p.60). Task analysis techniques have been used to model text editing (Holt 1992, p.60). He points out however that while a great deal is

known about the editing stage of writing, the same cannot be said about the planning stage; hence what we need is a *task model of planning* (Holt 1992, p.62).

Now, given that many software tools for writers are unusable, it would seem an uncontentious argument that software designers should take greater account of users. However, Holt's argument goes further, in advocating that software designers must take greater account of users by changing their approach to "user-centred design", and there are several problems with this argument.

The first concerns models of writing. On the one hand, Holt criticises the models of Hayes and Flower (1980a) and Sharples and Pemberton (1992) for their broadness, arguing that we need more detailed task models. On the other hand, he uses the Hayes and Flower model as the basis for identifying those tasks, so that not only are planning, translating and reviewing seen as the basic tasks that need further elaboration, but they are also seen as *stages* in the process of writing - thus, throughout this discussion, Holt assumes a linear model of "Plan, Draft, and Revise". There is a double irony here. The first is that he dismisses broad models of writing strategies, yet assumes a specific strategy in discussing the way forward. The second is that he criticises standalone software (Holt 1992, p.59), arguing that the way forward is "the integration of planning, generating and revision into a single software environment" (Holt 1992, p.62), yet he does not question a model of writing based on observations of a pen and paper medium. According to Holt's argument, the problem of usability is to be resolved through a change in design methodology, not by developing more models of writing - but this change involves the development of detailed task models, and the tasks that Holt identifies rest on a model of writing. The assumption is that questions of a general nature, and questions concerning the underlying model, have all been resolved.

The second problem concerns the nature of tasks in writing and their representation. As Holt points out, task models are used

in human-computer interaction work to describe how a user carries out a dialogue with a computer; these techniques have been used to model text editing (Holt 1992, p.60). In this instance however, it is a relatively easy though time-consuming task to accumulate the data from which to develop a task model - a user's interactions with a computer can be recorded and logged by the method of keystroke analysis. A user's input from mouse or keyboard can be recorded by embedded software, so that this can be a non-intrusive way of studying the writing process (Eklundh 1993). A great deal is known about the editing stage of writing, as Holt points out, because many writers use computers to perform this operation, there are ways of recording their interactions with the machine, and we can identify editing from specific keystrokes.

However, as we discussed in chapter five, many writers do not find computers conducive to planning, and do not use them for this purpose. We know less about "the planning stage" of writing, therefore, partly because "the planning stage" uses a different medium, so that the method of keystroke analysis is unavailable to us. We also know less about planning because of the confusion about what it is; consequently, it is not as easy to identify as editing. In situations where writers do use computers to compose, we could use the method of keystroke analysis to log the temporal gaps between generating or manipulating text; in Matsuhashi's (1982) "real-time" observations of writers, a temporal gap is interpreted as planning. To make this inference, we have to assume that a temporal pause in writing is an indicator that a writer is thinking, and that such thinking constitutes planning. As we showed in chapter five, these equations are not without their problems.

In short, it is difficult to see how we can study editing and planning by using the same techniques. Can we apply a method of establishing a task model of editing to establish a task model of planning, in the detail and the form that Holt insists are needed? As Holt points out, several task models are in the form of a grammar; production rule grammars have been applied to the specification of human-computer dialogue (Holt 1992, p.60). In

chapter four, we saw how a set of production rules can represent the operation of editing. Because production rule grammars have been used to specify human-computer dialogue and to represent the operation of editing, Holt assumes that they can also represent planning and writing. Yet as he admits, "none have been applied to the task of writing" (Holt 1992, p.60), so where is the evidence that planning and writing can be represented in this fashion?

Our argument is that there is a basic difference between the operation of editing, and the other writing operations defined by Hayes and Flower (1980a). In chapter five, we showed how we could reconstruct those operations from our basic model of thinking, writing, and reading. If we return to Figure 8, we see that the basic difference between editing and the other operations of translating, planning and reviewing is that thinking is omitted from the cycle - ie editing is an automatic process, triggered when certain conditions are satisfied. While editing is an automatic process, the operations of writing - planning in particular - generally involve conscious thought. As Holt recounts, "*writing is not editing, editing is part of writing*" (Holt 1992, p.60) - we can also say that *writing is not an automatic operation, but automatic operations are part of writing.*

In our basic model of writing, thinking, writing, and reading can all be construed as *tasks* in writing. Our task was to develop that basic model into a model of fiction writing by trying to identify what constitutes cognitive planning in fiction writing - we could argue, therefore, that the result, represented by Figure 27, is a model that Holt argues is needed: a "task model of planning" in fiction writing, in which remembering, imagining, focusing the imagination, and problem solving constitute the tasks.

The third problem with Holt's argument is his technique of argumentation, which not only makes it difficult to criticise his argument, but also makes it difficult to establish what that argument is - the technique is that of "cogito interruptus". We referred to this technique in our discussion of *The Gutenberg Galaxy* in chapter ten. McLuhan's text is marked by the absence of

terms such as "because", "therefore" or "whereas" - terms of the rationalistic code - and we noted that the absence of such terms in the juxtaposition of two sometimes contradictory ideas is filled in by the reader. Holt's text is marked by a similar absence, so that we are constantly required to fill in the gaps.

As an example, let's start at the beginning. In his introduction, Holt provides a summary of his argument:

> "This paper...argues that...computer-based tools are only partially successful in supporting writers. The reason for this failure is the very nature of the way tools are designed. What is needed is a different approach to system design, referred to as user-centred design."
> (Holt 1992, p.54)

After this introduction, Holt discusses the question, "What is usability?" Here, we are told about the existence of an EEC directive, which "specifies how software should be made more usable" (Holt 1992, p.54). And then we read:

> "At this stage, it is important to pose the question: How can highly usable software be developed, in particular for writers? Software developers and users must adopt an approach to software design that takes greater account of the users, i.e. the design and implementation process is user rather than technology driven. This change of approach is referred to as *user-centred design*."
> (Holt 1992, p.54)

Holt then discusses the methodology of "user-centred design". So, having told us that computer-based tools are only partially successful in supporting writers because of the way that tools are designed, Holt omits to tell us how tools are designed. Then, having told us about an EEC directive which specifies how software should be made more usable, Holt omits to tell us any details about this specification. Instead, we have an interruption - from this we gather that the current design of writing tools is technology driven, rather than user driven. We can now read his text to the end, without finding an answer to the question, "How are tools designed?" So we can only conclude that tools are

designed in a way that is "technology driven", and this must be the reason why computer-based tools are only partially successful in supporting writers.

Now, we could use the above observations on outliners as a basis for arguing that design is "technology driven". But on the other hand we could also argue - without blaming Chomsky for the poor usability of outliners - that the underlying data structure of the tree has been adopted in outliners because of assumptions about language, linguistics, and structures: a tree can represent syntactic structure; therefore it must be able to represent semantic structure. In that case however, design is "data driven" rather than "technology driven". Moreover, there are many problems with the equations that are suggested by Holt's cogito interruptus. If design is "technology driven", does it necessarily follow that the resulting computer software is unusable? The notion that technology drives design raises a set of questions concerning the relations between technology, design, usability, commodities and society, which, following Holt's gloss over these questions, we are not going to discuss here.

The fourth problem with Holt's argument concerns the methodology of "user-centred design" (Norman & Draper 1986). Holt's technique of cogito interruptus gives an authority to the advocation of this methodology, while he fails to provide any evidence that this methodology will succeed in producing highly usable software. After telling us about an EEC directive due to become law, he then asks the question, "How can highly usable software be developed?" We are then told that software designers *must* change their approach to "user-centred design". Is Holt suggesting that this methodology is stipulated by an EEC directive, so that it will shortly become *law* that software designers must adopt it?

In the literature on current writing research, "user-centred design" is not a conspicuous feature. Consequently, it is difficult to find any evidence to support Holt's argument that this approach will necessarily produce more usable software. While one can

applaud the aims of such an approach, its application raises the question of feasibility. Explaining the principle of iteration, Holt points out that "sometimes the number of iterations is determined by time constraints and/or financial considerations" (Holt 1992, p.56). Sometimes? Is Holt suggesting that there are research and design projects which are not subject to the constraints of time and money, and are able to continue ad infinitum? If the constraints of time and money determine the curtailment of a project after a limited number of iterations, are there any guarantees that the result will be a highly usable piece of software?

Constraints of time and money will also determine whether such an approach is feasible in the first instance. Unfortunately, a methodology that demands "an early and intense involvement of users" (Holt 1992, p.56) is also going to demand an early and intense investment of time and money. In the specific case of developing software tools for student writers, the methodology of "user-centred design" is not a feasible option - the users will not have the time, and the institution may not have the financial resources. Moreover, in the case of courseware or software with a pedagogical function, an early and intense involvement of users through the application of "user-centred design" is tantamount to embracing a constructivist perspective on learning, and this is another discussion that we will have to gloss over at this stage.

If we consider how to apply the general principle of "user-centred design" to the design of writing software, we find that this involves techniques that have been applied in other areas of human-computer interaction work so are not specific to this methodology. Holt identifies "three categories of information which are essential to the application of user-centred design techniques" (Holt 1992, p.57). These are understanding user characteristics, formal user requirements studies, and user modelling. In the ensuing discussion, Holt concentrates on this last category, which includes task analysis, task modelling and representation. Yet task analysis is not an activity that is specific to the methodology of "user-centred design". In their discussion of

the development of a "Writer's Assistant", Sharples and colleagues argue for a development methodology called DCSS - a "development methodology for a cognitive support system" (Sharples et al 1989, p.25). The first phase of this strategy consists of the development of a model of writing. They comment: "Having developed a preliminary model of the writing process, we then tested and refined it by performing a task analysis of the activities of two people carrying out report writing tasks using both paper and a conventional text editor" (Sharples et al 1989, p.28). Neither is the notion of iteration specific to the methodology of "user-centred design" - even the data-driven and hierarchical SSADM method of design entertains the notion of a "planning cycle" and "temporal iteration" (Downs, Clare & Coe 1988, pp.153-154).

In summary, Holt's advocation of "user-centred design" is marked by the rhetorical technique of cogito interruptus, which lends authority to his argument while failing to provide it with substance. He fails to provide any evidence to justify his claim that a specific methodology will result in highly usable software, nor does he provide any evidence to support his insistence that production rule grammars can be used to represent planning and the task of writing. How can we test Holt's theory that this method will produce highly usable software? Given the lack of software tools for writers that have been designed by the "user-centred design" method, it is difficult to find any evidence to justify or falsify his argument. The techniques that he advocates are not unique to "user-centred design", but are used in other development methodologies that take greater account of users than some of the older data-driven methodologies such as SSADM. Underlying his argument and discussion of tasks in writing is the assumption of the Hayes and Flower (1980a) model of writing, a model that was developed from observations of writing in a pen and paper medium.

So, let's return to the relation between model and tool, and let's remind our readers of our aims and assumptions discussed in chapter one. As Holt points out, the category of writer includes

"both professional and amateur creative writing, professions such as journalism, technical writing and translation, and numerous professionals who write as part of their jobs although writing may not be their main job function (scientists, engineers, business executives, etc.)" (Holt 1992, p.62). Within this wide range of writers, there will be some groups who may be more amenable to the method of "user-centred design" than others. As we pointed out, many professional fiction writers do not use computers to compose, do not believe that computers have any use in creative processes, and do not see any need for software tools. However, within this wide range of writers there are students in higher education, and within this category of students there are a smaller number on creative writing courses, who perform most of their writing activities in a writing laboratory or resource centre. Our aim was to develop software tools for those students, and in this case, "an early and intense involvement of users" was not a feasible option.

What was our strategy? In the first instance, we conducted a *"situational analysis"* and a study of *"user characteristics"*. These were not carried out as formal procedures, but informally through miscellaneous communications with lecturers and students. We also conducted a study of *"user requirements"*. Again, this was not carried out as a formal procedure - instead, we reviewed the literature on computers and writing to establish what kind of software tools would be beneficial to student writers, given the situations in which they worked, and concluded that software tools to assist planning were a priority.

However, we were in no position at that stage to identify what constitutes planning in fiction writing. Given this lack, and given that writing software is always based on a model of writing (Williams 1991a, p.31), we began an *iterative process* of reviewing current models of writing from the perspective of design. The principal question that we asked of these models was whether one could one use them to design aids for fiction writing; an iterative process in which we considered a model, considered its implications for design, dismissed the model and considered

another, and so forth. Thus a design perspective provided one reason for finding the models of writing used in current writing research to be inadequate; that is, they could not be used as the basis for designing a planning, thinking or structuring tool for fiction writers.

We argued however that we could develop a model of fiction writing by analysing the texts produced by professional fiction writers, and by identifying the processes that create fictional texts. The result would be a general model of fiction writing which we could use as a basis for designing tools for student writers. In this case, a software tool is bound to have a pedagogic function, so that the model will serve to fill in the details of user requirements in the first instance; ie the model should help us to identify aspects of planning in which student writers need assistance, and should gives us some clues to the design. Subsequently, we enter the iterative cycle shown in Figure 28 of prototyping, evaluating, reviewing user requirements, and modifying the design, so that once we enter this cycle, the model will have served its purpose. In this case therefore, the test of a model is a separate issue to the test of a tool; the former was discussed above, while the latter will rely on standard HCI methods of software evaluation. Indeed, given the above discussion on usability, it is difficult to see how a model can be tested by testing a tool, unless the tool is a computer program that simulates human writers.

11.5 APPLYING THE MODEL

The purpose in developing the model was to design a tool to assist student writers in the planning of fiction writing. Given its pedagogic purpose, the model could also serve as a guide in the teaching of fiction writing or creative writing. However, to discuss that application would involve a detailed discussion of the contents of courses in creative writing. In the remainder of this chapter, we shall confine our discussion to the design of a hypertextual tool for student writers of fiction.

