The oceanic mind: a study of emotion in literary reading
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Chapter 1

Discourse processes and memory functions

1.0 Introduction
In this first chapter I will set out the basics of reading processes. I will begin with a brief historical account of reading, highlighting some main stages of its development, which will include taking a look at the notion of reading as a mnemonic act and the relatively recent origins of silent reading. This will be followed by an in-depth account of the essentially discourse-psychological nature of language processes during reading and an overview of some of the various memory functions involved. This, in turn, will include looking at the nature of processing during reading from both a cognitive and a neurobiological perspective. Additionally, I shall briefly discuss a number of current persuasive discourse-psychological models of text processing. From what will be set out here, I shall make a preliminary observation with regard to the nature of mind and brain functions, both during reading procedures and during more general stimulus-driven cognitive processing: that these processes are dynamic.

1.1 A brief history of reading
Unlike speaking, reading is a relatively recent phenomenon. According to several historical accounts it emerged less than 5000 years ago. Developing written signs in order to convey units of meaning was as much a socio-cultural phenomenon as it was a cognitively-mediated one. The social aspect is highlighted by the fact that reading skills are not acquired naturally; rather they must be explicitly taught, often with quite inconsistent results. It is believed that the first writers, and hence the first readers, were the Sumerian scribes, who lived in the fourth millennium BC in present-day Iraq. These people did not engage in acts of reading and writing to give or receive aesthetic pleasure, as is common these days in the case of literature, but rather for purely pragmatic reasons. They had administrative motives for learning to recognise these essentially iconic, cuneiform-style pictograms that were etched on stone tablets. It is therefore not surprising to learn that most of the tablets that have been unearthed from this period by archaeologists have turned out to record nothing more than everyday financial transactions, produced in order to provide a kind of visual, mnemonic prompt. Hence, reading seems to have evolved from a simple registering device that was developed at a moment when people began to realise that long-term human memory was not the ideal place to accurately record detailed past events. The cognitive act of reading therefore has, at its very source, the basic mnemonic function of recovering an incident in our past life that would otherwise have been either lost or irrevocably distorted by human memory. Reading and memory appear to be inextricably linked.

Today, both reading and remembering are principally known as silent cognitive procedures. This also holds for the reading of literature, which, in itself, is a relatively new form of ‘entertainment’, emerging in Europe in its present form in the eighteenth century. Since reading, including novel reading, takes place silently in the privacy of our individual minds, the act of reading seems very personal. Nevertheless, although one might think of silent reading as the default mode, it is a socio-cultural rather than a biological development. It may seem strange from a twenty-first century perspective, but texts were almost always written to be read aloud, as

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1 Oral storytelling is of course a much older phenomenon.

2 See Gibson & Levin (1975: 156). For a detailed account of the origins of reading and writing from an archaeological perspective see Gelb (1952). For more recent accounts see Robinson’s The Story of Writing (1995) and Hooker’s Reading the Past (1990).

3 Gibson & Levin (9-10).
indeed they still are in some religions today like Judaism and Islam. In the past, therefore, reading was anything but a silent pastime.

One of the first recorded silent readers in Western history was the fourth-century bishop of Milan, St Ambrose. His friend and colleague St Augustine wrote about him in his *Confessions*, with much amazement:

When he read the eyes scanned the page and his heart sought out the meaning but his voice was silent and his tongue was still. Anyone could approach him freely and guests were not commonly announced, so that often when we came to visit him we found him reading like this in silence, for he never read aloud (VI, 3).

Clearly, St Ambrose was considered a bit of an oddity and it would be a long while before silent reading became the norm in the West. There had been some silent reading long before the time of St. Ambrose. Indeed, there is fragmentary evidence going as far back as the fifth century BC that some ancient Greeks did indeed read silently. Knox, for example, cites a passage from the *Knights* by Aristophanes (c.424BC). In the story, Demosthenes, who is absorbed in reading an oracle, is asked by his friend Nicias, who is serving him wine at that particular moment, “what does it say?” Demosthenes answers “fill me another cup”. Nicias takes this as verbatim and thinks that this is what the oracle literally says. Demosthenes does eventually tell him what it says, but only by way of a summary of the actual text. He has evidently first read the text silently, while drinking his wine, in order to be able to summarise and retell it afterwards. Hence, Aristophanes’ character — who should not be confused with the famous 4th century BC Athenian orator — was reading silently, which provides compelling evidence of this phenomenon some 800 years before St Augustine recorded his account. This idea of some Ancient Greeks being silent readers seems to fly in the face of all we know about these deeply rhetorical Ancients, famed as they are for their love of sonority in communication. Knox, however, puts forward a logical explanation as to why some Greeks sometimes exchanged the performative power of oral rhetoric for the pensiveness of cerebral reading: one can read far faster silently than one can aloud. Since many learned Greeks involved in the running of the city states like Athens had to read large quantities of text on a day-to-day basis, silent reading appears to have evolved as a kind of pragmatic, social necessity (421-22). In sum, although it is these days taken for granted that we read silently, it is important to remember that this soundless reading, like the earlier development of reading itself, chiefly came about as a result of socio-cultural necessities. Such insights serve to remind us that history and culture play a significant role in the cognitive act of reading.

1.2 Reading in the modern age
Any study of reading processes must try to work out the relationship between so-called ‘bottom-up’ or ‘stimulus-driven’ processes on the one hand and ‘top-down’ or ‘concept-driven’ processes on the other. My study, which deals exclusively with literary reading in the English language, will

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4 In fact, the Hebrew language still does not essentially differentiate between the verb ‘to speak’ and ‘to read’. For these speakers then, the act of speaking and the act of reading still are one and the same. See Manguel (45), who in turn cites Martin’s 1977 work.

5 It is interesting to note here how in this English translation St Augustine observes how St Ambrose’s heart, rather than his mind or brain, “sought out the meaning” of this written text.

6 This example is cited by Svenbro in his anthropological work *Phrasikleia* on the notions of reading and writing in Ancient Greece (164-7). Svenbro goes on to add that judging by the completely different reactions of Nicias and Demosthenes it shows that in 424 BC the practice of silent reading was not familiar to everybody who was literate. He also draws the, to my mind, plausible conclusion that although silent reading was evidently practised by some of the literate classes in fifth century Greece, it was by no means practised, or even known, by all readers (164).
also have to carry out this task. The first of these processes is mainly concerned with how a text might trigger or guide a reader’s meaning-making faculties. This may incorporate such things as the written medium, the rhetorical text structure, the style, the genre, the syntax, the graphology, the vocabulary, etc. The second of these processes primarily focuses on what a reader brings to bear on a text. This may include the act of vision itself and the subsequent cognitive and emotive processing that takes place, as well as the reading-induced mental imagery, which involves mnemonic input, i.e. prior knowledge, experiences, etc. One of the main reasons why text and discourse scholars wish to try and work out this relationship is to discover which of the two, i.e. top-down or bottom-up, plays the greater role in meaning-making in particular contexts and, more importantly, why. Another reason is to explore the shifting boundaries of individual, intersubjective and social aspects of cognition in reading processes.

1.2.1 Bottom-up processing: Words in the world
Stimulus-driven studies on reading and comprehension are largely concerned with which formal features of a text guide a reader’s meaning-making faculties. Some of the first linguistically-orientated studies into reading processes were the very formal readability tests of the 1940s. The most famous of these was devised by the linguist Rudolf Flesch. His test measured the average number of syllables per word and per sentence and he claimed that shorter sentences with shorter words should be easier to read. Although still useful today in formal composition teaching environments, such readability tests are otherwise limited as they pay little or no attention to the actual context of the reading situation. Take, for instance, a couple of simple words like ‘April’ and ‘thirteen’. According to Flesch’s readability test these disyllabic lexical items should be processed relatively swiftly and without much cognitive effort. This is probably the case in a sentence like ‘his son will turn thirteen in April’. But put these two seemingly ‘easy-to-process’ words in the hands of a literary artist and you may get a sentence like “It was a bright, cold day in April and the clocks were striking thirteen”. Here, it becomes evident that readability and comprehension rely to a large extent on something far more fundamental than merely counting up the number of syllables in a word or the words in a sentence. By their formal nature such readability tests appear to look at texts in isolation and entail perhaps the most pronounced bottom-up approach.

Early work conducted in the fields of discourse psychology and discourse analysis also tended to rely heavily on ‘words on the page’ in describing how concepts are formed. For example, in their influential 1983 work on text comprehension Teun van Dijk and Walter Kintsch set out three levels of representation in meaning making. The first of these they called ‘the surface level of representation’, which included the linguistic surface features of the text. The second category, which included any inter-sentential and intra-sentential aspects of meaning making, they called ‘the text-base level of representation’. This is what is more commonly known as the co-text, i.e. the immediate linguistic environment of a stretch of discourse that is being processed. Both these categories can be said to be language-based. The third level of representation, which they called ‘the situation model level’ concerns the referential state of affairs in the world that the text describes, whether real or imaginary. This third category does indeed leave open the option for reflection on a more extensive amount of cognitive input. Nevertheless, their model was still very much text-based, as linguistic elements here play a far more dominant role in the construction of mental representation. Similar approaches in this period that emphasised the importance of stimulus-driven aspects of the processing continuum tended to focus on such core linguistic issues as referential or clausal cohesion.²

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² This is the opening line to George Orwell’s novel 1984.