So, how can we apply the model to the design of writing software? We need to interpret the model in terms of our initial objective - the design of a planning, thinking, or structuring tool for student writers of fiction. Winograd and Flores argue that:

> "The most successful designs are not those that try to fully model the domain in which they operate, but those that are 'in alignment' with the fundamental structure of that domain, and that allow for modification and evolution to generate new structural coupling. As observers (and programmers), we want to understand to the best of our ability just what the relevant domain of action is. This understanding guides our design and selection of structural changes, but need not (and in fact cannot) be embodied in the form of the mechanism."
> (Winograd & Flores 1986, p.53)

If we assume that in our case "the fundamental structure of the domain" is represented by the structuring activities in the model, then one interpretation of Winograd and Flores' argument is that tools that serve to replicate such activities or tools that anticipate all possibilities are not feasible. In the former case, we need to point out the frequent assumption that a tool involves automation (eg Collins & Gentner 1980). For tools such as spelling or grammar checkers, this may be the case, but the analogy in the case of a "thinking tool" suggests that the machine is doing the thinking. In using "tool" to refer to an item of software whose purpose is to assist thinking, we assume that thinking is left to the writer.

In the case of tools that attempt to anticipate all possibilities, the arguments of Winograd and Flores suggest instead that certain activities from the model will have to be selected for the tool. This agrees with our initial assumption that, if we establish a model of fiction writing by analysing the texts created by professional fiction writers, then we can use the model to identify where students need assistance and design the software accordingly. Winograd and Flores also argue that tools may be used in ways that cannot be foreseen, and that "design includes the generation of new possibilities" (Winograd & Flores 1986, p.170). In the case of hypertext, this is an argument for

providing a basic minimum of links in the first prototype until it is tested. Moreover, one could argue that some links may have a relevance to some readers but not to others, so that their insertion is best left as an activity for the user.

As mentioned above, the purpose of the model is to serve as a guide in designing the first prototype of the tool. In this case, designing a hypertext involves the following activities:

- Defining what structuring activities the tool is intended to assist, and therefore the general content of the hypertext in terms of modules, menus, or basic components.

- Defining the general form or structure of the hypertext in terms of a) types of nodes and b) types of links.

- Establishing the basic layout and display of items on the screen.

The model should serve as a guide to solving these problems. In the last case, information provided by the model will be supplemented by general guidelines concerning human-computer interface design (eg Sutcliffe 1988, Monk 1984).

A further consideration is the extent to which the tool enables *interaction* on the part of its users. In his discussion of the use of hypertext in education, Hammond (1993) describes three dimensions along which computer based learning varies. One is "the degree to which the learner rather than the system controls exposure to learning materials" (Hammond 1993, p.64). Traditional computer based learning materials present information in a fixed sequence, while permitting jumps back to earlier stages. Hypertexts on the other hand often allow readers to choose their own route through the materials. In our case, whatever the general content of the hypertext, the structure must allow for the jumps that are indicated by the model; that is, between different activities, and between the objects of those activities.

Another dimension is "the nature of the learning activity", and whether it requires the learner "to create materials or relationships rather than merely observe them" (Hammond 1993, p.64). In our case, if we design a hypertext that includes examples, should the tool allow for students to insert their own? In addition, should the tool allow for students to insert their own links?

The third dimension is similar to the second, and concerns "the extent that learners are required to process the materials actively rather than passively" (Hammond 1993, p.64). One strategy for engaging learners is to provide them "with external motivation for making the best of the information available, perhaps through imaginative learning assignments", while another is to "provide a range of learning activities which move outside strict hypertext" (Hammond 1993, p.65). In our case, we assume that the external motivation to use the tool, and the learning activities which are outside the hypertext, are partly provided by the writing assignment that the student is already engaged in. However, if we are designing a tool to assist thinking, planning, or textual structuring, the question is whether such a tool could be used as a personalised notebook, rather than a non-interactive database through which the student merely browses.

For the remainder of this chapter, we shall outline the conceptual design of *Story-Prompt* , a hypertextual aid for student writers of fiction. It is planned initially as a minimal database or minimal manual whose purpose is to assist the planning of fiction writing. Whether such a tool could be developed into a personalised notebook is a question that must await future developments. We shall discuss the structure of *Story-Prompt* in terms of modules, nodes and links, and we shall discuss the incremental stages in developing, implementing and evaluating a prototype.

In its conception, *Story-Prompt* has some similarities with the type of planning software described by Kellogg, which "presents menus and prompts to lead a writer through a

standardized genre" (Kellogg 1989, p.72). In this case however, *Story-Prompt* presents menus and prompts to offer some suggestions to student writers in ways of structuring fiction. It has some similarities also with Williams' "open learning system for writers" (Williams 1991b), in that two of the three entities in that system (concepts and examples) appear in this one, albeit in different forms; "concepts" appears in the form of the *explanatory nodes* described below. The basic difference, however, is that *Story-Prompt* is seen less as instructional software, and more as a resource for fiction writers who work with computers, containing hints on textual structuring and a minimal database of quotes or examples. *Story-Prompt* is intended to be a tool for students on writing courses and writers already engaged in writing fiction. Thus Williams' third entity, "practice", is seen as the fiction that a writer is engaged in. However, there are a number of ways of providing for interaction with the tool, which will be explored once the initial prototype has been implemented and tested; the avenues of future development are sketched below.

Story-Prompt will have what Wright and Lickorish (1989) call a modular structure, consisting of four main modules: *story memory, characters, mysteries,* and *symbols.* As mentioned above, one purpose of the model is to select the structuring activities which the tool is intended to assist. The four components of the tool reflect four activities in the model, while the contents of the modules are supplementing or *prompting* a writer's story memory in the one case and semantic memory in the other three:

- *story memory* - remembering
- *characters* - focusing the imagination
- *mysteries* - problem solving
- *symbols* - imagining by applying the symbolic

The home stack will consist of nodes or cards that explain the purpose of the hypertext, displays the main menu, and offers a choice of three routes to view the contents in broadcast mode: the *event* route, the *scenic* route, or the *abstract* route.

The story memory module will present a number of story schemata at various levels of abstraction, including Aristotle's "beginning, middle and end", and Todorov's "state, transformation and state". At a more specific level, the schemata might include an abridged morphology of the folktale (adapted from Propp), or a schema of initiation ritual (adapted from Thomson). Each schema would be illustrated with examples taken from recorded myths or legends, folktales, and novels. In most cases we would not attempt to summarise or re-write the texts used for the examples. As *Story-Prompt* is intended to be a minimal database, our intention is to use as examples a sequence of three sentences selected from episodic boundaries. The examples would be connected to each other at an abstract level, so one could browse through story memory by browsing through "beginnings" "middles" or "endings".

The characters module will be sub-divided into three modules: *"What's a character?"*, *"How to create characters"*, and *"You and your characters"*. Apart from the first, each module will also be sub-divided into *event*, *scene*, and *name*. The first module will present different notions of what constitutes a character, and might include the medieval notion of humours, for example, or Forster's definition of flat and round characters. The second module will present a number of different ways in which characters are created textually, such as by speech, by proper name, or by description, for example. Each method would be illustrated by examples. The third module will present different ways of focusing narration, again illustrated by examples. Thus this module owes a large debt to Genette's analysis of text types. In chapter seven above, we used his notion of "focus" to suggest that there are diverse ways in which writers relate to their characters, and that this is manifest in the different ways in which stories can be told. All the examples would again use a sequence of three sentences.

The mysteries module will present the different kinds of mysteries to be found in fictional texts. These will be sub-divided into mysteries of the *event*, *scene*, and *name*, and presented as a range of questions, such as "Where is X?", "Who is X?", or "Why did

the event occur?". Each question would be illustrated by examples, in which an enigma is first proposed.

The symbols module will present different notions of the symbolic and be sub-divided into three modules: *correspondences, antithesis,* and symbolism in the *plot.* The first two modules will be further sub-divided into *event* and *scene,* while the third module will take the reader to story memory.

We have tried to define the types of nodes in *Story-Prompt* by their function. On that basis, there would be three kinds: *explanatory nodes, menu nodes,* and *syntax nodes.* The first includes most of the cards in the home stack, and the cards in the opening sequences of each module which explain concepts. The second category applies to all the cards that display a number of options to the user, including the main menu card in the home stack, and the menu cards of each module. The third category applies to all the examples.

To define the types of links in *Story-Prompt,* we can use the model as a guide. The model was used to select four kinds of structuring activities which are reflected in the four modules of *Story-Prompt.* It also tells us that a jump between these four activities can occur at any time. The consequence for design is that all four modules must be available from any part of the hypertext. In practice, the exceptions to this general rule are when the reader first enters *Story-Prompt,* and when the reader chooses the example cards, which present three sentences in sequence before returning to the point of departure. The model also tells us that a jump between the objects of the four activities can occur at any time. The consequence for design is that within each module, the four options of *events, scenes, names,* and *syntax* are always available, where applicable. In the case of *story memory,* for example, the *event* option is the only one available.

In total, there are eight types of links. Firstly, there is the type of link that links cards or nodes of the same module: these are defined as *sequential links.* Secondly, there is the type of link

that enables users to jump from one module to another: these jumps correspond to the jumps between the different activities shown in the model, and are defined as *inter-modular links*. Thirdly, there is the type of link which enables users to choose a sub-module; these are defined as *sub-modular links*. Fourthly, there is the type of link which is always available within each module and enables the user to jump between events, scenes, names, and syntax: these jumps correspond to the jumps between the objects of the activities shown in the model, and are defined in the same way, as *metonymic links* (to events), *metaphoric links* (to scenes), *abstractive links* (to names), and *syntactic links* (to the examples). Finally, there is the type of link which connects the schemata and examples in *story memory:* these are defined as *associative links.*

In its conception, the first prototype of *Story-Prompt* is seen as a basic skeleton that would have to be implemented and tested before extra features can be added and further possibilities investigated. The skeleton would contain all the menus and prompts described above, and a minimal database of examples. It would exclude the option of *names,* but retain those of *events, scenes,* and *syntax.* Names would be omitted at this stage, because this axis of the model is primarily concerned with abstraction and argumentation. Once the prototype has been implemented and tested, the future development of the software would occur in stages, following the principle of iterative design. Each stage would investigate a specific feature, according to the following sequence:

Firstly, we would investigate how users of the software can add their own examples to the database. One problem with using a sequence of three sentences as examples is that the readers may be unfamiliar with the texts from which they are taken. To supply the entire text on-line will be ergonomically counter-productive, and totally against the guiding principle of maintaining *Story-Prompt* as a minimal database. On the other hand, examples are fundamentally necessary to the tool; for example, in illustrating different ways of telling stories by using a range of Genette's text

types. One solution is to supply a basic minimum of examples in the prototype, and to use a range of texts; some will be more familiar to students than others.

The facility for adding new examples therefore needs to be investigated. However, to insist that students find their own examples as a condition of using the tool is to turn the tool into instructional software and departs from its original purpose. The aim of *Story-Prompt* is to supply a range of examples of sufficient breadth to enable student writers to find the most appropriate way of telling the stories they want to tell, and of structuring the texts they are writing. Finding examples from texts may interfere with a student's usual assignments. The primary purpose of the prompt is to provoke a student's own writing. In this context, *Story-Prompt* will be more successful if it encourages students to supply examples by writing their own stories, rather than find examples by searching texts.

The second facility that needs investigating is how readers in story memory can insert their own schemata and their own links between schemata. Once again however, this should not be made a condition of using the tool, and *Story-Prompt* will be more successful if it encourages students to use schemata to write their own stories, rather than find correspondences between stories they have read.

The third facility is the facility for taking notes. If such a facility were included, then *Story-Prompt* would begin to resemble a writing environment rather than a tool - the hypertextual writing environment that Bolter calls a topographic writing space. However, one problem with using hypertext as the basis for a writing environment is the linearisation problem: notes entered in the hypertext will have to be copied or cut and pasted into a word processing application if they are to be incorporated into the text in production. Switching between applications in this fashion is not conducive to usability (Holt 1992).

The fourth stage would involve gathering together the results of the previous stages to investigate whether *Story-Prompt* could be developed as a notebook for fiction writers. In that case, each user would receive a basic version, consisting of menus, prompts, and one set of examples. The basic version could then be converted into a personalised notebook, which fiction writers would use to add their own examples, insert their own schemata, insert their own links between schemata, and as a space for note taking, storing, and organising. However, the problem we would then have to resolve is how to integrate such a tool into a single writing environment - as we mentioned above, if writers have to switch applications from word processor to notebook and back again, this can lead to frustration on the part of the user and poor usability on the part of the tool (Holt 1992).

To fully evaluate the prototype we will need to adopt objective and subjective measures. Firstly, we would like some account of the *paths* which the readers of *Story-Prompt* pursue through the hypertext. These paths can be measured objectively by logging the user's input from mouse or keyboard. Input can be recorded by software embedded in the hypertext, so that this is a non-intrusive method of observation. This sort of information can be used to identify problems with the arrangement of menus and buttons on the screen. Usability is another aspect of the software that requires evaluation. Apart from empirical tests of usability (Bawa 1994), other ways of measuring usability include guided evaluation techniques, such as cognitive walkthroughs (Polson, Lewis, Rieman & Wharton 1992) or heuristic evaluation (Nielsen 1992), and model-based evaluation techniques (Card, Moran & Newell 1983).

As a subjective measure however, we would like to know more directly from the users of *Story-Prompt* whether it works. In the case of a writer who is thinking about writing a story but has not yet started writing, we would like to know whether using the software helps to provoke ideas for the text of a story, whether notes or syntax. In the case of a writer who has already started writing a story, we would like to know whether using the

software helps in textual structuring or in finding a structure for the story they are writing. In terms of the categories of writers established by behavioural psychologists, we would like to know whether *Story-Prompt* is an aid to *invention* in the case of the "Planners", and an aid to *discovery* in the case of the "Discoverers".

11.6 CONCLUSION

In this chapter we presented the results of our investigations over the latter course of this thesis in the form of a cognitive model of fiction writing. The model is based on the basic model of writing discussed in chapter five. We identified the principal elements of cognitive planning in fiction writing as remembering and reflecting, imagining, focusing the imagination, and problem solving. Each of these processes can be applied to events, scenes, syntax, and names or signifiers. Just as Hayes and Flower (1980a) use the metaphor of information processing to represent writing operations, we used the metaphor of hypertext to represent these thinking processes.

Discussing the model in more detail, we compared it with other models of writing, and showed how it is similar to cognitive models in its concern for representation and process. We discussed the question of testing the model, and argued that empirical tests of the model in its entirety are not feasible. Some researchers suggest that a model of writing can be tested by designing and testing a software tool based on the model. We discussed this notion and concluded that the testing of models and the testing of software are separate questions. We also discussed the notion of iterative design, and the place of models of writing in this process. We argued that although software designers need to take greater account of users, the methodology of "user-centred design" (Norman & Draper 1986) is not always a feasible option due to economic, temporal, and pedagogic considerations - in our case, a model of writing is instrumental in helping to establish a user's requirements in the first instance.

Finally, we showed how the model can be used in design by using it to construct a hypertextual aid for student writers of fiction. The aid is planned initially as a minimal database or minimal manual that would assist the planning of fiction writing. We discussed the structure of the tool in terms of modules, nodes and links, and we outlined the incremental stages in developing, implementing and evaluating a prototype. Whether such a tool could be developed into a personalised notebook for fiction writers is a question that must await future developments.

In summary, here is a comparison of the above model of fiction writing (CMFW) with the models of Hayes and Flower (1980a) and Sharples and Pemberton (1992):

Hayes & Flower:	Sharples & Pemberton:	CMFW:
concerned with:		
motivation metacognition cognition	cognition (external reps)	cognition: (mental reps)
method of representation:		
data flow diagram	grid/boxes	cycles/axes
writing viewed as:		
operations, information processing	operations, techniques, tasks	activities, tasks, conscious processes
assumptions:		
Chomsky, rationalistic view of language	Hayes/Flower model	Saussure, semiological view of language
testing:		
protocol analysis	protocol analysis, task analysis	discursive, protocol analysis ? task analysis ?

CONCLUSION AND DISCUSSION

The research that resulted in this thesis was concerned with the design of software tools for students on writing courses, courses in which creative writing and fiction writing are significant elements. An initial survey of the literature found that there is a *need* for on-line planning tools for students on writing courses who perform most of their writing in a writing laboratory or resource centre, while there is a *lack* of writing software aimed specifically at fiction writers. We also found that one of the uses of hypertext is the design of "problem exploration tools" - "tools to support early unstructured thinking on a problem when many disconnected ideas come to mind" (Conklin 1987, p.20). Hypertext is the basis of "idea processors", tools designed to assist the planning of argumentative texts (Kellogg 1989, p.75), and of an "open learning system" for writers (Williams 1991b). Conklin claims that hypertext "opens some very exciting possibilities, particularly for new uses of the computer as a communication and thinking tool" (Conklin 1987, p.17). It seemed, therefore, that hypertext would be a suitable device to design a thinking, planning or structuring tool for writing fiction - our aim was to design a hypertext that would assist a student's thinking about their writing, given the environmental conditions in which most of their writing takes place.

However, we also found that "writing software and writing teaching always use a model of writing" (Williams 1991a, p.31). Moreover, given that creative writing is often seen as a mysterious activity in which writers are possessed by the muse, we could not identify what constituted planning in the context of fiction writing, or even establish whether this was an activity that fiction writers engaged in. So, we looked at models of writing in current writing research to see what they could tell us about planning, and to see whether we could find a suitable basis for designing a planning or structuring tool for fiction writers. As we discussed in chapters three to six, the result of this investigation was a negative response to this last question, but we did emerge with a basic model of writing behaviour (Figure 5), and some clarity regarding planning and a writer's thinking processes (Figure 4).

In the course of these investigations, we also discovered that much of the current research into writing is based on a set of assumptions concerning language and linguistics. These include the rationalistic view of language as a nomenclature, in which words are the names of things, and ideas are autonomous entities that exist separately from language. In writing research, this view is manifest in the separation of cognitive planning and linguistic planning, and in Hayes and Flower's (1980a) notion of translation. As we showed in chapter six, most of these views seem to be inherited from Chomsky's transformational grammar and his separation of syntax and semantics. Chomsky's ideas have had a major influence on computational linguistics, and the heritage of these ideas can be seen in the development of story grammars, text grammars, and linguistic models of writing.

Our alternative approach in developing the basic model into a model of fiction writing was to follow a semiological view of language. In this approach, we adopted Saussure's notion of the linguistic sign, the assumption that we cannot separate ideas from language, and the view of language as a system of sequential and associative relations, in which syntax is an aspect of the former. We pursued this approach in looking at narration and description in the context of fiction writing, where we found that apparently irrational features in myths, fairy stories and contemporary fictions, could all be cited as counter examples to rationalistic definitions of narrative and causality. However, in looking more closely at these "irrational features", we found their defining terms to be those of metaphor and metonymy, as exemplified in Frazer's discussion of magical thought. In the course of this discussion, we found that sequential and associative relations apply not only to language but also to human memory. In particular, the sequential and associative operations that Freud notes in the workings of the unconscious are the same operations that cognitive psychologists note in people trying to remember stories accurately. We argued that they were also evident in fiction writing, in cases where writers select certain episodes from their experience or their story memory, and use them as the basis for a

fictional work - thus interpretation, in the sense defined by Todorov, plays the role in fiction writing of binding together the two processes of remembering and imagining.

As well as adopting a semiological view of language, to develop a model of fiction writing we looked at research in the area of narratology - the work of Jakobson, Genette, Todorov and Barthes in particular. We also used the findings of research into human memory conducted by cognitive psychologists, so that the result - the model of writing discussed in the last chapter - is the consequence of analysing and comparing research in the areas of linguistics, narratology, and cognitive psychology.

This comparative approach was necessary for two main reasons. Firstly, as we noted at the beginning of this thesis, current research into writing has a marked preference for direct observations of writers at work. In these empirical studies, there is a conspicuous absence of textual analysis, while the texts that writers create are a conspicuous absence in current models of writing. Given the linguistic assumptions inherited from Chomsky, and given the absence of semiological approaches to studying writing, we had to use research in the area of narratology to gain a perspective on how different types of texts might influence the process of writing. As we were also using narratology and textual analysis to make inferences about thinking processes, we looked to research in cognitive psychology for any confirmation or refutation of these inferences.

However, as we also pointed out at the beginning, apart from research into human memory, learning and problem solving, cognitive psychology has tended to concentrate on the basic processes of attention and perception, while tending to ignore conscious thought. At the same time, research into artificial intelligence (AI) has been primarily concerned with input processes rather than output processes, so that cognitive science - which tries to integrate the aims of AI, cognitive psychology, and linguistics - has not been concerned with modelling the creative aspects of human activities. So, the second reason for a

comparative approach was the absence of creative activities in models of cognitive processes. To describe the elements of cognitive planning in fiction writing, we have had to use terms which do not figure in cognitive models because of this absence, as we discussed in the last chapter.

Our discovery of the underlying linguistic assumptions in current writing research tends to confirm the observations of Winograd and Flores (1986) on the rationalistic tradition in computer science and its manifestation in cognitive science. In the case of natural language understanding, AI systems assume a rationalistic notion of semantics, in which lexical items and sentences have some kind of absolute meaning that is independent of the context in which they occur. Winograd and Flores characterise such an approach as follows:

> "In a complete rationalistic analysis of meaning, we would be able to explicate the meaning of each utterance by showing how it is built up systematically from smaller elements, each with its own determinate meaning. At the bottom, the smallest elements would denote objects, properties, and relations of interest in the external world. Although there is a deep fallacy in this orientation, there is also a power in its emphasis on regular formal structures. To the extent that they are adequate for a particular purpose (such as the implementation of language-like facilities on computers) they provide a systematic approach for generating rules and operations dealing with symbolic representations."
> (Winograd & Flores 1986, p.64)

As we discussed in chapter six, linguistic approaches to modelling writing are dominated by a concern for structure, and by the use of grammars to represent structure. Indeed, grammars have a ubiquitous presence in computer science. The main reason for this is that grammars are readily implemented on a computer, so that the principal motivation for using them would seem to be the aim of designing machine intelligence, whether this is intended to enhance interaction or provide automation. As we discussed in chapter two, the test of a cognitive model for a cognitive scientist is whether it can be used to design computer software that can

simulate the relevant process. Thus one could construe the motive behind the use of grammars in linguistic models of writing as the simulation test - that is, to design a model of writing that can be used to design computer programs that simulate human writers. As we discussed in chapter two, this may be more feasible for some types of writing than for others - in the case of fiction writing, such a task faces the initial problem of modelling a writer's biographic or episodic memory, and the further problem of how to evaluate the results.

Some "techno-phobes" might cite the above aims as evidence of the onward march of machines.[1] Presumably, they would find further evidence in Holt's (1992) advocation of the integrated software environment for writers - in which all the writer's tasks ("planning, generating and revision") would be performed on the machine. One does not have to be technophobic, however, to ask whether the integrated software environment is what writers want. As it appears to this writer, the main problem with such a notion is that a gain in usability may be a loss in ergonomics, in the case of documents as long as this one. The production of this thesis has necessitated many days, weeks and months in which eight hours a day were spent composing with the computer. A great percentage of that composition time involved reading off the screen, and when this activity is sustained over a long period, one's eyes get tired. In this situation, a change of environment is welcome, so that in this case, textual planning consisted of a combination of on-line methods and pen and paper techniques. Consequently, the idea of performing each and every task on the machine - in the case of producing a lengthy document over a long period of time - does not get much support from the writer of this thesis.

For smaller documents with a shorter production schedule, an integrated environment would not have the same ergonomic drawbacks. On the other hand, one could argue that, while there is

---

[1] "Come in humans, your time is up..." - Kevin Warwick, professor of cybernetics at Reading University, on his new book, *March of the Machines*, in the Times Higher Education Supplement, 7/3/97, p.17.

a need for integrated environments in the case of small documents, there is still a need for separate tools such as notebooks and planning aids for two reasons. Firstly, separate tools give writers the option of using the computer for a specific task such as planning and the option of composing with pen and paper - in other words, an inverted scenario to what currently seems to be the case. Secondly, separate tools would give writers engaged in long documents the option of working with pen and paper or with the machine. In either case, we are arguing that ergonomic considerations demand a certain flexibility in the provision of tools for writers. Moreover, one could argue that there is a need for specialised aids to assist writers with particular kinds of documents - for example, an integrated software environment for writing short stories, one for academic papers, other tools for novelists, and so forth.

In any case, software designers still have to face the problem of design methodology. In the last chapter, we argued that a "user-centred design" approach, while desirable, was not always feasible. This was not only due to the constraints of time and economics, but also due to the pedagogic purpose in providing tools for student writers. While Holt (1992) argues for a "user-centred design" methodology in the design of writing software, he assumes the Hayes and Flower (1980a) model of writing in discussing the writing operations that this methodology should address, thus confirming Williams' claim that writing software is always based on a model of writing (Williams 1991a, p.31). Our argument is that, in situations where a "user-centred design" approach is not feasible - particularly in the case of designing tools for student writers - a model of writing serves as a guide in establishing a user's requirements in the first instance. Thus in this case, a model of writing serves as a portal, a way in to the iterative cycle of designing, prototyping, evaluating, and reviewing the user's requirements.

However, in the case of full-time students on writing courses who perform most of their writing in a writing laboratory or resource centre, one could argue that the ergonomics of producing

long documents is less of a concern than the usability of the tools in this environment. We then face the problem that standalone tools are poor in their usability, as Holt (1992) points out, because users have to switch from one application to another. One solution is an integrated software environment for students, the integrated environment recommended by Holt, in which every task in writing is performed on the machine.

However, problems have been reported with writing environments that attempt to combine word processing software with inducements to planning, as we pointed out in chapter one. A six-year project to design a writing environment for students was discussed by Thea van der Geest at the *Sixth UK Conference on Computers and Writing* (van der Geest 1993). The environment combines word processing software with writing instruction in an attempt to encourage students to plan. Evaluation of the project identified a basic problem in trying to integrate instruction on the one hand, and on the other, the word processing software that students use to perform their regular writing assignments; van der Geest argues for the separation of tools and courseware. Winterbauer reports a similar problem in his evaluation of a "pre-writing" aid; according to Winterbauer, "the core of the problem seemed to be that students were unwilling to devote 'extra time' to using an innovation that did not seem to have a direct relationship with the rest of the course requirement" (Winterbauer 1992, p.176). In both cases, instruction or exercises had an interference effect on a student's regular writing tasks, giving rise to the question: why bother with tools or exercises that appear to be irrelevant to the task at hand?

In the case of student writers then, ergonomics and usability are not the only considerations in designing software; a third consideration is pedagogy. As we have discussed elsewhere, if a student performs all aspects of her writing in a writing laboratory or resource centre, then, unless planning is a part of writing instruction, it may not happen because of the pressure to produce a text (Bloor 1995, p.142). This problem will not be resolved by providing students with software tools that are seen as irrelevant

to the task at hand. In this case - where software tools have a pedagogic function - instead of integrating standalone tools into a writing environment, the second solution to the problem of usability is through the integration of their pedagogic function into the kinds of teaching and instruction that students receive. So, in providing a tool to assist students on writing courses in the planning of their writing, we are assuming that planning will form part of their course, and that using such a tool will be integrated into the sessions allocated to this activity.

In conclusion, this discussion has raised a number of issues with implications for future research, design, and teaching:

Research:

- In the area of *cognitive psychology*, there is a need for research that is directed towards developing our understanding of creative processes.
- In the area of *linguistics and textual analysis*, there is a need to develop methods of analysing argumentative texts from a semiological perspective.
- In *writing research*, there is a need for empirical research that assumes a semiological view of language, whether this be directed towards testing the model discussed in the last chapter, or towards developing our understanding of writing argumentative texts.

Design:

- More models of writing need to be developed for *particular kinds of writing*. The design of integrated writing environments, as well as separate tools, needs to be aimed at facilitating the creation of particular kinds of documents.
- Software designers need to take into account ergonomic and pedagogic considerations, as well as usability; the use of tools with a pedagogic function intended for student writers needs to be integrated into the kinds of teaching and instruction that students receive on their course.