³ See, for example, Trabasso, Secco and van den Broek (1984).
Technological advances of the late 1980s helped to move this research forward. New approaches, including such methods as eye-tracking techniques, led to a focus on the actual on-line reading process itself. What happens to readers when they process written discourse became a central concern. Hence, the actual reader, and not just the text, was becoming an important focus. This heralded a move to include top-down processes more fully in addition to bottom-up ones. Many models were developed in this period that started to look at the role of cognitive inference in meaning-making strategies. One problem that these scholars had to come to terms with was the imbalance between the large number of inferences that must be made in order to comprehend a text, and the very limited processing capacity of working memory. Two of the more prominent models at this time included Kintsch’s developing Constructionist-Integrationist (CI) model, first set out in the late nineteen-eighties, and McKoon and Ratcliff’s far more bottom-up, minimalist model from the early nineteen-nineties. Although these continue to produce interesting data, especially Kintsch’s model, the focus today appears to be much more on trying to integrate more fully bottom-up comprehension processes on the one hand and top-down recall strategies on the other.9 One particularly persuasive model of reading that, to my mind, does try to combine equally comprehension and recall is Paul van den Broek et al.’s ‘Landscape model of comprehension and memory’ (1996, 1999), about which more will be said later in this chapter.

Some of the earlier accounts of reading comprehension in cognitive psychology did try to address both bottom-up and top down matters. One drawback, however, is that reading was still largely viewed as a linear procedure that usually involved the four stages of (i) decoding, (ii) literal comprehension, (iii) inferential comprehension and (iv) comprehension monitoring. John B. Best summarises the first three of these as follows:

Decoding refers to feature analysis of letters and clusters of letters and pattern recognition. At this stage, the graphemic code is mapped onto another internal representation. In the second stage, the reader accesses his lexicon. As we have seen, this process is apparently done directly from the graphemic code in most cases. In the third stage, the reader accesses larger units of cognitive organisation to integrate separate sentences (361).

Of the fourth stage ‘comprehension monitoring’, Best says that although it is not involved in the actual translation of a graphemic code to meaning, it is an important aspect of reading (361). He suggests further that reading involves a two-way procedure:

The stages of reading indicate that both bottom-up and top-down processes are involved. For example, decoding is largely a bottom-up process. Literal comprehension for skilled readers is probably also a bottom-up process, although top-down processes play a definite role in limiting the locations within the lexicon that might be activated. Inferential comprehension is almost completely a top-down process (362).

In spite of the integration of both aspects, the stimulus appears to remain paramount. In the words of Best “decoding is largely a bottom-up process”. Best does appear to leave the door ajar for something else with his use of the ‘largely’ modifier here, but for what? In which domains of reading, and under what kinds of reading conditions, might ‘decoding’ be something other than a bottom-up process? This is something my work will seek to investigate.

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9 Indeed, the modern version of Kintsch’s CI model does just this by focusing “on the integration of knowledge and memory and on texts or other nontextual sources in the process of comprehending an item or situation. It deals with the environment to be comprehended and the long-term memory that enables a person to comprehend it” (Comprehension 409).
1.2.2  Top-down processing: The body and the mind

Current cognitive psychology and cognitive linguistics assume that comprehension is dependent on the activation and availability of experience-based prior knowledge that is located in what might be termed ‘the embodied mind’. This process can be discussed within the context of schema theory. Schema theory can be traced back to the work of the psychologist Sir Frederick C. Bartlett, who produced his seminal work *Remembering* (1932) while working in the Gestalt tradition of psychological experimentation in the 1920s and early 1930s. A central tenet of modern schema theory holds that no definitive meaning is to be found in texts or in words alone; rather, meaning comes into existence at the moment of interaction between the textual base on the one hand and the reader’s background knowledge on the other. This is also the case for literary reading. As Elena Semino puts it in her cognitive stylistic work, “we make sense of new situations — and texts in particular — by relating the current input to pre-existing mental representations of similar situations, situations and events” (123).

In his original qualitative empirical investigations Bartlett showed how knowledge plays an important role with regard to understanding, perception and memory by suggesting that the comprehension of a new situation depends on the activation of relevant areas of existing knowledge. He described such basic schematic units of prior knowledge as “an active organisation of past reactions, or past experiences” (201). Bartlett’s experiments suggested that readers’ expectations, based on their knowledge of previous texts and previous experiences, produce powerful interpretations of a text which can override the semantic content of the textual information. In practice, this actually means that culturally unfamiliar events, actions and episodes in texts are overruled, as it were, by reader-based knowledge and by the corresponding familiar mental imagery produced by the intersubjective, individual reader. Words in specific texts are then not processed on the basis of their formal, decontextualised semantic content, but rather their contextualised, pragmatic situation. Moreover, Bartlett did not just claim that comprehension requires the activation of appropriate areas of background knowledge, he was also convinced that the organisation and activation of knowledge is crucially affected by factors such as emotions, interests and attitudes (206-7). Although Bartlett explored the influence of emotions and affective attitudes in minimal detail only, he did have some interesting things to say, the crucial importance of which, as Semino has already noted, has not been fully realised in

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10 The notion of embodiment as set out in Gibbs’s most recent work on the topic *Embodiment and the Cognitive Sciences* (2005) can be broadly described as the role that people’s subjective, felt experiences of their bodies in motion have on their language and cognition. This notion of embodiment will return in later chapters.

11 The term ‘schema’ has been defined by M. W. Eysenck and M. T. Keane as a portion of background knowledge relating to a particular type of entity, situation or event.

12 Bartlett attributes the development of the notion of schema theory to the neurophysiologist H. Head in the early 1920s. Even before that, however, the claim can be made that the general idea of schemata stems from some of Kant’s philosophical ideas set out in his *Critique of Pure Reason* (1781). Bartlett’s work may seem to be too dated to be of use for a thesis written in the twenty-first century perspective. However, this is not the case. This is also the view of psychologists Keith Oatley and Jennifer M. Jenkins, who state in their recent 1996 work *Understanding Emotions* that a strong case can be made that Bartlett’s *Remembering* is the most important study of memory completed so far (267). As such, I will draw on Bartlett’s work freely.

13 The story that Bartlett used in one of his main experiments entitled ‘War of the Ghosts’ was a native American story. The British upper-middle class undergraduates at Cambridge University who took part in the experiment had quite a different cultural background from the characters in the story. As such, they recalled many details from the story through the filter of their own cultural subjectivism.

14 This functions in a similar fashion to my earlier-mentioned ‘April thirteen’ example.
subsequent developments of schema theory in literary reading environments since the early 1930s (127). This largely absent emotive dimension in modern literary text processing studies is something that I shall seek to address. 

Soon after the publication of Bartlett’s work, the Gestalt tradition became swamped by the emergence of behaviourism. As a result, the study of cognitive processes was to remain unpopular for some forty years until its revival in the 1970s due, in part, to the rise of artificial intelligence. Three theories related to schema theory are usually mapped out during this period: the ones developed by (i) David E. Rumelhart, (ii) Roger C. Schank and Robert Abelson, and (iii) Schank, this time working alone. The cognitive scientist Rumelhart conducted work on ‘story grammars’ in the mid-nineteen-seventies, an analytic approach which assumes that comprehension and recall rely heavily on story structures. Perhaps paradoxically, comprehension was grounded in a predominantly language-based, bottom-up approach. As a result, story grammars, with their formal methods of sentence parsing came under fire because of their inherent inflexibility. A decade later, in the mid-eighties, Rumelhart et al. conducted work on his theory of ‘parallel distributed processing’. To some extent this idea counters the claim of schema theory that knowledge is first of all ordered in blocks ‘top-down’, by positing that instead it is distributed across lower level units. Once again, this theory of Rumelhart’s was, in effect, primarily focusing on stimulus-driven processes. Two other researchers interested in schema theory were Schank and Abelson, who worked chiefly in artificial intelligence rather than in cognitive psychology. In the mid-nineteen seventies they developed the notion of ‘script’, which can be said to be a specific mental structure, like a visit to the dentist or to a restaurant. Schank, reflecting on them much later, says that they are knowledge structures that are useful in text processing to the extent that they direct the inference process and tie together pieces of input. Thus input sentences are connected together by referring to the overall structure of the script to which they make reference (4). In this view, as the author himself concludes, scripts are a kind of high-level knowledge structure that can be called upon to supply background information during the understanding process (4). Like Rumelhart’s story grammars, this theory was also quite formal and rigid despite its advantages and did not seem to cohere to a satisfactory level with real discourse interactions and memory structures. Schank, this time working alone, came up with a pliant theory of cognition he called ‘dynamic memory’, which he updated in Dynamic Memory Revisited. In these works Schank moves away from scripts and develops the notion of ‘scene’. In the words of the author, whereas scripts were “specific structures”, scenes “transcend the specifics of a situation” (19). A scene

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15 In her own 1997 work Semino considers the likely emotional associations of different schemata and their interpretative role in the poems she analyses. (To the best of my knowledge this developmental emotive work has not been expanded on by the author or anyone else since).

16 For more general work on how the cognitive schemata of readers can be used to interpret poetic discourse see Peter Verdonk’s 1999 article (299-300) and his 2002 work (102-4).

17 Jerry L. Morgan and Manfred B. Selner (1980), for example, argued that this type of linguistic analysis that relies on formal markers like referring pronouns cannot explain or even relate ‘coherence’ and ‘meaning assimilation’ processes in a reader’s head. They argued further that lexical markers do not cause the pattern of coherence in texts — instead such lexical markers are merely “an effect arising out of the more abstract coherent nature of narrative in the first place” (159-60). Cited in M. A. Forrester (159-69) and originally published in Spiro, Bruce and Brewer (Eds.).

18 Schank (1999) would later claim that in some senses stories can be the opposite of scripts when viewed from the perspective of memory functions since we do not tell a story unless it deviates from the norm in some interesting way (89).

19 The original work was published in 1983. It is from this most recent (1999) work that I cite here in this section.
refers to an event in a larger chain. Take, for example, a ‘van rental episode’. This is a scene in a larger organising structure which could be ‘moving house’ or ‘going on a camping vacation’ or ‘going to buy furniture’, etc. Schank also developed two higher-level processing mechanisms, which he termed memory organisation packets (MOPs) and thematic organisation points (TOPs). MOPs basically organise the scenes. They are the larger organising structures mentioned above, like the house moving episode in my example. They are flexible as well in that they allow new information to be integrated into existing expectations. TOPs are somewhat different. They are high-level structures under which memories are organised (81). Three types of information are stored in TOPs: expectational, static and relational (81). To employ a literary discourse processing analogy as an illustration, TOPs account for how readers draw on a whole host of similar experiences to flesh out an ongoing reading experience. Both MOPs and TOPs move away from the text-base towards the processing qualities of the human mind, where Bartlett had begun some fifty years earlier. In his updated 1999 work Schank says that he “now sees language understanding as an integrated process”, adding “people don’t understand things without making reference to what they already know” (4). In that same discussion he adds “we don’t break down the tasks of understanding language into small components” (5). In effect he is arguing against linear models of discourse processing. Schank concludes by stating that “expectations are the key to understanding” (79). He goes on to qualify this by stating “in a great many instances these expectations are sitting in a particular spot in memory, awaiting the call to action. Frequently, they are prepackaged like scripts” (79-80). Although Schank adds that it is not always that simple, the implications of this claim for top-down processing in reading comprehension situations is significant. In this same discussion he further observes:

More often we do try to figure out what will happen in a situation we encounter … In attempting to imagine what will happen next we must construct a model of how things will turn out. (This model can often be quite wrong of course). Sometimes during the construction of the model, we come across memories that embody exactly the same state of affairs that we are constructing; this is an instance of outcome-driven reminding (80).

Perhaps one reason why much of this earlier work did not account fully for the pivotal role that cognitive processes played was that almost all of this psychological work was based on simple, pre-fabricated sentences. In other words, the sentences studied were not real or natural language that had been produced in real discourse situations. They were often very short and isolated pieces of text lacking meaningful co-text as well as context. It is easy to see how under such minimalist and artificial circumstances there was little scope for exploring the processes involved in reading literary texts. It was to remain so for a long time. This is odd since literary texts are essentially stories and storytelling is fundamental to human communication. This is supported by Schank who writes “whatever the means and whatever the venue, storytelling seems to play a major role in human interaction” (89). Despite the neglect of literary discourse processing there were some admirable models developed at the end of the twentieth century.

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20 In defence of this practice it was not uncommon at the time. Indeed, it could be observed in other linguistic areas of research, as diverse as generative grammar and even pragmatics. (Arguably, the exclusive use of such contrived sentences can still be said to be restricting the potential of reading experiments using eye-tracking technology).

21 Following Catherine Emmott (1997) and others, I view literature as a natural kind of discourse (269).

22 As Rolf Zwaan remarked in the 1990s “contemporary models of text comprehension are not well equipped to account for the comprehension of literary texts” (241).

23 I cannot go into these seminal studies here in any real detail, but their roots can be said to lie in the literary critical works of a number of key twentieth-century scholars including I.A. Richards, William Empson, Jonathan Culler, Stanley Fish, Norman Holland and Wolfgang Iser.
These included Rolf Zwaan’s own model of literary reading (1993), Paul Werth’s text world theory (1999) and Catherine Emmott’s study on narrative comprehension (1997). There was also work on applying schema theory to the analysis of literary texts. Guy Cook claimed, for example, in his work on the interplay of form and mind in literary discourse processing that literary language, and by default the inherently slippery notion of ‘literariness’, rests on what he terms the ‘refreshment’ and subsequent ‘reinforcement’ of cognitive schemata.24

The lack of attention to top-down processes in many discourse processing studies in the 1990s is something that Teun van Dijk has recently highlighted by proposing a view of text processing based on what he terms ‘context models’ (1999). Context models are a type of experience model in that they represent “the ongoing, subjective interpretation of everyday episodes in the lives of social actors” (125). Experience models are characterised by how they are built by “the primacy of personal experiences” (127). Unlike situation models (often now referred to as ‘event’ models), the focus of context models is on pragmatics rather than on providing a cognitive base for the semantics of the text: involving cohesion, coherence, reference, etc. Van Dijk argues that it is not contexts themselves that influence discourse or language use but rather how they are subjectively interpreted by discourse participants (124). During communicative events in social situations “participants actively and ongoingly construct a mental representation of only those properties that are currently relevant to them” (124, emphasis as original). Thus opinions, and emotions, are prominent in the workings of mental models (126). Such subjective interpretations of contexts, he argues further, are located in episodic memory and have a crucial role in controlling text and talk. Van Dijk argues further that “the mental representation of the ongoing discourse itself should be part of the context model” and that, as such, this shows “how the traditional distinction between text and context is therefore only an analytic one” (132). He points out further that despite the confluence of text and context this does not mean that event models and context models collapse, as a distinction between the two can and should be made where appropriate (133). Van Dijk’s focus is on reading newspaper discourse. However, since reading literature is a communicative event in a broadly social situation, there seems to be no reason why this general idea could not be extended to literary discourse processing, in which an author or implied author/narrator communicates with a reader, whose mental models of the discourse situation are subjective, relevant to the reader involved and based on emotions.25

1.2.3 Some current discourse psychological views on text processing

In the above section I started to discuss some discourse-psychological views on text processing. Here I will address this more centrally. Current reading research broadly falls either into the category of memory-based research, involving such methods as questionnaires or think-aloud protocols or the more technological domain of on-line processing research, such as eye-tracking and even some basic neural-scaning procedures. These involve either ‘what readers remember about reading’ or ‘what readers do when they read’. As van Dijk has noted (1999) “linguists and discourse analysts have paid a great deal of attention to the role of context but have failed to develop explicit theories of text-context relationships” (123). Recently, however, there has been a growing realisation that a combination of both approaches might prove to be most effective. In essence, what one is looking for is an approach that seeks not to subjugate either language or the mind but rather one that seeks to understand the contextualised complexities of their confluent interaction in any given discourse comprehension situation.

One persuasive current model of text processing that appears to do this is van den Broek et al.’s earlier mentioned landscape model of reading. This theory goes some way towards

24 Semino (1997) built on this work and added an emotive dimension, which I referred to earlier in this section.

25 I will expand on this in chapters seven and eleven.
emphasising the dynamic, complex and bi-directional process that takes place during the bottom-up activation of concepts and the top-down deployment of conceptual networks. These authors are interested in finding out how readers construct representations from a text based on memories. They are also interested in how the process of comprehending individual sentences translates into mental representations that, to cite the authors, “linger far after the reader has put down the book” (71). The authors view each new sentence as a reading ‘cycle’. They claim that there are four sources of activation in such a cycle (73). The first is from the text that is currently being processed, i.e. the present reading cycle. The second concerns the activation of a concept from the preceding reading cycle. This can occur because this conceptual representation is still fresh in the mind and may override the current input. The third concerns the reactivation of a concept from even earlier reading cycles. This reactivation need not be due to the (re)occurrence of a literal, textual reference; it can be triggered as well by available background knowledge. This purely top-down input is thus the fourth and final source. These four sources are labelled (i) text, (ii) carryover, (iii) reinstatement (from prior cycles), and (iv) background knowledge. Crucially, the authors stress that the latter three can all influence the first, i.e. the sentence that is currently being read. To take this to its most expanded form, background knowledge can affect the text itself. Van den Broek et al. particularly note that “there is ample evidence that readers routinely—and often automatically—activate background knowledge that is associated with what they read” (74). The authors further claim that “together, the limited attentional capacity and the access to these sources of activation cause text elements constantly to fluctuate in activation as the reader proceeds through a text” (74, my emphasis). By considering the simultaneous activation of what the authors go on to term ‘peaks’ and ‘valleys’ for each concept across a reading cycle, they arrive at their notion of ‘a landscape of conceptual activation in reading processes’. This empirically grounded sense of a ‘fluctuation’ of textual elements or, one might say, ‘an undulation’ of both textual elements and cognitive elements, is central to their landscape model of reading. On the subject of retrieval, van den Broek et al. say that it is a matter of the activation vector and the memory representation. They suggest that retrieval of representations can occur both during and after reading and that, if after reading, it can be immediate or delayed. If retrieval is initiated immediately after reading has been completed, the activation vector for the last cycle is still active and will enter into the equation of the retrieval process, but if recall is delayed it will play no role (92).