- The conceptual design of *Story-Prompt* needs to be developed into a prototype; investigations into its further development need to be carried out as outlined in the last chapter, while taking into account the above considerations.

Teaching:

- Teaching modules that look at computers and writing from the perspective of *symbolism* and *semiology* offer a way of integrating the teaching of technology with the teaching of writing, so that writing skills and technological skills develop in tandem.
- Developers of writing courses need to consider ways of teaching an *applied narratology* for writers and designers, following Genette's suggestion that "what would theory be worth if it were not also good for *inventing practice*?" (Genette 1988, p.157).

REFERENCES:

Allinson, L. & Hammond, N. (1993) 'A Learning Support Environment: the Hitch-Hiker's Guide', in *Hypertext: Theory into Practice*, (ed. R. McAleese), Oxford: Intellect, pp. 53-63.

Anderson, J. (Ed.) (1981) *Cognitive Skills and Their Acquisition.* Hillsdale, NJ: Lawrence Erlbaum.

Anderson, J. (1983) *The Architecture of Cognition.* Cambridge, Mass: Harvard University Press.

Argyros, A. (1992) 'Narrative and Chaos', *New Literary History*, 23, 3, pp. 659-673.

Aristotle (1965) 'Poetics', in *Classical Literary Criticism*, transl. by T. Dorsch, Harmondsworth: Penguin, pp. 29-75.

Baddeley, A. & Hitch, G. (1974) 'Working Memory', in *The Psychology of Learning and Motivation, Vol. 8,* (ed. G. Bower), Orlando, Florida: Academic Press.

Baird, P. & Percival, M. (1993) 'Glasgow Online: Database Development Using Apple's Hypercard', in *Hypertext: Theory into Practice*, (ed. R. McAleese), Oxford: Intellect, pp. 64-79.

Balio, T. (Ed.) (1976) *The American Film Industry.* Madison, Wisconsin: University of Wisconsin Press.

Bamford, C. & Curran, P. (1987) *Data Structures, Files and Databases.* Basingstoke: Macmillan.

Barthes, R. (1967) *Systeme de la Mode.* Paris: Editions du Seuil.

Barthes, R. (1973) *Mythologies.* transl. by A. Lavers. St Albans: Paladin/Granada. First published in Great Britain by Jonathan Cape, 1972. First published in French by Editions du Seuil, Paris, 1957.

Barthes, R. (1979a) 'Introduction to the Structural Analysis of Narratives', in *Image-Music-Text: Essays Selected and Translated by Stephen Heath*, London: Fontana/Collins, pp. 79-124. First published 1977. 'Introduction a l'Analyse Structurale des Recits' first appeared in *Communications*, 8, 1966.

Barthes, R. (1979b) 'Writers, Intellectuals, Teachers', in *Image-Music-Text: Essays Selected and Translated by Stephen Heath*, London: Fontana/Collins, pp. 190-215. First published 1977. 'Ecrivains, Intellectuels, Professeurs' first appeared in *Tel Quel* 47, Autumn 1971.

Barthes, R. (1981) 'Textual Analysis of Poe's 'Valdemar'', in *Untying the Text*, (ed. R. Young), London: Routledge and Kegan Paul, pp. 133-161. First published in French 1973.

Barthes, R. (1990) *S/Z*. transl. by R. Miller. Oxford: Blackwell. First published in the USA by Hill & Wang, New York, 1974. First published in Great Britain by Jonathan Cape, London, 1975. First published in French by Editions du Seuil, Paris, 1970.

Bartlett, F. (1932) *Remembering*. Cambridge: Cambridge University Press.

Bawa, J. (1994) 'Comparative Usability Measurement: The Role of Usability Lab in PC Magazine UK and PC/Computing', *Behaviour and Information Technology*, 13, 1&2, pp.17-19.

Beard, D. & Walker, J. (1990) 'Navigational Techniques to Improve the Display of Large Two-Dimensional Spaces', *Behaviour & Information Technology*, 9, 6, pp. 451-466.

de Beaugrande, R. & Dressler, W. (1981) *Introduction to Text Linguistics*. London: Longman.

de Beaugrande, R. & Miller, G. (1980) 'Processing Models for Children's Story Comprehension', *Poetics*, 9, pp. 181-201.

Beeken, J., Geerts, G. & van Belle, W. (1992) 'The CONST-Project: Computer Instructed Writing Techniques', in *Computers and Writing: State of the Art*, (ed. P. Holt & N. Williams), Oxford: Intellect, pp. 337-354.

Beer, M. & Diaper, D. (1991) 'Reading and Writing Documents Using Headed Record Expertext', in *Proceedings of the Fourth Annual Conference on Computers and the Writing Process*, (ed. M. Sharples), Brighton: University of Sussex, 22-23 March 1991, pp. 198-207.

Benest, I. (1990) 'A Hypertext System with Controlled Hype', in *Hypertext: State of the Art*, (ed. R. McAleese & C. Green), Oxford: Intellect, pp. 52-63.

Bereiter, C. (1980) 'Development in Writing', in*Cognitive Processes in Writing*, (ed. L. Gregg & E. Steinberg), Hillsdale, NJ: Lawrence Erlbaum, pp. 73-93.

Bereiter, C. & Scardamalia, M. (1987) *The Psychology of Written Composition*. Hillsdale, NJ: Lawrence Erlbaum.

Bergonzi, B. (1972) *The Situation of the Novel*. Harmondsworth: Penguin. First published by Macmillan in 1970.

Bettelheim, B. (1978) *The Uses of Enchantment: the Meaning and Importance of Fairy Tales*. Harmondsworth: Penguin. First published by Thames & Hudson in 1976.

Black, J. & Bower, G. (1980) 'Story Understanding as Problem Solving', *Poetics*, 9, pp. 223-250.

Black, J. & Wilensky, R. (1979) 'An Evaluation of Story Grammars', *Cognitive Science*, 3, pp. 213-230.

Black, J, Wilkes-Gibbs, D. & Gibbs Jr., R. (1982) 'What Writers Need to Know That They Don't Know They Need to Know', in *What*

Writers Know: The Language, Process and Structure of Written Discourse, (ed. M. Nystrand), New York: Academic Press, pp.325-343.

Black Elk (1971) *The Sacred Pipe: Black Elk's Account of the Seven Rites of the Oglala Sioux*.. ed. J. Brown. Harmondsworth: Penguin. First published by the University of Oklahoma Press 1953 as Volume 36 in *The Civilization of the American Indian Series*.

Bloor, A. (1990) *Straight Line Encoding of Regional Boundaries*. MSc thesis, University of Loughborough.

Bloor, A. (1995) 'Student Writers, Writing Technology, and Writing Behaviour', *Notebooks*, 3/4, pp. 136-159.

Bolter, J. (1991a) *Writing Space: The Computer, Hypertext, and the History of Writing*. Hillsdale, NJ: Lawrence Erlbaum.

Bolter, J. (1991b) 'Topographic Writing: Hypertext and the Electronic Writing Space', in *Hypermedia and Literary Studies*, (ed. P. Delany & G. Landow), Cambridge, Mass: MIT, pp. 105-118.

Bolter, J. & Joyce, M. (1989) *Storyspace*. (Disk). Watertown, Mass: Eastgate Systems.

Borges, J. (1970a) 'The Garden of Forking Paths', (transl. by D. Yates), in *Labyrinths: Selected Stories and Other Writings*, (ed. D. Yates & J. Irby), Harmondsworth: Penguin, pp. 44-54. *Labyrinths* first published in the USA by New Directions 1964. This translation of 'The Garden of Forking Paths' first appeared in *Michigan Alumnus Quarterly Review*, Spring 1958.

Borges, J. (1970b) 'The Shape of the Sword', (transl. by D. Yates), in *Labyrinths: Selected Stories and Other Writings*, (ed. D. Yates & J. Irby), Harmondsworth: Penguin, pp. 96-101. *Labyrinths* first published in the USA by New Directions 1964.

Borges, J. (1970c) 'The Immortal', (transl. by J. Irby), in *Labyrinths: Selected Stories and Other Writings*, (ed. D. Yates & J. Irby), Harmondsworth: Penguin, pp. 135-149. *Labyrinths* first published in the USA by New Directions 1964.

Borges, J. (1970d) 'The Fearful Sphere of Pascal', (transl. by A. Kerrigan), in *Labyrinths: Selected Stories and Other Writings*, (ed. D. Yates & J. Irby), Harmondsworth: Penguin, pp. 224-227. *Labyrinths* first published in the USA by New Directions 1964. This translation of 'The Fearful Sphere of Pascal' first appeared in *Noonday*, 3, 1959.

Borges, J. (1970e) 'A Note on (towards) Bernard Shaw', (transl. by J. Irby), in *Labyrinths: Selected Stories and Other Writings*, (ed. D. Yates & J. Irby), Harmondsworth: Penguin, pp. 248-251. *Labyrinths* first published in the USA by New Directions 1964.

Borges, J. (1970f) 'A New Refutation of Time', (transl. by J. Irby), in *Labyrinths: Selected Stories and Other Writings*, (ed. D. Yates & J. Irby), Harmondsworth: Penguin, pp. 252-270. *Labyrinths* first published in the USA by New Directions 1964.

Bornat, R. (1979) *Understanding and Writing Compilers.* Basingstoke: Macmillan.

du Boulay, J., O'Shea, T. & Monk, J. (1981) 'The Black Box Inside the Glass Box: Presenting Computing Concepts to Novices', *International Journal of Man-Machine Studies*, 14, 3, pp. 237-249.

Boylan, C. (Ed.) (1993) *The Agony and the Ego: The Art and Strategy of Fiction Writing Explored.* Harmondsworth: Penguin.

Boyle, C. & Snell, J. (1990) 'Intelligent Navigation for Semistructured Hypertext Documents', in *Hypertext: State of the Art*, (ed. R. McAleese & C. Green), Oxford: Intellect, pp.28-42.

Bracewell, R., Frederiksen, C. & Frederiksen, J. (1982) 'Cognitive Processes in Composing and Comprehending Discourse', *Educational Psychologist*, 17, pp. 146-164.

Bratko, I. (1986) *PROLOG Programming for Artificial Intelligence.* Wokingham: Addison-Wesley.

Bringsjord, S. (1991) 'CINEWRITE: An Algorithm-sketch for Writing Novels Cinematically, and Two Profound Problems Therein', in *Proceedings of the Fourth Annual Conference on Computers and the Writing Process*, (ed. M. Sharples), Brighton: University of Sussex, 22-23 March 1991, pp. 27-39.

Brondmo, H. & Davenport, G. (1990) 'Creating and Viewing the Elastic Charles: a Hypermedia Journal', in *Hypertext: State of the Art*, (ed. R. McAleese & C. Green), Oxford: Intellect, pp. 43-51.

Brooke-Rose, C. (1992) 'Palimpsest History', in *Interpretation and Overinterpretation*, (U. Eco; ed. S. Collini), Cambridge: Cambridge University Press, pp. 125-138.

Brooks, P. (1984) *Reading for the Plot: Design and Intention in Narrative.* New York: Vintage.

Brown, J., Collins, A. & Duguid, P. (1989a) 'Situated Cognition and the Culture of Learning', *Educational Researcher*, 18, pp. 32-42.

Brown, J., Collins, A. & Duguid, P. (1989b) 'Debating the Situation: A Rejoinder to Palinscar and Wineburg', *Educational Researcher*, 18, pp. 10-12.

Burn, A. (1966) *The Pelican History of Greece.* Harmondsworth: Penguin. First published as *A Traveller's History of Greece* by Hodder and Stoughton 1965.

Burtis, P., Bereiter, C., Scardamalia, M. & Tetroe, J. (1983) 'The Development of Planning in Writing', in *Explorations in the*

Development of Writing: Theory, Research and Practice, (ed. B. Kroll & G. Wells), Chichester: John Wiley, pp.153-174.

Bush, V. (1945) 'As We May Think', *Atlantic Monthly*, 176, 1, pp. 101-108.

Card, S., Moran, T. & Newell, A. (1983) *The Psychology of Human-Computer Interaction*. Hillsdale, NJ: Lawrence Erlbaum.

Carothers, J. (1959) 'Culture, Psychiatry and the Written Word', *Psychiatry*. Cited by McLuhan, M. in McLuhan (1969), p. 27.

Cayley, J. (1993) *Indra's Net*. (Disk) London: Wellsweep Press.

Chanquoy, L., Foulin, J.-N. & Fayol, M. (1994) 'Written Production by Children: a Real Time Approach', in *Abstracts of the Seventh European Conference on Writing and Computers*, ed. H. van den Bergh, Th. van der Geest, D. Janssen, G. Rijlaarsdam & S. Sengers, (Utrecht, Netherlands, 19-21 October 1994), p.77.

Charniak, E. & McDermott, D. (1985) *Introduction to Artificial Intelligence*. Reading, Mass: Addison-Wesley.

Chomsky, N. (1957) *Syntactic Structures*. The Hague: Mouton.

Chomsky, N. (1965) *Aspects of the Theory of Syntax*.. Cambridge, Mass: MIT.

Cohen, G., Eysenck, M., & LeVoi, M. (1986) *Memory: A Cognitive Approach*. Milton Keynes: Open University.

Coirier, P., Dellerman, P. & Marchand, E. (1994) 'The Specificity of Argumentative Planning', in *Abstracts of the Seventh European Conference on Writing and Computers*, ed. H. van den Bergh, Th. van der Geest, D. Janssen, G. Rijlaarsdam & S. Sengers, (Utrecht, Netherlands, 19-21 October 1994), pp. 80-81.

Colby, B. (1973) 'A Partial Grammar of Eskimo Folktales', *American Anthropologist*, 75, pp. 645-662.

Collins, A. & Gentner, D. (1980) 'A Framework for a Cognitive Theory of Writing', in*Cognitive Processes in Writing*, (ed. L. Gregg & E. Steinberg), Hillsdale, NJ: Lawrence Erlbaum, pp. 51-72.

Collins, A. & Quillian, M. (1969) 'Retrieval Time from Semantic Memory', *Journal of Verbal Learning and Verbal Behaviour*, 8, pp. 240-247.

Conklin, J. (1987) 'Hypertext: An Introduction and Survey', *IEEE Computer*, 20, 9, pp. 17-41.

Conze, E. (1959) 'Introduction' to *Buddhist Scriptures*, Harmondsworth: Penguin, pp. 11-16.

Cooper, C. & Greenbaum, S. (1986) *Studying Writing: Linguistic Approaches.* Beverly Hills, Ca: Sage.

Cooper, C. & Matsuhashi, A. (1983) 'A Theory of the Writing Process', in *The Psychology of Written Language: Developmental and Educational Perspectives*, (ed. M. Martlew), Chichester: John Wiley, pp. 3-39.

Crane, G. & Mylonas, E. (1991) 'Ancient Materials, Modern Media: Shaping the Study of Classics with Hypertext', in *Hypermedia and Literary Studies*, (ed. P. Delany & G. Landow), Cambridge, Mass: MIT, pp. 205-220.

Crystal, D. (1971) *Linguistics.* Harmondsworth: Penguin.

Culler, J. (1975) *Structuralist Poetics - Structuralism, Linguistics and the Study of Literature.* London: Routledge & Kegan Paul.

Culler, J. (1983) *On Deconstruction - Theory and Criticism after Structuralism.* London: Routledge & Kegan Paul.

Culler, J. (1992) 'In Defence of Overinterpretation', in *Interpretation and Overinterpretation*, (U. Eco; ed. S. Collini), Cambridge: Cambridge University Press, pp. 109-123.

Cunningham, D., Duffy, T. & Knuth, R. (1993) 'The Textbook of the Future', in *Hypertext: A Psychological Perspective*, (ed. C. McKnight, A. Dillon & J. Richardson), Hemel Hempstead: Ellis Horwood, pp. 19-49.

Dames, M. (1976) *The Silbury Treasure: The Great Goddess Rediscovered.* London: Thames and Hudson.

Davies, R. (1993) 'A Try for Greatness', in *The Agony and the Ego*, (ed. C. Boylan), Harmondsworth: Penguin, pp. 213-221.

Delany, P. & Gilbert, J. (1991) 'HyperCard Stacks for Fielding's *Joseph Andrews* : Issues of Design and Content', in *Hypermedia and Literary Studies*, (ed. P. Delany & G. Landow), Cambridge, Mass: MIT, pp. 287-297.

Derrida, J. (1978a) 'Force and Signification', in *Writing and Difference*, transl. by A. Bass, London: Routledge & Kegan Paul, pp. 3-30. *L'Ecriture et la Difference* first published in France 1967.

Derrida, J. (1978b) 'Structure, Sign, and Play in the Discourse of the Human Sciences', in *Writing and Difference*, transl. by A. Bass, London: Routledge & Kegan Paul, pp. 278-293. *L'Ecriture et la Difference* first published in France 1967.

Dickey, W. (1991) 'Poem Descending a Staircase: Hypertext and the Simultaneity of Experience', in *Hypermedia and Literary Studies*, (ed. P. Delany & G. Landow), Cambridge, Mass: MIT, pp. 143-152.

van Dijk, T. (1972) *Some Aspects of Text Grammars.* The Hague: Mouton.

van Dijk, T. (1979) 'Relevance Assignment in Discourse Comprehension', *Discourse Processes*, 2, pp. 113-126.

van Dijk, T. (1980) 'Story Comprehension: An Introduction', *Poetics*, 9, pp. 1-21.

Dillon, A., McKnight, C. & Richardson, J. (1993) 'Space - the Final Chapter *or* Why Physical Representations are not Semantic Intentions', in *Hypertext: A Psychological Perspective*, (ed. C. McKnight, A. Dillon & J. Richardson), Hemel Hempstead: Ellis Horwood, pp. 169-191.

Dillon, G. (1980) 'Discourse Processing and the Nature of Literary Narrative', *Poetics*, 9, pp. 163-180.

Dorner, J. (1992) *Writing on Disk*. Hatfield: John Taylor Book Ventures.

Doubtfire, D. (1982) *Novel Writing*. London: Clarefen. First published under the title *The Craft of Novel Writing* 1978.

Douglas, J. (1991) 'Reading and Writing in Hypertext Spaces', in *Proceedings of the Fourth Annual Conference on Computers and the Writing Process*, (ed. M. Sharples), Brighton: University of Sussex, 22-23 March 1991, pp. 49-59.

Douglas, J. (1992) 'Is There a Reader in this Labyrinth? Notes on Reading Afternoon', in *Computers and Writing: State of the Art*, (ed. P. Holt & N. Williams), Oxford: Intellect, pp. 29-39.

Downs, E., Clare, P. & Coe, I. (1988) *Structured Systems Analysis and Design Method: Application and Context*. Hemel Hempstead: Prentice Hall.

Draper, S. & Oatley, K. (1992) 'Action Centred Manuals or Minimalist Instruction? Alternative Theories for Carroll's Minimal Manuals', in *Computers and Writing: State of the Art*, (ed. P. Holt & N. Williams), Oxford: Intellect, pp. 222-243.

Dseagu, S. (1992) 'The Influence of Folklore Techniques on the Form of the African Novel', *New Literary History*, 23, 3, pp. 583-605.

Duncan, E. (1993) 'A Faceted Approach to Hypertext?', in *Hypertext: Theory into Practice*, (ed. R. McAleese), Oxford: Intellect, pp. 133-137.

Dundes, A. (1968) 'Introduction' to the Second Edition of Propp's *Morphology of the Folktale*, (Propp, V.), Austin, Texas: University of Texas Press, pp. xi-xvii.

Eco, U. (1987a) 'Cogito Interruptus', in *Travels in Hyperreality*, essays transl. by W. Weaver, London: Pan/Picador, pp. 221-238. Travels in Hyperreality first published in 1986 by Secker & Warburg under the title *Faith in Fakes.*

Eco, U. (1987b) 'On the Crisis of the Crisis of Reason', in *Travels in Hyperreality*, essays transl. by W. Weaver, London: Pan/Picador, pp. 125-132. Travels in Hyperreality first published in 1986 by Secker & Warburg under the title *Faith in Fakes.*

Edwards, D. & Hardman, L. (1993) "Lost in Hyperspace': Cognitive Mapping and Navigation in a Hypertext Environment', in *Hypertext: Theory into Practice*, (ed. R. McAleese), Oxford: Intellect, pp. 90-105.

Eklundh, K. (1991) 'Problems in Achieving a Global Perspective in Computer-based Writing', in *Proceedings of the Fourth Annual Conference on Computers and the Writing Process*, (ed. M. Sharples), Brighton: University of Sussex, 22-23 March 1991, pp.140-150.

Eklundh, K. (1993) 'Two Levels of Computer Support for Tracing the Writing Process', paper delivered to the *Sixth UK Conference on Computers and Writing* (Aberystwyth: University of Wales, 13-15 April 1993).

Fernihough, A. (1995) 'Introduction' to D. H. Lawrence's *The Rainbow*, Harmondsworth: Penguin, pp. xiii-xxxiv.

Finley, M. (1971) *The Ancient Greeks.* Revised edition. Harmondsworth: Penguin. First published by Chatto & Windus 1963.

Finley, M. (1972) *The World of Odysseus.* Fourth edition. Harmondsworth: Penguin. First published in the USA 1954.

Fitzgerald, P. (1993) 'Hearing Them Speak', in *The Agony and the Ego*, (ed. C. Boylan), Harmondsworth: Penguin, pp. 141-150.

Flower, L. & Hayes, J. (1980a) 'The Dynamics of Composing: Making Plans and Juggling Constraints', in*Cognitive Processes in Writing*, (ed. L. Gregg & E. Steinberg), Hillsdale, NJ: Lawrence Erlbaum, pp. 31-50.

Flower, L. & Hayes, J. (1980b) 'The Cognition of Discovery: Defining a Rhetorical Problem', *College Composition and Communication* , 31, pp. 21-32.

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

Forster, E. (1962) *Aspects of the Novel.* Harmondsworth: Penguin. First published by Edward Arnold in 1927.

Frankfort, H., Frankfort, H. A., Wilson, J., & Jacobsen, T. (1949) *Before Philosophy: The Intellectual Adventure of Ancient Man.* Harmondsworth: Penguin. First published by the University of Chicago Press, Chicago, 1946.

Frazer, J. (1993) *The Golden Bough.* Ware, Herts: Wordsworth. Single volume edition first published in 1922.

Frederiksen, C. (1986) 'Cognitive Models and Discourse Analysis', in *Studying Writing: Linguistic Approaches*, (ed. C.Cooper & S. Greenbaum), Beverly Hills, Ca: Sage, pp. 227-267.

Freud, S. (1975) *The Psychopathology of Everyday Life (Penguin Freud Library: Vol. 5)* (transl. under general editorship of J.Strachey, ed. A.Richards), Harmondsworth: Penguin.

Freud, S. (1976a) *The Interpretation of Dreams (Penguin Freud Library: Vol. 4)* (transl. under general editorship of J.Strachey, ed. A.Richards), Harmondsworth: Penguin.

Freud, S. (1976b) *Jokes and Their Relation to the Unconscious (Penguin Freud Library: Vol. 6)*, (transl. under general editorship of J.Strachey, ed. A.Richards), Harmondsworth: Penguin.

Freud, S. (1985a) 'Totem and Taboo', in *Penguin Freud Library: Vol. 13 - The Origins of Religion*, (transl. under general editorship of J.Strachey, ed. A.Dickson), Harmondsworth: Penguin, pp. 43-224.

Freud, S. (1985b) 'Moses and Monotheism: Three Essays', in *Penguin Freud Library: Vol. 13 - The Origins of Religion*, (transl. under general editorship of J.Strachey, ed. A.Dickson), Harmondsworth: Penguin, pp. 237-386.

Freud, S. (1985c) 'Creative Writers and Day-Dreaming', in *Penguin Freud Library: Vol.14 - Art and Literature*, (transl. under general editorship of J.Strachey, ed. A.Dickson), Harmondsworth: Penguin, pp. 129-141.

Freud, S. (1985d) 'The "Uncanny"', in *Penguin Freud Library: Vol.14 - Art and Literature*, (transl. under general editorship of J.Strachey, ed. A.Dickson), Harmondsworth: Penguin, pp. 335-376.

Friedlander, L. (1991) 'The Shakespeare Project', in *Hypermedia and Literary Studies*, (ed. P. Delany & G. Landow), Cambridge, Mass: MIT, pp. 257-271.

Frye, N. (1990) *Anatomy of Criticism.* Harmondsworth: Penguin. First published 1957 by Princeton University Press.

Galbraith, D. (1991) 'Conditions of Discovery through Writing', in *Proceedings of the Fourth Annual Conference on Computers and the Writing Process,* (ed. M. Sharples), Brighton: University of Sussex, 22-23 March 1991, pp.151-160.

Galbraith, D. & Reed, R. (1994) 'Writing and Thinking', in *Abstracts of the Seventh European Conference on Writing and Computers,* ed. H. van den Bergh, Th. van der Geest, D. Janssen, G. Rijlaarsdam & S. Sengers, (Utrecht, Netherlands, 19-21 October 1994), pp. 97-99.

Galer, I. (Ed.) (1987) *Applied Ergonomics Handbook.* second edition, London: Butterworths.

Gardam, J. (1993) 'Angels and Daemons: The Anatomy of a Novel', in *The Agony and the Ego,* (ed. C. Boylan), Harmondsworth: Penguin, pp. 7-19.

van der Geest, T. (1993) 'Effects of Computer Support on Text Planning and Production", paper delivered to the *Sixth UK Conference on Computers and Writing* (Aberystwyth: University of Wales, 13-15 April 1993).

Genette, G. (1980) *Narrative Discourse.* transl. by J. Lewin. Oxford: Blackwell. *Discours du Recit* first published as part of *Figures III* by Editions du Seuil, Paris, 1972.

Genette, G. (1988) *Narrative Discourse Revisited.* transl. by J. Lewin. Ithaca, NY: Cornell University Press. *Nouveau Discours du Recit* first published by Editions du Seuil, Paris, 1983.

George, S., Rada, R. & Beer, M. (1991) 'Link Attributes for Controlling Hypertext', in *Proceedings of the Fourth Annual Conference on Computers and the Writing Process,* (ed. M.

Sharples), Brighton: University of Sussex, 22-23 March 1991, pp.208-218.

Ghaoui, C., George, S., Rada, R., Beer, M. & Getta, J. (1992) 'Text to Hypertext and Back Again', in *Computers and Writing: State of the Art*, (ed. P. Holt & N. Williams), Oxford: Intellect, pp. 109-130.

Gick, M. & Holyoak, K. (1980) 'Analogical Problem Solving', *Cognitive Psychology*, 12, pp. 306-355.

Gleick, J. (1987) *Chaos: Making a New Science*. New York: Viking Penguin.

Gould, J. (1980) 'Experiments on Composing Letters: Some Facts, Some Myths, and Some Observations', in*Cognitive Processes in Writing*, (ed. L. Gregg & E. Steinberg), Hillsdale, NJ: Lawrence Erlbaum, pp. 97-127.

Grandjean, E. (1987) *Ergonomics in Computerised Offices*. London: Taylor & Francis.

Graves, R. (1955) *The Greek Myths*. Harmondsworth: Penguin. Published in two volumes.

Graves, R. (1961) *The White Goddess: A Historical Grammar of Poetic Myth*. London: Faber & Faber.

Greene, J. (1986) *Language Understanding: A Cognitive Approach*. Milton Keynes: Open University Press.

Greene, J. & Coulson, M. (1995) *Language Understanding - Current Issues*. second edition. Milton Keynes: Open University Press.

Greene, J. & Hicks, C. (1984) *Basic Cognitive Processes*. Milton Keynes: Open University Press.

Greimas, A. (1966) *Semantique Structurale*. Paris: Larousse.

Griffin, D. (1984) 'Animal Thinking', *American Scientist*, 72, pp. 456-464.