Three important concepts in contemporary text processing studies that warrant some explanation are ‘immediacy’, ‘incrementation’ and ‘inferencing’. The immediacy theory proposes that linguistic information is processed word by word. This means that decoding leads to spontaneous conceptual processing. This idea was primarily put forward in the cognitive psychological experiments of Marcel Just and Patricia Carpenter in the early 1980s. Their ‘immediacy assumption’ in text comprehension is based partially on the idea that working memory is limited and as such cannot hold onto too much uninterpreted information. However, this was thought by other researchers to be too one-sided. Later work, including eye-tracking experiments conducted by Lyn Frazier and Keith Rayner (1987; 1990) on the complexities of...

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26 The essence of this idea was expressed much earlier in the domain of literature in F. Scott Fitzgerald’s celebrated quote to his contemporary Ernest Hemingway cited at the very beginning of this work that “the purpose of a work of fiction is to appeal to the lingering after-effects in the reader’s mind”. I will return to this idea later in chapter seven.

27 Notice how this is a shift in emphasis compared to the far more linear cognitive psychological account of reading described by Best earlier in this section.

28 This notion of textual undulation, set within a cyclical framework, is most persuasive. As such, it is something to which I shall return in a later analytic chapter. It is worth noting too that van den Broek et al. also point out that concepts will be activated to different degrees (76). So some can be at the centre of attention, while others might ‘hover in the background’ as the authors put it.
processing purely syntactic structures, and especially on the differences between processing
patterns of lexical ambiguities compared to sense ambiguities, led to the adjustment of this model
and to the development of what these authors term the ‘immediate partial interpretation
hypothesis’. Two other researchers influential in this field are Anthony J. Sanford and Simon
Garrod. In their 1990s work, which builds on their earlier research, they distinguish two
general modes of discourse processing.\(^{29}\) The first of these is broadly incremental in fashion and
is concerned with the ways that discourse is built up in interpretation strategies. The second
concerns both local and global knowledge and focuses on the ways in which patterns in the input
may match those types of knowledge. With regard to the second of these two modes, the authors
argue that processing is immediate and not incremental, and can operate on a whole scale of
language processing, from the syntactic level right up to the discourse level (4). These authors
suggest that the general availability of background knowledge will determine the speed of
processing. This means that incoming information that cannot rely on background information but
instead has to be ‘computed’ on-line, as it were, will take more time. They have also suggested
that this predominantly syntactic distinction between either computing alternative interpretations,
as opposed to being able to rely on pre-stored knowledge, is applicable as well to semantic and
discourse processing levels (6). In addition to the above they have developed a theory of
‘scenario-mapping and focus’ where they suggest that “language input is related to world
knowledge at the earliest opportunity” (23).\(^{30}\) They suggest too that despite being sometimes
constrained by processing factors, specific scenario knowledge in immediate interpretation is
powerful enough to override local syntactic and semantic interpretations of sentences (24). Such a
claim ties in with their observation that “human language processing may often be incomplete”
(25). This finding echoes the similar one mentioned earlier by Bartlett. It is also
one of the major claims of Gestalt psychology.\(^{31}\)

The amount of background knowledge that is available to a specific reader can be
considered too by means of the notion of ‘inference generation’ during discourse comprehension.
McKoon and Ratcliff’s earlier mentioned minimalist hypothesis claims that the only real
inferences that readers make are local bridging ones. The authors add that sometimes use is made
of background knowledge but only if there are strong pre-existing multiple associations.\(^{32}\) In their
work the role of top-down processing is very limited and to a certain extent predictable. This
position has been successfully challenged by a number of scholars who argue for a more global
position with regard to inferencing in text processing.\(^{33}\) Two inferences that they seem to agree on
as necessary in order to achieve some valid sense of global coherence are ‘thematic inferences’
and ‘character emotional reactions’. This position has its roots in one of Arthur C. Graesser’s
much earlier works on literary discourse processing from 1981 in which he suggests that if
readers are asked to make inferences from a given story, and if they are then given enough time in
which to make them, then the number that they can come up with is unlimited. Another account
of the global nature of inferencing has recently been set out by Emmott in her earlier-mentioned
work on literary narrative comprehension. She argues that a global representation of a textual
world is necessary in order to make even the most basic of inferences (270). Emmott notes that

\(^{29}\) See the influential *Understanding Written Language* (1981) as an example of their earlier work.

\(^{30}\) See Sanford & Garrod’s 1981,1994 & 1999 works. The above citation is from their 1999 study.

\(^{31}\) Similar claims have been made by Rand J. Spiro (1980) in his ‘accommodative reconstruction
hypothesis’ and Dan Sperber (1985) in his ideas on what he terms ‘semi-propositional’ and ‘propositional’
knowledge.

\(^{32}\) This work was conducted in 1992 and 1995.

\(^{33}\) See, for example, the work of Graesser & Kreuz (1993); Graesser, Singer & Trabasso (1994) and Singer,
Graesser & Trabasso (1994).
“whenever events are set in a fictional context, the reader has to make priming and focusing inferences and repeatedly update entity representations” (269). The mental agility required for this constant mental monitoring and updating in inferences is expressed in her notions of ‘frame switches’ (i.e. flashbacks/forwards) and ‘frame recall’ (i.e. returning to the main story). Emmott accordingly claims that naturally occurring sentences, such as those found in fiction, depend for their interpretation on knowledge of the full text (269).

This final observation brings to a close for now my brief discussion on the nature of bottom-up and top-down processes in reading. I shall return to some of these theories when setting out my own model in chapter seven. It will not have gone unnoticed that the concept of memory has come up in many of the above discussions as it is fundamental to any study on reading and text processing. Some aspects from that mnemonic domain that are relevant to my study will now be sketched out below: first from a cognitive perspective and thereafter from a neurobiological one.

1.3 Memory and reading: A cognitive psychological account
Cognitive psychology traditionally makes a clear distinction between what is known as ‘short-term memory’ and ‘long-term memory’. The first, also often referred to as ‘working memory’ or sometimes even ‘consciousness’, is a very limited system that is characterised by its on-line processing capacity.34 It is believed to last for just a few seconds and is only able to deal with and retain about seven items of very concise information. Long-term memory, on the other hand, is often described as a kind of hypothetical storage system that is available to cueing and is characterised by the notions of duration, accessibility and capacity. There are obvious links between long-term memory and the notions of unconscious and subconscious mind processes. A second traditional classification is made between ‘semantic’ and ‘episodic’ memory. M. W. Eysenck and M. T. Keane, for example, describe the first of these as “our decontextualised memory for facts about the entities and relations between entities in the world” (250). Semantic memory, therefore, is broadly word-based, as it encompasses the storage of words and meanings, even though some concepts and world knowledge are stored too. But the emphasis in semantic memory is always on knowledge of ‘facts’. Episodic memory, on the other hand, is described by Eysenck and Keane as “our memory about specific situations and events that occurred at a particular time” (250), which can be said to be more ‘mind-based’. However, this type of memory also accounts for the names of people and places, especially those who are dear to us. Episodic memory, therefore, refers to the sort of memory that concerns information about time-related episodes and events together with the relationship between such events. The emphasis here, then, is on a kind of ‘experiential’ knowledge. In fact, episodic memory is in many ways similar to the notion of autobiographical memory in which emotion plays a pivotal role. This is illustrated by the clinical neurologist Antonio Damasio, who states in The Feeling of what Happens that “the autobiographical self depends on systematized memories of situations in which core consciousness was involved in the knowing of the most invariant characteristics of an organism’s life — who you were born to, where, when, your likes and dislikes, the way you usually react to a problem or a conflict, your name and so on” (17).

There is another type of memory that specifically links memory to place. It has its roots in the rhetorical work of Cicero and involves associating items to be remembered in conjunction with a specific physical location.35 It also involves revisiting those actual sites during recall. This

34 Antonio Damasio claims that “consciousness begins as the feeling of what happens when we see or hear or touch” (26). He continues “it is a feeling that accompanies the making of any kind of image—visual, auditory, tactile, visceral—within our living organisms” (The Feeling of what Happens 26).