Haas, C. (1989) 'How the Writing Medium Shapes the Writing Process: Effects of Word Processing on Planning', *Research in the Teaching of English*, 23, 2, pp. 181-207.

Haas, C. & Hayes, J. (1986) 'What Did I Just Say? Reading Problems in Writing with the Machine', *Research in the Teaching of English*, 20, 1, pp. 22-35.

Halliday, M. & Hasan, R. (1976) *Cohesion in English*. London: Longman.

Hammond, N. (1993) 'Learning with Hypertext: Problems, Principles and Prospects', in *Hypertext: A Psychological Perspective*, (ed. C. McKnight, A. Dillon & J. Richardson), Hemel Hempstead: Ellis Horwood, pp.51-70.

Harrison, J. (1962) *Prolegomena to the Study of Greek Religion.* London: Merlin Press. First published in 1903.

Harrison, J. (1963) *Themis: A Study of the Social Origins of Greek Religion.* London: Merlin Press. First published in 1911.

Hart, J. (1993) 'My Waterloo', in *The Agony and the Ego*, (ed. C. Boylan), Harmondsworth: Penguin, pp. 207-211.

Hartley, J. & Branthwaite, A. (1989) 'The Psychologist as Wordsmith: a Questionnaire Study of the Writing Strategies of Productive British Psychologists', *Higher Education*, 18, pp. 423-452.

Hawkes, T. (1989) *Metaphor.* London: Routledge. First published 1972.

Hayes, J. & Flower, L. (1980a) 'Identifying the Organization of Writing Processes', in *Cognitive Processes in Writing*, (ed. L. Gregg & E. Steinberg), Hillsdale, NJ: Lawrence Erlbaum, pp.3-30.

Hayes, J. & Flower, L. (1980b) 'Writing as Problem Solving', *Visible Language*, XIV, 4, pp.388-399.

Hayes-Roth, B. & Hayes-Roth, F. (1979) 'A Cognitive Model of Planning', *Cognitive Science*, 3, pp.275-310.

Headland, J. (1994) 'Wrecking Writing',*Writing and Computers Newsletter*, 9, pp. 12-14.

Highsmith, P. (1993) 'Thickening My Plots', in *The Agony and the Ego*, (ed. C. Boylan), Harmondsworth: Penguin, pp. 151-156.

Hill, S. (1993) 'Heady Stuff', in *The Agony and the Ego*, (ed. C. Boylan), Harmondsworth: Penguin, pp. 113-122.

Hitch, G. & Baddeley, A. (1976) 'Verbal Reasoning and Working Memory', *Quarterly Journal of Experimental Psychology*, 28, pp. 603-621.

Hoard, J., Wojcik, R. & Holzhauser, K. (1992) 'An Automated Grammar and Style Checker for Writers of Simplified English', in *Computers and Writing: State of the Art*, (ed. P. Holt & N. Williams), Oxford: Intellect, pp. 278-296.

Hoban, R. (1982) *Riddley Walker*. London: Pan/Picador. First published in 1980 by Jonathan Cape.

Holt, P. (1989) 'Models of Writing: a Question of Interaction?', in *Computers and Writing: Models and Tools*, (ed. N.Williams & P. Holt), Oxford: Intellect, pp. 50-60.

Holt, P. (1992) 'User-Centred Design and Writing Tools: Designing *with* Writers, not *for* Writers', *Intelligent Tutoring Media*, 3, 2/3, pp. 53-63.

Holt, P., Howell, G. & Gjengendal, J. (1991) 'Logic and Writing: Experiments on the Logical Structuring of Hypertext Documents', in *Proceedings of the Fourth Annual Conference of Computers and the Writing Process*, (ed. M. Sharples), Brighton: University of Sussex, 22-23 March 1991, pp. 190-197.

Hooker, J. (1973) *Writers of Wales: John Cowper Powys.* Aberystwyth: University of Wales Press.

Hope, M. (1989) *The Elements of the Greek Tradition.* Shaftesbury, Dorset: Element Books.

Hough, G. (1969) *Style and Stylistics.* London: Routledge & Kegan Paul.

Howell, G. (1990) 'Hypertext Meets Interactive Fiction: New Vistas in Creative Writing', in *Hypertext: State of the Art*, (ed. R. McAleese & C. Green), Oxford: Intellect, pp. 136-141.

Howell, G. & Douglas, J. (1990) 'The Evolution of Interactive Fiction', *Computer Assisted Language Learning*, 2, pp. 93-109.

Hughes, T. (1981) 'Foreword' to *The Way to Write: A Complete Guide to the Basic Skills of Good Writing*, (Fairfax, J. & Moat, J.), London: Elm Tree Books, pp.xi-xix.

Hulme, C. (1984) 'Reading: Extracting Information from Printed and Electronically Presented Text', in *Fundamentals of Human-Computer Interaction*, (ed. A. Monk), London: Academic Press, pp. 35-47.

Ide, N. & Veronis, J. (1990) 'Artificial Intelligence and the Study of Literary Narrative', *Poetics*, 19, pp. 37-63.

Ide, N. & Veronis, J. (1991) 'An Artifical Intelligence Approach to Literary Narrative', in *Research in Humanities Computing, Vol.1*, (ed. I. Lancashire), Oxford: Oxford University Press, pp. 165-176.

Iketani, A. (1984) 'Struggle for Preventing Disease due to VDT Labor and Establishing Labor Standards: Laying Stress on Eye-Strain', Tokyo: Japanese Federation of Radio and TV Workers Unions.

Jakobson, R. (1973) *Questions de Poetique.* Paris: Editions du Seuil.

Jakobson, R. (1987) 'Two Aspects of Language and Two Types of Aphasic Disturbances', in *Language in Literature*, (ed. K. Pomorska & S. Rudy), Cambridge, Mass: Belknap Press of Harvard University Press, pp.95-114. First published in 1956 as Part II of *Fundamentals of Language*, (written in collaboration with M. Halle), The Hague: Mouton.

Johnson, N. & Mandler, J. (1980) 'A Tale of Two Structures: Underlying and Surface Forms in Stories', *Poetics*, 9, pp. 51-86.

Jolley, E. (1993) 'Literary Landscapes', in *The Agony and the Ego*, (ed. C. Boylan), Harmondsworth: Penguin, pp. 163-175.

Jonassen, D. (1990) 'Semantic Network Elicitation: Tools for Structuring Hypertext', in *Hypertext: State of the Art*, (ed. R. McAleese & C. Green), Oxford: Intellect, pp. 142-152.

Jonassen, D. (1993) 'Effects of Semantically Structured Knowledge Bases on Users' Knowledge Structures', in *Hypertext: A Psychological Perspective*, (ed. C. McKnight, A. Dillon & J. Richardson), Hemel Hempstead: Ellis Horwood, pp. 153-168.

Joyce, J. (1975) *Finnegans Wake.* Fourth edition. London: Faber & Faber. First published in 1939.

Jung, C. (1959) *Archetypes and the Collective Unconscious.* London: Routledge & Kegan Paul.

Kahn, P. (1991) 'Linking Together Books: Adapting Published Material into Intermedia Documents', in *Hypermedia and Literary*

Studies, (ed. P. Delany & G. Landow), Cambridge, Mass: MIT, pp. 221-256.

Kahney, H. (1986) *Problem Solving: A Cognitive Approach.* Milton Keynes: Open University Press.

Kellogg, R. (1989) 'Idea Processors: Computer Aids for Planning and Composing Text', in *Computer Writing Environments: Theory, Research, and Design*, (ed. B. Britton & S. Glynn), Hillsdale, NJ: Lawrence Erlbaum, pp. 57-92.

Kenny, A. (1992) *Computers and the Humanities.* London: British Library.

Kibby, M. & Mayes, T. (1993) 'Towards Intelligent Hypertext', in *Hypertext: Theory into Practice*, (ed. R. McAleese), Oxford: Intellect, pp.138-144.

Kintsch, W. & van Dijk, T. (1978) 'Toward a Model of Text Comprehension and Production', *Psychological Review*, 85, pp. 363-394.

Kintsch, W. & Greene, E. (1978) 'The Role of Culture-Specific Schemata in the Comprehension and Recall of Stories', *Discourse Processes*, 1, pp. 1-13.

Kirk, G. (1974) *The Nature of Greek Myths.* Harmondsworth: Penguin.

Kitto, H. (1957) *The Greeks.* Revised edition. Harmondsworth: Penguin. First edition published 1951.

Knopik, T. & Ryser, S. (1990) 'AI Methods for Structuring Hypertext Information', in *Hypertext: State of the Art*, (ed. R. McAleese & C. Green), Oxford: Intellect, pp.224-230.

Koh, T.-T., Loo, P. & Chua, T.-S. (1990) 'On the Design of a Frame-Based Hypermedia System', in *Hypertext: State of the Art,* (ed. R. McAleese & C. Green), Oxford: Intellect, pp. 154-165.

Kowalski, R.(1979) *Logic for Problem Solving.* New York: North-Holland.

Kristeva, J. (1980) 'The Bounded Text', in *Desire in Language: A Semiotic Approach to Literature and Art,* (ed. L. Roudiez, transl. by T. Gora, A. Jardine, and L. Roudiez), Oxford: Blackwell, pp. 36-63.

Kroll, B. & Wells, G. (Eds.) (1983) *Explorations in the Development of Writing: Theory, Research and Practice.* Chichester: John Wiley.

Kruse, R. (1989) *Programming with Data Structures.* Englewood Cliffs, NJ: Prentice-Hall.

Kundera, M. (1985) *The Unbearable Lightness of Being.* transl. from Czech by M. Heim. London: Faber & Faber. First published in 1984.

Lacan, J. (1979) *The Four Fundamental Concepts of Psychoanalysis.* transl. by A. Sheridan. ed. J.-A. Miller. Harmondsworth: Penguin. First published by the Hogarth Press and the Institute of Psychoanalysis 1977. First published in French by Editions du Seuil, Paris, 1973.

Landow, G. (1991) 'The Rhetoric of Hypermedia: Some Rules for Authors', in *Hypermedia and Literary Studies,* (ed. P. Delany & G. Landow), Cambridge, Mass: MIT, pp. 81-103.

Landow, G. & Delany, P. (1991) 'Hypertext, Hypermedia and Literary Studies: The State of the Art', in *Hypermedia and Literary Studies,* (ed. P. Delany & G. Landow), Cambridge, Mass: MIT, pp. 3-50.

Lawrence, D. (1962) *The Symbolic Meaning: The Uncollected Versions of Studies in Classic American Literature*. ed. A. Arnold. Arundel: Centaur Press.

Lawrence, D. (1995) *The Rainbow*. ed. M. Kinkead-Weekes with an Introduction and Notes by A. Fernihough. Harmondsworth: Penguin. First published by Methuen 1915.

Leach, E. (1970) *Levi-Strauss*. London: Collins/Fontana.

Leavis, F. (1948) *The Great Tradition*. London: Chatto & Windus.

Lee, H. (1955) *Plato's 'Republic'*. Harmondsworth: Penguin.

Levi-Strauss, C. (1972) *The Savage Mind*. English transl. London: Weidenfeld & Nicolson. First published in Great Britain 1966. *La Pensee Sauvage* first published by Librairie Plon, Paris, 1962.

Levi-Strauss, C. (1977) 'The Structural Study of Myth', in *Structural Anthropology, Volume One*, transl. by C. Jacobson and B. Schoepf, Harmondsworth: Peregrine/Penguin, pp. 206-231. *Structural Anthropology* first published in the USA 1963, and in Great Britain 1968.

Levi-Strauss, C. (1978a) 'The Scope of Anthropology', in *Structural Anthropology, Volume Two*, transl. by M. Layton, Harmondsworth: Peregrine/Penguin, pp. 3-32. *Structural Anthropology Volume Two* first published in the USA 1976, and in Great Britain 1977.

Levi-Strauss, C. (1978b) 'Structure and Form: Reflections on a Work by Vladimir Propp', in *Structural Anthropology, Volume Two*, transl. by M. Layton, Harmondsworth: Peregrine/Penguin, pp. 115-145. *Structural Anthropology Volume Two* first published in the USA 1976, and in Great Britain 1977.

Levi-Strauss, C. (1978c) 'Cultural Discontinuity and Economic and Social Development', in *Structural Anthropology, Volume Two*, transl. by M. Layton, Harmondsworth: Peregrine/Penguin, pp.

312-322. *Structural Anthropology Volume Two* first published in the USA 1976, and in Great Britain 1977.

Levi-Strauss, C. (1978d) 'Race and History', in *Structural Anthropology, Volume Two*, transl. by M. Layton, Harmondsworth: Peregrine/Penguin, pp. 323-362. *Structural Anthropology Volume Two* first published in the USA 1976, and in Great Britain 1977.

Levi-Strauss, C. (1986) *The Raw and the Cooked: Introduction to a Science of Mythology.* transl. by J. & D. Weightman. Harmondsworth: Peregrine/Penguin. First published in Great Britain by Jonathan Cape, London, 1970. *Le Cru et le Cuit* first published by Librairie Plon, Paris, 1964.

Levy, C. & Ransdell, S. (1994) 'Is Writing as Difficult as it Seems? Two Experiments', in *Abstracts of the Seventh European Conference on Writing and Computers*, ed. H. van den Bergh, Th. van der Geest, D. Janssen, G. Rijlaarsdam & S. Sengers, (Utrecht, Netherlands, 19-21 October 1994), pp. 122-124.

Liddell, R. (1965) *A Treatise on the Novel.* London: Jonathan Cape. First published in 1947.

Longinus (1965) 'On the Sublime', in *Classical Literary Criticism*, transl. by T. Dorsch, Harmondsworth: Penguin, pp. 97-158.

Mandler, G. (1985) *Cognitive Psychology: An Essay in Cognitive Science.* Hillsdale, NJ: Lawrence Erlbaum.

Mandler, J. (1978) 'A Code in the Node: The Use of a Story Schema in Retrieval', *Discourse Processes*, 1, pp. 14-35.

Mandler, J. (1982) 'Recent Research on Story Grammars', in *Language and Comprehension*, (ed. J.-F. LeNy & W. Kintsch), Amsterdam: North-Holland, pp. 207-218.

Mandler, J. & DeForest, M. (1979) 'Is There More than One Way to Recall a Story?', *Child Development*, 50, pp. 886-889.

Mandler, J. & Johnson, N. (1977) 'Rememberance of Things Parsed: Story Structure and Recall', *Cognitive Psychology*, 9, pp. 111-151.

Mandler, J. & Johnson, N. (1980) 'On Throwing Out the Baby with the Bathwater: A Reply to Black and Wilensky's Evaluation of Story Grammars', *Cognitive Science*, 4, pp. 305-312.

Mantel, H. (1993) 'Growing a Tale', in *The Agony and the Ego*, (ed. C. Boylan), Harmondsworth: Penguin, pp. 35-46.

Marr, D. (1982) *Vision*. San Francisco: Freeman.

Martlew, M. (Ed.) (1983) *The Psychology of Written Language: Developmental and Educational Perspectives*. Chichester: John Wiley.

Matsuhashi, A. (1982) 'Explorations in the Real-Time Production of Written Discourse', in *What Writers Know: The Language, Process and Structure of Written Discourse*, (ed. M. Nystrand), New York: Academic Press, pp. 269-290.

Mayes, T., Kibby, M. & Anderson, A. (1990) 'Signposts for Conceptual Orientation: Some Requirements for Learning from Hypertext', in *Hypertext: State of the Art*, (ed. R. McAleese & C. Green), Oxford: Intellect, pp.121-129.

McAleese, R. (1993) 'Navigation and Browsing in Hypertext', in *Hypertext: Theory Into Practice*, (ed. R. McAleese), Oxford: Intellect, pp. 5-38.

McGahern, J. (1993) 'The Devil Finds Work for Idle Hands', in *The Agony and the Ego*, (ed. C. Boylan), Harmondsworth: Penguin, pp. 95-104.

McKnight, C., Dillon, A. & Richardson, J. (1990) 'A Comparison of Linear and Hypertext Formats in Information Retrieval', in

Hypertext: State of the Art, (ed. R. McAleese & C. Green), Oxford: Intellect, pp. 10-19.

McKnight, C., Dillon, A. & Richardson, J. (1993) 'Why Psychology?', in *Hypertext: A Psychological Perspective*, (ed. C. McKnight, A. Dillon & J. Richardson), Hemel Hempstead: Ellis Horwood, pp. 1-6.

McKnight, C., Richardson, J. & Dillon, A. (1993) 'The Authoring of Hypertext Documents', in *Hypertext: Theory into Practice*, (ed. R. McAleese), Oxford: Intellect, pp. 116-124.

McLuhan, M. (1969) *The Gutenberg Galaxy.* New York: Mentor. First published by University of Toronto Press, Toronto, 1962.

McLuhan, M. (1973) *Understanding Media*. London: Abacus. First published in England by Routledge and Kegan Paul, London, 1964.

Milian, M. (1994) 'Contextual Factors Enhancing Cognitive and Metacognitive Activity During the Process of Collaborative Writing', in *Abstracts of the Seventh European Conference on Writing and Computers*, ed. H. van den Bergh, Th. van der Geest, D. Janssen, G. Rijlaarsdam & S. Sengers, (Utrecht, Netherlands, 19-21 October 1994), pp. 135-136.

Miller, G. (1956) 'The Magical Number Seven, Plus or Minus Two: Some Limits on our Capacity for Processing Information', *Psychological Review*, 63, 2, pp. 81-97.

Miller, J. (1971) *McLuhan*. London: Fontana/Collins.

Minsky, M. (1975) 'A Framework for Representing Knowledge', in *The Psychology of Computer Vision*, (ed. P. Winston), New York: McGraw-Hill, pp. 211-277.

Minsky, M. (1977) 'Frame-System Theory', in *Thinking: Readings in Cognitive Science* (ed. P. Johnson-Laird & P. Wason), Cambridge: Cambridge University Press.

Moggach, D. (1993) 'Fleshing My Characters', in *The Agony and the Ego*, (ed. C. Boylan), Harmondsworth: Penguin, pp. 131-140.

Monk, A. (Ed.) (1984) *Fundamentals of Human-Computer Interaction.* London: Academic Press.

Monk, A. (1990) 'Getting to Known Locations in a Hypertext', in *Hypertext: State of the Art*, (ed. R. McAleese & C. Green), Oxford: Intellect, pp. 20-27.

Moore, L. (1993) 'Better and Sicker', in *The Agony and the Ego*, (ed. C. Boylan), Harmondsworth: Penguin, pp. 195-206.

Mortimer, J. (1993) 'Plot Luck', in *The Agony and the Ego*, (ed. C. Boylan), Harmondsworth: Penguin, pp. 237-243.

Moulthrop, S. (1991) 'Reading From the Map: Metonymy and Metaphor in the Fiction of "Forking Paths"', in *Hypermedia and Literary Studies*, (ed. P. Delany & G. Landow), Cambridge, Mass: MIT, pp. 119-132.

Murray, G. (1963) 'Excursus on the Ritual Forms Preserved in Greek Tragedy', in Harrison, J. (1963), pp.341-363.

Nagel, E. & Newman, J. (1989) *Godel's Proof.* London: Routledge. First published 1958.

Nash, W. (1980) *Designs in Prose.* London: Longman.

Neale, S. (1980) *Genre.* London: British Film Institute.

Newell, A. & Simon, H. (1972) *Human Problem Solving.* New York: Prentice Hall.

Nicolson, R. (1990) 'Towards the Third Generation: the Case for (IKBH) Intelligent Knowledge Based Hypermedia Environments', in *Hypertext: State of the Art*, (ed. R. McAleese & C. Green), Oxford: Intellect, pp.166-173.

Nielsen, J. (1992) *Usability Engineering*. San Diego, CA: Academic Press.

Nietzsche, F. (1969) *Thus Spoke Zarathustra.* transl. by R. Hollingdale. Harmondsworth: Penguin.

Norman, D. & Draper, S. (Eds.) (1986) *User Centred System Design: New Perspectives on Human-Computer Interaction*. Hillsdale, NJ: Lawrence Erlbaum.

Nystrand, M. (Ed.) (1982) *What Writers Know: The Language, Process and Structure of Written Discourse.* New York: Academic Press.

O'Bannon, R. (1987) 'Putting it in Context', *Macuser*, April 1987, pp.94-98.

O'Flaherty, W. (1975) *Hindu Myths: A Sourcebook Translated from the Sanskrit.* Harmondsworth: Penguin.

Odell, L. (1980) 'Teaching Writing by Teaching the Process of Discovery: An Interdisciplinary Exercise', in *Cognitive Processes in Writing*, (ed. L. Gregg & E. Steinberg), Hillsdale, NJ: Lawrence Erlbaum, pp. 139-154.

Paretsky, S. (1993), "My Turn', in *The Agony and the Ego*, (ed. C. Boylan), Harmondsworth: Penguin, pp. 81-94.

Parthemore, J. (1991) 'JONATHAN: A Collaborative Creating Writing Environment', in *Proceedings of the Fourth Annual Conference on Computers and the Writing Process*, (ed. M. Sharples), Brighton: University of Sussex, 22-23 March 1991, pp. 40-48.

Passerault, J.-M. & Coquin, D. (1994) 'Cognitive Planning in Textual Descriptions of Plans', in *Abstracts of the Seventh European Conference on Writing and Computers*, ed. H. van den Bergh, Th.

van der Geest, D. Janssen, G. Rijlaarsdam & S. Sengers, (Utrecht, Netherlands, 19-21 October 1994), pp. 139-140.

Phythian, B. (1980) *English Grammar.* Sevenoaks: Hodder & Stoughton.

Poe, E. (1967) 'The American Drama', in *Selected Writings,* (ed. D. Galloway), Harmondsworth: Penguin, pp. 448-477. First published in 1845.

Polson, P., Lewis, C., Rieman, J. & Wharton, C. (1992) 'Cognitive Walkthroughs: A Method for Theory-based Evaluation of User Interfaces', *International Journal of Man-Machine Studies,* 36, pp.741-773.

Powys, J. (1964) *Wolf Solent.* Harmondsworth: Penguin. First published by Cape 1929.

Propp, V. (1968) *Morphology of the Folktale.* transl. by S. Pirkova-Jakobson. second edition. Austin, Texas: University of Texas Press.

Quillian, M. (1968) 'Semantic Memory', in *Semantic Information Processing,* (ed. M. Minsky), Cambridge, Mass: MIT.

Rada, R. (1989) 'Guidelines for Multiple Users Creating Hypertext: SQL and Hypercard Experiments', in *Computers and Writing: Models and Tools,* (ed. N.Williams & P. Holt), Oxford: Intellect, pp. 61-89.

Rahtz, S., Carr, L. & Hall, W. (1990) 'Creating Multimedia Documents: Hypertext Processing', in *Hypertext: State of the Art,* (ed. R. McAleese & C. Green), Oxford: Intellect, pp. 183-192.

Ramsay, J. & Oatley, K. (1991) 'Designing Minimal Manuals from Scratch', in *Proceedings of the Fourth Annual Conference of Computers and the Writing Process,* (ed. M. Sharples), Brighton: University of Sussex, 22-23 March 1991, pp. 86-114.

Reece, J. (1994) 'The Listening Word Processor', *Writing and Computers Newsletter*, 9, pp. 7-11.

Rimmon-Kenan, S. (1989) *Narrative Fiction: Contemporary Poetics.* London: Routledge. First published in 1983 by Methuen.

Rittel, H. & Webber, M. (1973) 'Dilemmas in a General Theory of Planning', *Policy Sciences*, 4.

Rousset, J. (1962) *Forme et Signification: Essais sur les structures litteraires de Corneille a Claudel.* Paris: Jose Corti. Cited by Derrida, J. in Derrida (1978a), p.24.

Roth, I. & Frisby, J. (1986) *Perception and Representation: A Cognitive Approach.* Milton Keynes: Open University Press.

Rumelhart, D. (1975) 'Notes on a Schema for Stories', in *Representation and Understanding - Studies in Cognitive Science*, (ed. D. Bobrow & A. Collins), New York: Academic Press, pp. 211-236.

Rumelhart, D. (1980) 'On Evaluating Story Grammars', *Cognitive Science*, 4, pp. 313-316.

Rushdie, S. (1990) *Haroun and the Sea of Stories.* London: Granta.

Rushdie, S. (1992) *The Satanic Verses.* Dover, Delaware: Consortium.

Ruskin, J. (1972) 'The Pathetic Fallacy', in *The Portable Victorian Reader*, (ed. G. Haight), New York: Viking, pp. 602-607. Extract from *Modern Painters*, first published in 1856.

de Saussure, F. (1983) *Course in General Linguistics.* transl. by R. Harris. London: Duckworth. *Cours de Linguistique Generale* first published by Payot, Paris, 1916.

Sawyer, T. & Weingarten, A. (1991) *Plots Unlimited.* (Disk) London: Ashley Wilde.

Schank, R. (1972) 'Conceptual Dependency: A Theory of Natural Language Understanding', *Cognitive Psychology*, 3, pp. 552-631.

Schank, R. & Abelson, R. (1977) *Scripts, Plans, Goals and Understanding.* Hillsdale, NJ: Lawrence Erlbaum.

Schilperoord, J. (1994) 'The Temporal Organisation of Macro-Planning Processes in Written Language Production', in *Abstracts of the Seventh European Conference on Writing and Computers*, ed. H. van den Bergh, Th. van der Geest, D. Janssen, G. Rijlaarsdam & S. Sengers, (Utrecht, Netherlands, 19-21 October 1994), p. 148.

Schreurs, D. & Adriaens, G. (1992) 'Controlled English (CE): From COGRAM to ALCOGRAM', in *Computers and Writing: State of the Art*, (ed. P. Holt & N. Williams), Oxford: Intellect, pp. 206-221.

Scrivener, S. (1989) 'Knowledge Based Picture Interpretation', LUTCHI Research Centre Paper (ref: HCC/L/60), Loughborough University of Technology.

Searle, J. (1970) *Speech Acts: An Essay on the Philosophy of Language.* Cambridge: Cambridge University Press.

Seneca (1969) *Letters from a Stoic*, transl. by R. Campbell, Harmondsworth: Penguin.

Sharples, M. (1985) *Cognition, Computers and Creative Writing.* Chichester: Ellis Horwood.

Sharples, M. (Ed.) (1992) *Computers and Writing: Issues and Implementations.* Dordrecht, Netherlands: Kluwer Academic Publishers. Published simultaneously as a special issue of *Instructional Science*, 21, 1-3.

Sharples, M. (1993) 'Computer Support for the Rhythm of Writing', paper delivered to the *Sixth UK Conference on Computers and Writing* (Aberystwyth: University of Wales, 13-15 April 1993).

Sharples, M., Goodlet, J. & Pemberton, L. (1989) 'Developing a Writer's Assistant', in *Computers and Writing: Models and Tools*, (ed. N. Williams & P. Holt), Oxford: Intellect, pp. 22-37.

Sharples, M. & Pemberton, L. (1992) 'Representing Writing: External Representations and the Writing Process', in *Computers and Writing: State of the Art*, (ed. P. Holt & N. Williams), Oxford: Intellect, pp. 319-336.

Simpson, A. & McKnight, C. (1990) 'Navigation in Hypertext: Structural Cues and Mental Maps', in *Hypertext: State of the Art*, (ed. R. McAleese & C. Green), Oxford: Intellect, pp. 73-83.

Slatin, J. (1988) 'Hypertext and the Teaching of Writing', in *Text, Context, and Hypertext: Writing With and For the Computer*, (ed. E. Barrett), Cambridge, Mass: MIT, pp. 111-129.

Smith, J. & Lansman, M. (1989) 'A Cognitive Basis for a Computer Writing Environment', in *Computer Writing Environments: Theory, Research, and Design*, (ed. B. Britton & S. Glynn), Hillsdale, NJ: Lawrence Erlbaum, pp. 17-56.