35 In De Oratore the story is told of Simonides, who, after delivering a poem to a packed banquet hall leaves the building, which suddenly collapses killing everybody inside. Since Simonides has only just left
rigid type of memory is known more commonly as the ‘method of loci’. Conversely, the cognitive psychologist Nico Frijda notes in his influential work *The Emotions* that emotions cannot be called up at will by remembering relevant thoughts or images (328). He adds that “even a visit to the cemetery or any other place that carries old memories, rereading old letters in search of old affect, or listening to one’s favourite music in the hope of delight may leave one emotionally empty” (328). Rather, the type of emotion that we as individuals are searching for comes to us ‘unasked for’ and ‘surprisingly’, at moments when one is least prepared for them. Frijda appears to be right here, since the most puissant kind of emotions cannot be called up at will, just by repeating an action that might have caused an emotion previously, like the ones Frijda mentions.\(^{36}\)

However, having said this, it is plausible too that in certain cases, such as conscious interactions with art objects, one can at least attempt to create the best possible conditions for more intense emotions to occur. In the case of reading literature this might include such things as solitude, silence and comfort. Of course, in many cases nothing more than the general enjoyment of the text is likely to happen as the plot unravels up to the end of the book. However, on occasion, when the reader, text, context and physical environment appear to click into place, as it were, dynamic and intense emotions can, and indeed are, experienced by readers.\(^{37}\) This I would argue is not ‘asking for emotion’ or ‘calling it up’, rather it is simply putting the optimum constituents together and then hoping. As Frijda also states “few emotional events fall upon an unprepared mind” (326). This enhances rather than contradicts his earlier observation.

Other types of memory include (i) *echoic memory*, which pertains to the persistence of auditory impressions and their broad availability for further processing, (ii) *eidetic memory*, which refers to uncommonly vivid memory as though actually perceived, and is more common during childhood and is often lost during adolescence, (iii) *flashbulb memory*, which stores an unexpected event of short duration in dramatic photographic detail, and (iv) *iconic memory*, which refers to the momentary persistence of visual impressions and their brief availability for further processing.\(^{38}\) Many of these types of memory appear to suggest just how vivid many memories can be. This, however, is becoming an increasingly debatable point. Flashbulb memories, for example, stress clear photographic detail. However, ample new empirical evidence questions this notion of clarity. For example, Kintsch has claimed in *Comprehension* that “flashbulb memories are not notably accurate; it is just that people have great confidence in them” (420). Ronald A. Finke makes a similar observation too in his *Principles of Mental Imagery* when discussing how memories are likely to never truly be ‘photographic’ in nature (16). Arguably then, several of these ‘vivid’ types of memory might not be as detailed or clear as many psychologists first thought back in the mid-twentieth century. This is something I will return to in chapter three.

Schank (1999) also stresses the difference between conscious and non-conscious knowledge bases. He does this in part by suggesting we try for a moment not to think in words. If we are successful, what we are left with are images, feelings, attitudes, expectations, etc. (239). He further states that none of his structures (MOPs, TOPs, scenes, etc) rely on conscious knowledge. In fact, procedures like ‘understanding sentences’ and ‘generating expectations’ are also non-conscious forms of knowledge (241). He places them in the same category as what he

\(^{36}\) Proust’s notion of ‘involuntary memory’ set out in his novel *Remembrance of Things Passed* perhaps best represents this idea in a literary context.

\(^{37}\) The entire third part of this thesis will be devoted to explaining this phenomenon.

\(^{38}\) For a more detailed overview see Benjafied (103-39) and Solso (151-251 & 518) from whose definitions these descriptions are taken.
calls ‘the racing mind’, i.e. acts of daydreaming or that moment before you fall asleep or “when you are calm, alone, and deprived of visual and auditory stimuli and find your mind taking off on its own” (247). Schank explains further how memory is inextricably linked to stories. He holds the view that the major processes of memory are the creation, storage and retrieval of stories (90-1). In short, at its core, the mind is a collection of experience-based stories. This idea is supported by neurobiologist James E. Zull who claims that “stories engage all parts of the brain” (228). Schank stresses further the familiarity and stereotypicality of those stories. No memories are new since we must have already experienced them during creation and storage. He suggests further that in order to build memory structures we need to be able to recognise that the experience we are currently undergoing is in some way related to a previous experience (155). Recall, however, is not a random process; we just use the nearest match and replay it (91). He argues as well against the idea that every sentence one may ever produce is sitting in the mind, word for word, ready for activation. He adds that stories themselves do not exist as entities in the mind (100).

Instead, because all humans evolve during their adult lives, so too do their views. So even if an utterance, or for that matter a thought, is slightly different from its original, the relationship between them will be strong (91). These stories, and the events that drive them, will, of course, be unique and personal to each individual. However, some may be intersubjective as well, in Iser’s sense, described in my introduction.39

1.3.1 Memory and reading: A neurobiological account

Using a variety of neural imaging techniques, recent research in cognitive neuroscience has made three general discoveries with regard to the neurobiology of human memory systems. First, memory has different stages; secondly, long-term memory is represented in multiple regions throughout the human brain; and thirdly, explicit and implicit memory, both of which can be subsumed under long-term memory, involve quite different neuronal circuits in processing, storage and retrieval procedures.40 Very generally speaking, the remembering and receiving parts of the brain are towards the rear, while the more ‘action’ part is towards the front.41

1.3.2 Explicit memory

As stated, the labels ‘explicit’ and ‘implicit’ refer to two different aspects of long-term memory. Explicit memory processes refer to the learning of facts, like the names of people and places. This is a highly flexible kind of memory that must be reactivated by conscious effort. It can be recalled verbally and is also sometimes referred to as declarative memory. One could say that semantic memory, pertaining to facts, and episodic memory, pertaining to events and personal experiences, both fit into this explicit category of neurobiological recall.

From a purely physiological perspective, the long-term storage of explicit memory is now believed to take place in the medial temporal lobe system. The temporal lobe system is the area of

39 Zull reports how brain imaging studies have shown that when we recall stories (i.e. the episodic kind of remembering) we use our right frontal cortex (see Figure 1 on the next page). Zull comments on the uniqueness of this phenomenon as all other things linked to stories (recall of facts and encoding stories) employ the left frontal cortex (229).

40 Much of the account that will follow on the topic of neural mnemonic systems has been based on Kandel, Kupfermann & Iversen’s chapter on “Learning and Memory” from Principles of Neural Science (4th ed).

41 See Zull (36). Zull also places memories of stories and place, flashbacks, long-term memory, emotions related to experiences, etc., at the back of the cortex, also known as the integrative cortex (a region bordering the parietal and temporal lobes (see Figure 1). Zull locates the integrative cortex between the three main sensory areas: visual, auditory and somatic, thus making it “a short journey for signals to travel from these sensory regions to the integrative back cortex” (155).
the cerebral cortex located just above the ear. It is chiefly, though not exclusively, concerned with hearing. There are four main lobe areas in the cerebral cortex. The other three are the frontal, parietal and occipital lobes. The frontal lobe is mainly concerned with movement and the planning of future action, while the parietal lobe is responsible for somatic issues and with the forming of a body image and relating that image to extra-personal space. The occipital lobe is predominantly concerned with vision. Attached to the brain stem is the cerebellum which helps in coordinating movement and balance (see Figure 1 below).

![Diagram of the main lobe areas of the brain](image)

*Figure 1: A diagram of the main lobe areas of the brain*<sup>42</sup>

It is also believed that the kind of knowledge that gets stored as explicit memory is first acquired through processing that takes place in one or more of the temporal, prefrontal or limbic cortices, which is an area of neural structures bordering the brainstem, and the cerebral hemispheres associated with all the emotions and basic drives such as food and sex (see Figure 2 below).

![Some main structures of the limbic system](image)

*Figure 2: Some main structures of the limbic system*

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In these areas, a confluence of visual, auditory, somatic and emotive information takes place. The entorhinal cortex has specifically been highlighted in the medial temporal lobe system as being crucial for processing explicit memory storage and for sending it to and from other areas in the brain — especially to the hippocampal region of the sub-cortex (see Figure 2), which is an important region for memory processing. The hippocampus also sends some signals directly to the amygdala (Zull 82). It is important as well to note that long-term memories of childhood are not stored in the hippocampus; rather they are only processed there. This is known because patients with amnesia, which causes damage to that specific region, are able to remember their childhood memories and other factual knowledge that occurred prior to the damaging of the hippocampus. The hippocampus therefore is only “a temporary way-station for long-term memory” (Kandel, Kupfermann and Iversen 1233). In sum, explicit memory storage can be said to be primarily mediated by the hippocampus and the (medial) temporal areas of the cortex.

The hippocampus is also the area that mediates spatial memories in the right hemisphere of the brain, while words, objects and people are mediated in the more dominant left hemisphere (Kandel, Kupfermann and Iversen 1233). Moreover, as already alluded to, the hippocampus is an important centre of emotion as well as memory. As neural scientist Joseph LeDoux puts it in The Emotional Brain “when the elements of the sensory world activate these cells, the tunes they play are the emotions we experience (95). Additionally, as can be gleaned from the previous discussion, the vast majority of neurobiologists place the storage of factual semantic knowledge in the neo-cortex in a fundamentally distributed fashion. However, they often situate the storage of episodic or autobiographical knowledge, which tends to deal with time, people and places, solely in the pre-frontal cortex (Kandel, Kupfermann and Iversen 1233-37). As a result of experiments conducted on patients with brain lesions it is now known that semantic knowledge is stored across a number of neo-cortical areas. When a person with a normal functioning brain is asked to recall an object, let us say, for example, a hippopotamus, then this seems to occur in one smooth, cognitive activity. Nevertheless, it would be wrong to assume that this has come from one general region of the brain. There is no single location in the brain for the storage of this semantic, mnemonic information pertaining to an object like a hippopotamus or indeed any other object. Different aspects and elements of the concept of this semi-aquatic mammal are stored in quite different anatomical areas across the neo-cortex. When a person is prompted to evoke this concept, then a fluvial parallel process takes place whereby all the relevant elements get activated and come together in what might be seen as ‘a confluence of cognition’ to produce the concept or mental image.

This idea of information ebbing back and forth in synaptic tidal flows across the neural basin of the brain is an idea that is becoming increasingly popular among neurobiologists. Zull, for example, in a discussion on the executive capacities of the integrative frontal cortex and its relationship with the integrative back cortex says “many, if not most, pathways of signaling in the brain include a combination of neurons that send signals in the other direction” (193). He refers to the “back and forth” movement between these areas, adding that this traffic is especially active

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43 Clinical neurologists are confident that the entorhinal cortex plays a crucial role in the functioning of explicit memory, in part because many studies have shown that the degenerative Alzheimer’s disease, which affects explicit memory first, attacks the entorhinal cortex at a very early stage. See Kandel, Kupfermann & Iversen (1232).

44 The neo-cortex (or cerebral cortex) refers to the intricate fabric of inter-connected neural cells that cover the cerebral hemisphere (see Figure 2).

45 This is known because people with damage to certain areas of the neo-cortex would, for example, be unable to activate certain aspects of a particular object. In the case of my ‘hippopotamus’ example, this could be its bulk, colour, gait, etc. Alternatively, a patient might be able to identify a hippopotamus in its entirety but might be unable to label it linguistically.
during the recollection of images (194). The idea of continual patterned movement in the mind is prominent too in the recent interdisciplinary work of neuroscientist György Buzsáki. In Rhythms of the Brain (2006) he puts forward a case for neuronal synchronisation and argues that it is this rhythmic regularity that organises meaning that in turn allows the brain to function the way it does. Similarly, in The Wet Mind (1992/1995) Stephen M. Kosslyn and Olivier Koenig discuss how the whole idea of neural computation might best be based on a hydraulic metaphor. The virtue of this view is that although it dictates a relatively strict anatomical location for most mind functions, it stresses the complex interactive nature of brain activity. They add that such a metaphor encourages us as well to think about the way emotion and motivation can alter information processing (447-8).

Mnemonic experiments have been conducted too with regard to the naming of animals and, as a means of contrast, the naming of tools.46 In such experiments it was found that during the naming of both these categories two areas were activated simultaneously, namely Broca’s area and the ventral temporal lobes.47 However, despite these similarities, there were stark differences as well. For instance, when an animal was named, the left medial occipital lobe was selectively activated. This presumably produced some kind of mental image. However, when a tool was named, a left motor area — an area which is also activated by hand movements — was selectively activated, as was a region in the left temporal gyrus, which is engaged when words are spoken.48 These experiments show that animate and inanimate objects are activated in different brain regions, and more specifically, that the brain areas activated during the inner visualisation of certain concepts are to a significant extent dependent on the inherent properties of that object, in this case, on whether it is used manually or not. In addition, positron emission tomography studies have further shown that visual knowledge about faces and objects is also represented across different cortical areas.49 For example, it is now known that the recognition of some objects activates the left occipital-temporal cortex and not those areas in the right hemisphere, which are activated in face recognition. Like linguistic knowledge, visual knowledge is therefore distributed rather than being located in just one specific area of the cortex.

As mentioned, the storage of episodic knowledge that deals with time, people and places is, unlike its semantic counterpart, primarily situated in one central area, namely in the pre-frontal cortex: ‘primarily’ because other areas of the neo-cortex are also sometimes activated in order to allow the recollection of ‘when’ and ‘where’ a past event occurred.50 In his discussion on the

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46 See Kandel, Kupfermann & Iversen (1236-37).

47 Broca’s is a language area located in the left frontal lobe. It is thought to be responsible for muscle movements in speech. Broadly speaking, ‘ventral’ is a term often referring to a lower, frontal position in the human brain – as opposed to ‘dorsal’ which often refers to an upper, rear position.

48 Gyri is the name given to the crests of the folded cortex in any given lobe system. The grooves are often called ‘sulci’ or ‘fissures’. The fact that the neo-cortex is folded in the human brain is an evolutionary strategy in order to be able to fit more cells in a limited space.

49 There have been a number of technological advances in neurobiology that have made empirical observations possible, some of which I have also briefly mentioned. These include (i) fMRI-scans functional magnetic resonance imaging, where the head is placed in a strong magnetic field; (ii) MEG-scans magnetoencephalography which involves the magnetic recording of brain activity from the scalp via electrodes; (iii) PET-scans positron emission tomography, whereby a visual display tracks where a radioactive glucose solution goes in the brain while it performs a given task; (iv) CAT-scans computerised axial tomography which involves a series of x-rays taken from various angles to provide a three-dimensional representation of any part of the body, and (v) EEG-scans electroencephalogramme, where electrodes are placed on the surface of the scalp in order to record electrical activity in the brain. (See Principles of Neural Science).

50 Kandel, Kupfermann & Iversen, 1237.
neurobiology of memory, Damasio says that the prefrontal cortex consists of a vast array of higher-order cortices, some of which can hold personal or autobiographical memories. These can relate to temporal, spatial or linguistic events but to memories of certain categories of events or somatic states as well. The prefrontal cortex, he adds, also plays a pivotal role in working memory. According to Damasio, not only is the prefrontal cortex crucial for consciousness, i.e. working memory, but, since it plays an important role in autobiographical memory, it is relevant as well to the autobiographical self as well as what he terms ‘extended’ consciousness (158).

Explicit memory in general can be said to have at least four distinct aspects. These are (i) encoding, i.e. how new information is initially attended to and processed, (ii) consolidation, i.e. how new information is altered to make it more stable for long-term retention, (ii) storage, i.e. how unlimited amounts of information are kept in long-term memory, and, (iv) retrieval, i.e. the process that allows recall and the activation of stored information. As mentioned, retrieval is centrally about bringing bits of information together from lots of different anatomical sites that have been stored separately. Kandel, Kupfermann and Iversen note that “retrieval of memory is much like perception; it is a constructive process and therefore subject to distortion, much as perception is subject to illusions” (1238). These authors go on to say that recall is never an exact copy of the information that is originally stored and that during recall a whole host of cognitive strategies might be employed. These can include the activation of inferences, comparisons, guesses and suppositions (1239).

It should be noted that in cognitive psychology there is a distinct relationship between ‘encoding’ and ‘recall’, particularly with regard to what might be called affective mnemonic situations. For example, if a person is feeling happy, then that person is more likely to remember things they learned and stored while in a happy state of mind, than things learned and stored in a negative state of mind. Two of these processes are known as mood-state-dependent retrieval and mood congruity effects (Frijda 121). Interestingly, it has been shown on many occasions that positive affective states lead to better retrieval of positive material. In light of this there is no reason why episodes of discourse-processing, and, in particular, literary discourse processing, should be any different; after all, when a person chooses to read literature, a main factor for such a decision is for reasons of pleasure as opposed, for example, to instruction. There is an important conclusion to be drawn here too as to the difference between emotion and the nature of human memory that is best summarised by Alice M. Isen, who claims that if positive affective states are essentially retrieval cues, then the events and experiences that are stored in memory must be tagged according to the feelings that are associated with them (218). Hence, and in anticipation of my argument to come, the activation of highly emotive memories can plausibly occur during certain literary reading situations far more readily than other kinds of memories. In some ways, this maps onto one of Bartlett’s earlier mentioned ideas, namely, that affective attitudes influence recall. Interestingly, Bartlett added that this “may tend, in particular, to produce stereotyped and conventional reproductions which adequately serve all normal needs, though they are very unfaithful to their originals” (55).

Another type of memory, alluded to previously and of some significance here, is short-term memory. This kind is not subsumed under either semantic or episodic memory, nor for that matter explicit or implicit memory. It can also be said to be less complex than its long-term

51 This discussion occurs in Part III of The Feeling of What Happens entitled “A Biology for Knowing”.

52 There is, of course, a valid school of literary and rhetorical thought going back to Longinus’s On the Sublime — and before that Horace’s The Art of Poetry (Ars Poetica) that argues that aesthetic literary works can both please and instruct. I believe this to be true; in specific contexts.