Sommerville, I., Haddley, N., Mariani J. & Thomson, R. (1990) 'The Designer's Notepad - a Hypertext System Tailored for Design', in *Hypertext: State of the Art*, (ed. R. McAleese & C. Green), Oxford: Intellect, pp. 260-266.

Stallings, W. (1990) *Computer Organization and Architecture: Principles of Structure and Function.* second edition. New York: Macmillan. First edition published 1987.

Steinberg, L. (1980) 'A Garden of Opportunities and a Thicket of Dangers', in *Cognitive Processes in Writing*, (ed. L. Gregg & E. Steinberg), Hillsdale, NJ: Lawrence Erlbaum, pp. 155-167.

Storrs, G. (1993) 'The Alvey DHSS Large Demonstrator Project Knowledge Analysis Tool: KANT', in *Hypertext: Theory into Practice*, (ed. R. McAleese), Oxford: Intellect, pp. 125-132.

Sutcliffe, A. (1988) *Human-Computer Interface Design.* Basingstoke: Macmillan.

Swift, G. (1993) 'Postscriptive Therapy', in *The Agony and the Ego*, (ed. C. Boylan), Harmondsworth: Penguin, pp. 21-25.

Thomson, G. (1973) *Aeschylus and Athens: A Study in the Social Origins of Drama.* Fourth edition. London: Lawrence & Wishart. First published in 1941.

Thomson, R. (1959) *The Psychology of Thinking.* Harmondsworth: Penguin.

Thorndyke, P. (1977) 'Cognitive Structures in Comprehension and Memory of Narrative Discourse', *Cognitive Psychology*, 9, pp. 77-110.

Thorndyke, P. & Yekovich, F. (1980) 'A Critique of Schema-Based Theories of Human Story Memory', *Poetics*, 9, pp. 23-49.

Tillyard, E. (1972) *The Elizabethan World Picture.* Harmondsworth: Penguin. First published by Chatto & Windus 1943.

Todorov, T. (1977a) 'The Grammar of Narrative', in *The Poetics of Prose*, transl. by R. Howard, Oxford: Blackwell, pp.108-119. *La Poetique de la Prose* first published by Editions du Seuil, Paris, 1971.

Todorov, T. (1977b) 'Narrative Transformations', in *The Poetics of Prose*, transl. by R. Howard, Oxford: Blackwell, pp. 218-233. *La Poetique de la Prose* first published by Editions du Seuil, Paris, 1971.

Todorov, T. (1977c) 'The Secret of Narrative', in *The Poetics of Prose*, transl. by R. Howard, Oxford: Blackwell, pp. 143-177. *La Poetique de la Prose* first published by Editions du Seuil, Paris, 1971.

Todorov, T. (1982a) *Symbolism and Interpretation*. transl. by C. Porter. Ithaca, New York: Cornell University Press. *Symbolisme et Interpretation* first published by Editions du Seuil, Paris, 1978.

Todorov, T. (1982b) *Theories of the Symbol*. transl. by C. Porter. Ithaca, New York: Cornell University Press. *Theories du Symbole* first published by Editions du Seuil, Paris, 1977.

Torrance, M. (1994) 'Is Writing Expertise Like Other Kinds of Expertise?', in *Abstracts of the Seventh European Conference on Writing and Computers*, ed. H. van den Bergh, Th. van der Geest, D. Janssen, G. Rijlaarsdam & S. Sengers, (Utrecht, Netherlands, 19-21 October 1994), p.164.

Torrance, M. & Thomas, G. (1993) 'Writing Strategies and Writing Behaviour', paper delivered to the *Sixth UK Conference on Computers and Writing* (Aberystwyth, University of Wales, 13-15 April 1993).

Torrance, M., Thomas, G. & Robinson, E. (1993) 'The Writing Strategies of Graduate Research Students in the Social Sciences', paper delivered to the *Sixth UK Conference on Computers and Writing* (Aberystwyth, University of Wales, 13-15 April 1993).

Trigg, R. & Suchman, L. (1993) 'Collaborative Writing in NoteCards', in *Hypertext: Theory into Practice*, (ed. R. McAleese), Oxford: Intellect, pp. 39-52.

Tulving, E. (1972) 'Episodic and Semantic Memory', in *Organization of Memory*, (eds. E. Tulving & W. Donaldson), New York: Academic Press.

Vygotsky, L. (1983) 'The Prehistory of Written Language', in *The Psychology of Written Language: Developmental and Educational Perspectives*, (ed. M. Martlew), Chichester: John Wiley, pp. 279-292. First published in *Mind in Society: the Development of Higher Psychological Processes*, (ed. M. Cole), Cambridge, Mass: Harvard University Press, 1979.

Walker, N. (1957) *A Short History of Psychotherapy*. London: Routledge & Kegan Paul.

Wason, P. (1980) 'Specific Thoughts on the Writing Process', in*Cognitive Processes in Writing*, (ed. L. Gregg & E. Steinberg), Hillsdale, NJ: Lawrence Erlbaum, pp. 129-137.

Watt, I. (1972) *The Rise of the Novel*. Harmondsworth: Penguin. First published by Chatto & Windus 1957.

Wayner, P. (1992) 'Boxweb: A Structured Outline Program for Writers', in *Computers and Writing: State of the Art,* (ed. P. Holt & N. Williams), Oxford: Intellect, pp. 78-89.

Whalley, P. (1990) 'Models of Hypertext Structure and Learning', in *Designing Hypermedia for Learning,* (ed. D. Jonassen & H. Mandl), Berlin: Springer-Verlag.

Whalley, P. (1993) 'An Alternative Rhetoric for Hypertext', in *Hypertext: A Psychological Perspective*, (ed. C. McKnight, A. Dillon & J. Richardson), Hemel Hempstead: Ellis Horwood, pp. 7-17.

Williams, N. (1989) 'Approaches to Computer Assisted Writing', in*Computers and Writing: Models and Tools*, (ed. N.Williams & P. Holt), Oxford: Intellect, pp. 1-16.

Williams, N. (1991a) *The Computer, the Writer and the Learner.* Berlin: Springer-Verlag.

Williams, N. (1991b) 'Teaching Writing Through Hypertext', in *Proceedings of the Fourth Annual Conference of Computers and*

the Writing Process, (ed. M. Sharples), Brighton: University of Sussex, 22-23 March 1991, pp. 66-75.

Williams, N. (1992a) 'New Technology. New Writing. New Problems?', in *Computers and Writing: State of the Art*, (ed. P. Holt & N. Williams), Oxford: Intellect, pp. 1-19.

Williams, N. (1992b) 'Computers and Writing', in *Computers and Written Texts*, (ed. C. Butler), Oxford: Blackwell, pp. 247-265.

Williams, W. (1980) 'Introduction' to *A Book of English Essays*, (ed. W. Williams), Harmondsworth: Penguin, pp. 11-16.

Williamson, M. & Pence, P. (1989) 'Word Processing and Student Writers', in *Computer Writing Environments: Theory, Research, and Design*, (ed. B. Britton & S. Glynn), Hillsdale, NJ: Lawrence Erlbaum, pp. 93-128.

Winograd, T. & Flores, F. (1986) *Understanding Computers and Cognition - A New Foundation for Design*. Norwood, NJ: Ablex.

Winter, A. (1994) 'Cognitive and Metacognitive Aspects of Text Producing', in*Abstracts of the Seventh European Conference on Writing and Computers*, ed. H. van den Bergh, Th. van der Geest, D. Janssen, G. Rijlaarsdam & S. Sengers, (Utrecht, Netherlands, 19-21 October 1994), p.183.

Winterbauer, A. (1992) 'Factors Affecting Organisational Acceptance of an Automated Writing Aid', in *Computers and Writing: State of the Art*, (ed. P. Holt & N. Williams), Oxford: Intellect, pp. 172-186.

Witte, P. & Cherry, R. (1986) 'Writing Processes and Written Products in Composition Research', in *Studying Writing: Linguistic Approaches*, (ed. C.Cooper & S. Greenbaum), Beverly Hills, Ca: Sage, pp. 112-153.

Wollen, P. (1976) 'North by North-West: A Morphological Analysis', *Film Form*, 1, 1, pp. 19-34.

Wright, P. (1993) 'To Jump or Not to Jump: Strategy Selection While Reading Electronic Texts', in *Hypertext: A Psychological Perspective*, (ed. C. McKnight, A. Dillon & J. Richardson), Hemel Hempstead: Ellis Horwood, pp. 137-152.

Wright, P. & Lickorish, A. (1989) 'The Influence of Discourse Structure on Display and Navigation in Hypertexts', in *Computers and Writing: Models and Tools*, (ed. N.Williams & P. Holt), Oxford: Intellect, pp. 90-124.

Wright, P. & Lickorish, A. (1990) 'An Empirical Comparison of Two Navigation Systems for Two Hypertexts', in *Hypertext: State of the Art*, (ed. R. McAleese & C. Green), Oxford: Intellect, pp. 84-93.

Yankelovich, N. (1991) 'From Electronic Books to Electronic Libraries: Revisiting "Reading and Writing the Electronic Book"', in *Hypermedia and Literary Studies*, (ed. P. Delany & G. Landow), Cambridge, Mass: MIT, pp.133-141.

Yankelovich, N., Meyrowitz, M. & van Dam, A. (1991) 'Reading and Writing the Electronic Book', in *Hypermedia and Literary Studies*, (ed. P. Delany & G. Landow), Cambridge, Mass: MIT, pp.53-79.

Yazdani, M. (1989) 'Computational Story Writing', in *Computers and Writing: Models and Tools*, (ed. N. Williams & P. Holt), Oxford: Intellect, pp. 125-147.

BIBLIOGRAPHY:

In the UK, the *Writing and Computers Association* publishes a newsletter and holds an annual conference which brings together researchers, writers, teachers and software designers. Selected papers from the first four conferences are available in:

- *Computers and Writing: Models and Tools*, ed. by N. Williams and P. Holt, Oxford: Intellect/Blackwell Scientific Publications, 1989. Published simultaneously in the USA by the Ablex Publishing Corporation, Norwood, New Jersey.
- *Computer Assisted Language Learning: Special Issue on Computer Assisted Composition*, 2, 1990, ed. by N. Williams.
- *Computers and Writing: State of the Art*, ed. by P. Holt and N. Williams, Oxford: Intellect, 1992. Published simultaneously in Europe and the USA by Kluwer Academic Publishers, Dordrecht, Netherlands.
- *Computers and Writing: Issues and Implementations*, ed. by M. Sharples, Dordrecht, Netherlands: Kluwer Academic Publishers, 1992. Published simultaneously as a special issue of *Instructional Science: An International Journal of Learning and Cognition*, 21, 1-3.

In Europe, the *European Association for Research on Learning and Instruction* (EARLI) has a *Special Interest Group* (SIG) on writing which publishes a newsletter and holds a regular conference on writing research. The *Writing and Computers Association, UK* joined forces with the *EARLI SIG on Writing* to hold a *Seventh European Conference on Writing and Computers* in 1994. Selected papers from this conference are available in:

- *Effective Learning and Teaching of Writing: Current Trends in Research on Writing*, ed. by G. Rijlaarsdam, H. van den Bergh and M. Couzijn, Amsterdam University Press, 1995.
- *Theories, Models and Methodology: Current Trends in Research on Writing*, ed. by G. Rijlaarsdam, H. van den Bergh and M. Couzijn, Amsterdam University Press, 1995.

- *Writing at Work: Professional Writing in the Computerised Environment*, ed. by G. Rijlaarsdam, H. van den Bergh and M. Couzijn, Amsterdam University Press, in press.

Selected papers from previous EARLI conferences are available in:

- *Journal of Psychology of Education: Special Issue on Writing*, VI, 2, June 1991, ed. by P. Boscolo, E. Esperet and M. Fayol.
- *Writing: Current Trends in European Research*, ed. G. Eigler and Th. Jechle, Freiburg: Hochschulverlag, 1993.

In the USA, the *Computers and Writing Association* also holds an annual conference for those who have an interest in this area. Recent publications from the USA on the subject include:

- *Computers and Writing: Theory, Research, Practice*, ed. by D. Holdstein and C. Selfe, Modern Language Association Press, New York, 1990. Volume 1 of the *MLA Research and Scholarship in Composition* Series.
- *Literacy and Computers: The Complications of Teaching and Learning with Technology*, ed. by C. Selfe and S. Hilligoss, MLA Press, New York, 1994. Volume 2 of the *MLA Research and Scholarship in Composition* Series.
- *Creating a Computer-Supported Writing Facility: A Blueprint for Action*, C. Selfe, Computers and Composition Press, Michigan Technological University, 1994. First in the series of *Advances in Computers and Composition Studies.*
- *Evolving Perspectives on Computers and Composition Studies: Questions for the 1990s*, ed. G. Hawisher and C. Selfe, Computers and Composition Press, Michigan Technological University, 1995. Second in the series of *Advances in Computers and Composition Studies.*
- *Writing Teachers Writing Software: Creating Our Place in the Electronic Age*, P. LeBlanc, Computers and Composition Press, Michigan Technological University, 1995. Third in the series of *Advances in Computers and Composition Studies.*

The main journals for papers on writing research, for studies of the use of computers in teaching and writing, and for articles on the related issues of ergonomics and HCI, are the following:

Applied Ergonomics, Behaviour and Information Technology, College Composition and Communication, Communications of the ACM, Computers and Composition, Computing Teacher, Educational Technology, Educational and Training Technology International, Ergonomics, Human Factors, IEEE Transactions on Communications, International Journal of Man-Machine Studies, Journal of Basic Writing, Journal of Business Communication, Journal of Educational Psychology, Journal of Experimental Education, Journal of Verbal Learning and Verbal Behaviour, Management Communication Quarterly, Research in the Teaching of English, Review of Educational Research, Technical Communication, Visible Language, Written Communication.

ACKNOWLEDGEMENTS:

Thanks to Mike Sharples, Peter Whalley, and the Socrates of Wivenhoe for encouraging me to think, Francis Mulhern for urging me to write, Billy Clark and Patrik Holt for their comments on the text, and Susanna Gladwin for the initial spark.