53 Zull points out how a difference can be made in working memory saying that “spatial working memory more frequently engages the upper part of the frontal cortex and object working memory the middle and lower parts” (183).
counterpart. Often referred to as ‘working memory’ or ‘consciousness’, short-term memory is cited as having three distinctive component systems. These are often termed (i) the attentional control system or ‘central executive’, (ii) the articulatory loop, and (iii) the visuo-spatial sketch pad. The first of these, thought to be located in the pre-frontal cortex, has a very limited storage capacity. Its attention is focused on events in the perceptual environment and it functions to regulate the flow of information to the two other areas, which are believed to hold memory for temporary use. These two areas are known too as ‘rehearsal systems’. The first one, the articulatory loop, is a storage system where memory for words and numbers can be maintained for oral production. The articulatory loop, however, has a rapidly decaying memory capacity. The second rehearsal system is the visuo-spatial sketch pad. This is another ephemeral, mnemonic storage system. It does not merely deal with the visual properties of things to be remembered, as the name suggests, but also with their actual spatial location. It should be noted that no information that enters into either of these two rehearsal systems has to decay. Indeed, it can pass into long-term memory for subsequent consolidation and storage, ready for later retrieval.

Motivation, be it conscious or subconscious, is thought to play an important role in transforming new short-term memories into stable, long-term ones. An important link between long-term memory and short-term memory is to be found in the notion of ‘retrieval structures’. Kintsch, for example, argues in *Comprehension* that retrieval structures are activated by cues in short-term memory. One such cue can activate an entire event or episode in a relatively wholesale manner. Hence, all of our memories are potentially just one step away, i.e. they can be retrieved in one operation by a single cue (244-6). Kintsch further points out that such structures do not occur naturally; instead, they have to be learned through repetition and practice (see also Ericsson and Kintsch 1995). Such cues might, for instance, be words. It is, however, questionable as to whether textual inferences are even necessary at all as generators of meaning and subsequent mental image construction. As Kintsch explains further, in a familiar domain the expert reader does not even need inferences from the text for a familiar retrieval structure to be activated immediately. Hence, not only does such information not have to be inferred, it need not even have to be installed in short-term memory or consciousness (245).

### 1.3.3 Implicit memory

Implicit memory processes are markedly different from explicit ones and can be said to refer to more perceptual, motor and especially affective activities. Unlike its explicit counterpart, this type of memory involves little conscious effort, and there is no explicit conscious search to try and recall information. Furthermore, it does not tend to use verbal channels of communication; rather it is more expressed in what might be termed ‘performance’ (Kandel, Kupfermann and Iversen 1239). It is also known as ‘non-declarative’ memory and is far more inflexible than explicit memory, as it tends to be tied to the original conditions under which a particular stimulus was learned. There are different forms of implicit memory which are learned in different ways and are housed in different parts of the brain. As stated above, emotion plays an important role in this kind of memory. One affective aspect of implicit memory is ‘fear conditioning’. This type of memory is thought to involve in particular the amygdala: two almond-shaped neural centres in the brain.

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54 For a more in depth overview of working memory see Kandel, Kupfermann & Iversen (1239) upon whose work this synopsis is based.

55 This model was set out by Alan D. Baddeley in the 1970s and has been worked on by him and his co-workers ever since. I discuss these rehearsal systems in chapter eleven.

56 First introduced by Chase and Ericsson (1982).

57 See LeDoux for a detailed and interesting discussion on this (138-224).
limbic system that register emotion, which process emotive, implicit memories.\textsuperscript{58} Another affective aspect of implicit memory is something known as ‘operant conditioning’, which uses the striatum and cerebellum for memory.\textsuperscript{59} A third type occurs through an exposure to such things as ‘classical conditioning’, ‘habituation’ and ‘sensitisation’ and centrally involves the sensory and motor systems. From this it is evident that studying reflex systems may give an insight into this kind of Pavlovian ‘response-type’ memory.\textsuperscript{60} It is worthwhile to note that some types of learned behaviour involve both implicit \textit{and} explicit forms of memory. As Kandel, Kupfermann and Iversen explain, although something like classical conditioning involves associating an unconscious reflexive response with a certain stimulus, this simple form of learning may also involve explicit memory when the response is mediated by core cognitive processes (1243). For example, avoiding danger or pain is not merely an automatic, unidirectional, skeletal-muscular response, as behaviourism would have us believe; rather it is a cognitive response, because differing flight situations will require different exit strategies that invariably use different muscle groups. Moreover, repeated exposure to a fact or an experience can turn it from an explicit learned response into an implicit, automatic one.

Implicit long-term memory thus generally involves the more subcortical areas of the brain in memory storage including the cerebellum, the sensory and motor areas and especially the main central emotive area: the amygdala. Clearly, the type of implicit memory needed to perform certain tasks requires numerous brain structures and diverse areas. This ultimately means that a form, or forms, of parallel processing must take place during mnemonic acts within implicit processing. Furthermore, it must be remembered that explicit and implicit memory essentially differ as to the areas that get activated during memory storage and retrieval procedures. Kandel, Kupfermann and Iversen make a clear distinction between the two modes when they say “implicit memory flows automatically in the doing of things, while explicit memory must be retrieved deliberately” (1245). This fluvial aspect to implicit memory is facilitated by the very nature of memory itself, since cerebral blood flow plays a crucial role in memory-production, as indeed does neurotransmitter activity at the level of the synapse; a process Zull refers to as “a chemical cascade” (226).\textsuperscript{61}

\textsuperscript{58} See Figure 2 for the position of the amygdala in the limbic system in relation to other brain areas.

\textsuperscript{59} The striatum is also in the sub-cortex and is part of the basal ganglia which is partly responsible for motor functions and some aspects of learning.

\textsuperscript{60} See Kandel, Kupfermann & Iversen (1239).

\textsuperscript{61} The synapse is the gap between the axon tip of the sending neuron and the dendrite or cell-body of the receiving neuron (an axon tip and a dendrite are both the branch-like structure of the sending and receiving neurons, respectively). Neurotransmitters are chemical messengers that travel across the synapse from neuron to neuron. There are thought to be more than 75 different types of neurotransmitters (Myers 46). Some of the more well-known ones include the natural opiate ‘endorphins’, which are linked to pain control and also to pleasure, and serotonin, a lack of which in synaptic activity will lead to depression. Chemical activity at the level of the synapse is often described as a fluvial, four-stage process. This maps out as (1) the synthesis of the transmitter substance, (2) the storage and the release of the transmitter, (3) the transmitter’s interaction with the receptor, and (4) the removal of the transmitter from the synaptic cleft (Schwartz 280). The very act of thinking and feeling is thus at this lowest physiological level a dynamic, fluvial procedure. This notion of ‘flow’ in synaptic activity is something that is stressed by LeDoux (214). (See Figure 3 on the next page).
Since some aspects of implicit memory make use of the amygdala, this type of memory might also be termed ‘emotional’. LeDoux makes an interesting distinction between explicit and implicit memory in the framework of emotions. He calls hippocampal (explicit) memory ‘a memory of an emotion’ and amygdaloidal (implicit) memory ‘an emotional memory’ (182). He adds that both implicit and explicit memory systems are activated when an emotive memory occurs, and uses the following example as an illustration: if you have been hurt in a car accident while driving down the road whereby the horn gets stuck, then the sound of a horn can bring back that negative memory in later life, since this sound has been conditioned as a fear stimulus. This involves both explicit and implicit memory systems. LeDoux explains that “the sound of the horn goes straight from the auditory system to the amygdala and implicitly elicits bodily responses that typically occur in situations of danger” (201). This then is the activation of an ‘emotional memory’ that can open the floodgates to emotive arousal and make the past experience feel seamlessly current in conscious experience (201). LeDoux adds that “the sound also travels through the cortex to the temporal lobe system where explicit declarative memories are activated” (201). It is at this point, in close interactive proximity to the hippocampal region that memory becomes conscious, i.e. it becomes a ‘memory of an emotion’. So, here, it would appear that emotive memory processing has a kind of ‘primacy’ over purely cognitive memory processing. LeDoux further maintains that in order to have a fully embodied emotive experience the amygdala system must be activated (201). Expanding on the role of that system he explains that “there are in fact abundant connections from the hippocampus and the transition regions, as well as many other areas of the cortex, to the amygdala” (203). The amygdala, however, does not just receive information; it has projections to many other cortical areas as well. Indeed, as LeDoux points out, there is probably more outgoing information from the amygdala than there is incoming. It projects back to the visual system, long-term memory, the lateral pre-frontal cortex, short-term memory and many other areas. In sum, in addition to information flowing into the amygdala from the cortex, it also flows back to attention, perception and memory areas (284). This general principle is supported by Kosslyn and Koenig, when, during their discussion of “the confluence of bottom-up and top-down processing that constitutes a specific emotion” they speak of how an emotion can “feed back” once it has been interpreted (463).

Interestingly, and perhaps somewhat controversially, LeDoux says that “it is also possible that processed stimuli activate the amygdala without activating explicit memories or otherwise being represented in consciousness” (203). This unconscious processing of stimuli can occur, he claims, “either because the stimulus itself is unnoticed or because its implications are unnoticed”

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62 More will be said about this phenomenon in the next chapter in the section on ‘cognitive appraisal’.

63 Zull notes that during emotive and cognitive episodes, many parts of the human brain can be active at once “in neuronal networks of incomprehensible complexity” (100).
(203). To return to his road accident example: the memory of the accident may be long forgotten by what one might term the ‘cognitive’ memory system, but it may not be forgotten by the emotive memory system housed in the amygdala region. As LeDoux explains “in a situation like this you may find yourself in the throes of an emotional state that exists for reasons you do not quite understand” (203). This experience, he says, “is all too common for most of us” (203). Emotive implicit memory, therefore, might be said to be more fundamental than explicit memory in the sense that it only contains basic links between cues and responses. There is an implicit suggestion in LeDoux’s claims that the memory systems located in the amygdala region may be more ‘reliable’ than those in the hippocampal region. He appears to back this up by explaining that although the explicit memory system is notoriously fragile, the implicit memory system is very robust. Indeed not only does it maintain emotive memories, but it can even strengthen them as time wears on (203). Additionally, the emotive memory system is in place and functioning normally long before the cognitive system is. This may account for the phenomenon known as infantile amnesia.⁶⁴

Despite all of the above-mentioned differences in memory systems, neural imaging techniques have suggested that both implicit and explicit memories are often stored and retrieved more or less in parallel.⁶⁵ This fluvial parallelism and seemingly general absence of the explicit notion of ‘primacy’ one way or the other is a point to which I shall return in the next chapter when discussing cognitive appraisal. Below is a basic diagram that attempts to represent the main points of what has been said about memory in this section. It is basic in the sense that it does not show those less strong yet important links that connect long-term to short-term memory, explicit memory to implicit memory and the varied projections back from the amygdala.

![Diagram of memory processes](image)

**Figure 4:** A rudimentary diagrammatic representation of the main memory processes

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⁶⁴ It is claimed that adults cannot recall childhood traumas before the age of three or four because in children the hippocampus has not yet matured to the point of forming conscious memories. The amygdala, however, is there and is functioning perfectly, recording emotive memories. (See the work of Nadel & Jacobs 1996). Another, more linguistic, reason may be that young children have too few linguistic labels at their disposal which they can use as retrieval cues.

⁶⁵ See also Zull (86).
1.3.4 Memory and text processing: Reading minds and reading brains

From a discourse perspective, memory appears to play at least two different roles in any text comprehension situation, irrespective of the nature of the text. First, it has to be able to access previous sentences or discourse units that have just been read while processing a current sentence. This broadly falls into the bottom-up aspect of text comprehension sketched out earlier. Secondly, and of equal importance, since text representations are not based solely on the text itself, a significant contribution to meaning making has to be supplied by the continual activation and ebbing and flowing of relevant, affect-driven schemata from long-term memory. This type of memory is of a top-down nature. Both types of memory, what might be termed the co-textual and the contextual, are crucial to everyday comprehension.

As we saw earlier, our memory storage system is both fragile and fragmentary. In the words of cognitive scientist Daniel Schacter (1996) it contains mere “snippets of conversation, glimpses of faces, an occasional scent or taste” (91). The fragmentary nature of memories is clear; their fragility on the other hand lies in the fact that they decay, often bottom-up – i.e. the details tend to go first. As we also learned, memory is an act of construction and composition, it is not a simple act of replay. Moreover, that construction might have as much to do with how we feel in the present, as it has to how we felt in the past. As Schacter notes “even the seemingly simple act of calling to mind a memory of a particular past experience … is construed from influences operating in the present as well as from information you have stored about the past”, (8). He goes on to suggest that sometimes the present conditions virtually create the memory (104-13).

Kintsch’s aforementioned Construction Integration (CI) model of comprehension deals with memory too, as it focuses on three aspects: (i) the integration of knowledge, (ii) the memory of the text, and (iii) other non-textual elements. Indeed, it gives special attention to the environment to be comprehended and the long-term memory that does the comprehending (409). In a similar fashion to van den Broek et al.’s work on reading processes, the CI model is persuasively described in terms of successive ‘cycles’ of comprehension processes. In this domain of discourse psychology, long-term memory is generally viewed as an extensive network of nodes representing such core cognitive issues as ‘beliefs’, ‘experiences’ and ‘knowledge’, whereby only a small part of the system needs to be triggered from working memory in order to activate a whole schema from a person’s background knowledge.66

What the previous discussion on the neurobiology of memory suggested was that some aspects of implicit long-term memory do not solely contain so-called purely, cognitive ‘belief-based’ elements in their interaction with working memory. Instead, both emotive and somatic elements appear to play a major role in recall. An increasing number of cognitive scientists and discourse psychologists appear to agree with this. In a chapter entitled ‘beyond text’ in Comprehension, Kintsch also embraces the idea that emotive and somatic markers are crucial to the dynamic and fluid meaning-making processes that take place in working memory (411). He states that the processes that take place in working memory are like “a dynamically changing stream”; he refers to these as “shifting patterns of activation” (411). He also claims that it is highly plausible that such somatic markers can act as cues that activate retrieval structures in long-term memory about one’s body:

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66 In neurobiological terms, one now knows from what has been set out earlier, that the brain region being referred to here by this term will depend on what type of explicit knowledge is being processed, namely, ‘semantic’ or ‘episodic’.
When I look out the window of my study on the scene below, I see the city nestled in the trees, the flat curve of the horizon, and the sky above speckled with afternoon clouds. I move my head as the eyes scan the horizon, the familiar view makes me feel good, and I stretch my legs and take a deep breath … When I recreate the image later, traces of my movements, the way I sat in my chair, and the somatic reactions that occurred in the first place are regenerated with it. I experience a little of that good feeling that went with the original perception (410).

The image reconstructed in the brain through a blend of working memory and the visual cortices will include bodily reactions that had occurred in the previous experience. Mnemonic images, it seems, are not solely reliant on external retinal information; far from it, they also crucially depend on internal visceral and motor input. As Kintsch puts it “cognition does not occur in a vacuum or in a disembodied mind but in a perceiving, feeling, acting body” (410). Kintsch further notes that somatic nodes in long-term memory may represent limbs, muscles and the position of the body in space as well as diverse balances and imbalances in the body, whether felt or actual, adding that the sense we have of our body is context-dependent (412). All this seems to suggest that seemingly ‘less prominent’ motor-based senses, such as proprioception and the vestibular balance faculty, can play a significant role in meaning making both in long-term memory and, when activated, in working memory too. Cognitive mnemonic images that are activated and processed during all acts of perception, including reading, appear to be saturated with affective-embodied input. For the ends of my thesis, this addition of such fundamental emotive and somatic aspects to working memory offers a procedure recognised in neurocognitive science to account for the role of emotion in the cognitive processing of literary texts.  

We may conclude that the kind of memory that is employed while reading must consist of at least six dynamic, one might even say ‘fluvial’, inputs, which include a number of external and internal elements as well as some that fall exclusively into neither category. In the specific context of literary reading, these can be preliminarily listed as:

- the immediate text that is being read
- sections of the previous text, either the last sentence that was read or more salient past sentences or fragments that are still available for recall
- a reader’s projected knowledge of how such texts often unfold and conclude
- subconscious background information about previous reading experiences and previous experiences in general
- various affective and somatic inputs either via the body to working memory from the affective and somatic areas of the brain or directly from the affective and somatic areas of the brain to working memory simulating the mediation of the body

Here, not only the importance of internal or top-down aspects of text-processing in memory become evident, but also affective, embodied aspects. This is something that is increasingly being acknowledged.  

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67 In chapter eleven, the final chapter of this work, I will model how I believe somatic aspects operate in the rehearsal systems of working memory during emotively-engaged acts of literary reading.

68 See, for example, Damasio 1994 & 1999 and Kintsch, 1998.
1.4 Conclusion
This opening chapter dealt with the first part of ‘some basics of reading’. This included a brief
discussion on the history of reading, a more in-depth one on the nature of processing and one on
the role of memory in processing. I introduced a number of increasingly prominent ideas
including (i) that mental processes are dynamic, and (ii) that memory, whether it be explicit or
implicit, is fundamentally linked to emotion. Before moving to the second chapter there is one
slight adjustment I should like to propose. The terms ‘bottom-up’ and ‘top-down’ have been used
repeatedly in this chapter. However, to my mind, the first of these does not distinguish clearly
enough between visual stimuli in the world, such as images and pictures, and the kind of
culturally constructed semiotic stimuli we know as writing that one encounters on the page or
computer screen. As such, this bottom-up term needs some modification in order to make clear
that in this work I am discussing the processing of written language and not visual stimuli in
general. For the purposes of clarity, I will henceforth use the term ‘sign-fed’ when referring to
visually appraised language-based written input, as this seems far more appropriate to represent
this linguistic stimulus-driven category. Correspondingly, the term ‘mind-fed’ appears apt to
present the top-down, concept-driven category. It should be noted that these are temporary terms
of convenience, as will become clear as this thesis unfolds. The next chapter will build on all this
by looking at the next group of relevant phenomena, namely perception, cognitive appraisal and
emotion, all of which are fundamental to the act of literary reading.