Memories, Thoughts, and Emotions:
Essays in Honor of George Mandler

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14 Cognitive Pathologies of Memory: A Headed Records Analysis[1]

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The Headed Records model of memory (Morton, 1990; Morton & Bekerian, 1986; Morton, Hammersley, & Bekerian, 1985) gives an account of a variety of experimental findings as well as a means of talking about our experience of our own memory. In this chapter, I explore some pathological phenomena of memory in terms of the model. The advantage of this approach is that it enables the various conditions to be seen in a particular relation to each other and the normal function of memory.

THE HEADED RECORDS MODEL

The basis of the Headed Records (HR) model is that our memory is divided up into discrete *records*. Either all of a record is accessed or none of it. Each record is linked to a *Heading*. The *headed record* is the basic structural unit in memory. HRs are structurally unrelated to one another. Behavior or subjective experience that might lead one to believe in the existence of associations between records are due to the unconscious, automatic operation of the accompanying processes.

In common with many other theorists, I regard the memory system as having the primary functions of interpreting the perceptual world and guiding actions. In the course of serving these functions, memory will have to be interrogated. This will normally happen without our conscious intervention. Memory can also be

[1]George has always understood Headed Records but never believed it. I have reciprocated by believing a number of George's ideas without really understanding them. I hope this offering will bring us closer together.

consciously interrogated, and this is the form of memory search with which we are more familiar. Within the model, the first thing that happens when memory is interrogated is that a *description* is formed. This is the information used in the search, the term being taken from Norman and Bobrow (1979). Search is carried out of headings only. Headings are searched in parallel. The objective of the search is to find a heading that matches the description according to some criteria. If such a match is found, then the linked record is made available for further processing and will be examined to see if it fulfills the current *task demands*. If the record that has been retrieved does not fulfill these task demands, then a new description is formed and the search cycle is repeated (see Williams & Hollan, 1981).

This modest beginning has far reaching implications for the way in which memory operates. The model contrasts with most other models of memory in that it is explicitly *not* freely content addressable.[2] In terms of the model, information that is in the record need not be duplicated in the heading in any form. But only headings are searched. Thus it is that information that is central to an event memory does not necessarily serve as a cue for the recall of that memory. The converse of this is that information in the heading need not be present in the linked record. Thus, something that would be a reliable cue for a set of knowledge might be unretrievable if that set of knowledge was accessed by other means. The most common example of such a principle operating in practice is with people's names. We all have the experience of being aware of everything we know about an individual, other than their name. Yet their name would, surely, serve as a guaranteed cue to this information.

The account of this phenomenon in HR terms is that the name forms a part of the heading for the record containing the information in question. As we see here, the headings have a number of components, and it is not necessary for the match between heading and description to be complete. It would be possible, then, for the record to be accessed by some other cue, such as the place where the subject of the record had last been encountered. Given that the record had been retrieved, all the information contained within it would potentially be available. However, there is no way (by definition) of retrieving the contents of the headings, and the name would not be retrievable. For another individual, of course, the name could be in the record and the situation would not arise. Such variability in memory organization is as much a burden to the theorist as it is to the owner of the memory.

A further class of memory experience that appears to be ubiquitous is the experience of a memory being triggered spontaneously by something that was just a part of the background for an event and irrelevant to the content of the memory. Common triggers of such experiences are specific locales in town or

[2]I also assert this as a fact about all human memory other than those owned by theorists to the contrary.

country, scents, and certain pieces of music. Here is an example taken verbatim from an informant:

> A couple of years ago I changed my perfume. The perfume I wore before that I had worn during a very unhappy time in my life. A few months ago, I found this large bottle of perfume and thought "I can't let this go to waste" and sprayed some on. Almost immediately I was back in hospital coming around after having my stomach pumped.

Thinking of the incident did not remind this woman of that particular perfume. The associated smells were those more typical of hospitals. However, the processes of memory formation had operated in such a way as to put the smell of the favorite perfume in the heading—perhaps because it was the last sensory experience before unconsciousness. Speculation apart, the principle exists in the HR model of the possibility of information acting as a retrieval cue that is incidental to the content of the memory record that is retrieved.

The Structure and Content of the Records

There are no constraints on the structure of records, which can take whatever form happens to have been computed by the current processing. Collections, lists, hierarchies, schemas are examples of the possible data structures. The content of records also depends on the nature of the current processing. There are two broad classes of record, which can be classified as primary and secondary. Primary records are those that result from the normal activity of interpretation of the perceptual world. Secondary records are those that result from the retrieval of primary records in the course of reminiscence or the retrieval of a primary record that is being used as the basis of a narrative. In the case of the narrative, the form of code will have been changed into a verbal one.

The Components of the Heading

Headings have a number of components. Roughly speaking, anything that contributes to the retrieval of a record will be in the heading. I say "roughly speaking" because the system is not that simple. To start with, the ostensive cue may have been transformed by the processes involved in forming the description. Second, the effect of a cue may be indirect—that is, the cue may serve to help retrieve one record that may contain information that can serve as a cue for the target information.

An experimental way of determining the components of headings is through a comparison of the relative effectiveness of variables on recognition memory compared with recall. The reason for this lies in the difference between the way these two tasks map onto the HR framework. Recognition memory involves the

subjects' judging whether or not the presented material had previously been experienced. This requires that the material should form a description that matches a heading and that the record that is retrieved contains information that enables the evaluation system to decide whether or not the task demands have been satisfied. In recall, the subject is given only some notion of the topic and the circumstances of the previous encounter. The material itself has to be found in a record. The data indicate that the literal form of the stimulus serves as a cue in recognition memory. In recognition memory for text, high- and low-level propositions are equally well recognized (Yekovitch & Thorndyke, 1981). In free recall, the higher level propositions are better reported in spite of instructions for literal recall (Kintsch, 1974). The natural interpretation of this would be that the literal form of each sentence is directly addressable (i.e., constitutes a heading) whereas the results of cognitive processing is that only what is evaluated as most important finds its way into the record. Equally, the sensitivity of recall to state and context variables contrasted with the relative insensitivity of recognition memory also indicates that such variables are to be found in headings (Bower, 1981; Eich, 1980; Godden & Baddeley, 1975, 1980).

Headings and Descriptions

Retrieval depends on a match between the description and the heading. I have remarked on how the relationship between the given cue and the description is open. Unless one is concerned with recognition memory, it is clear that there needs to be a process of description formation that will pick out the most likely descriptors from the given cue. If you are asked "Could you tell me the address of your best friend, please?", the control processes will guarantee that the variable ⟨best friend⟩ will be filled in before a search for the address is instituted. The reason for this is that ⟨best friend⟩ is not a plausible heading for a record. Clearly, for the search process to be rational the set of descriptors and the set of headings should overlap. Indeed, the only reasonable state of affairs would be that the creation of headings and descriptions is the responsibility of the same mechanism. Elsewhere I show how this principle, allied with developmental factors, gives us a cognitive account of infantile amnesia (Morton, 1990).

The second aspect of the heading-description match follows from our interpretation of the recognition-recall differences. I claimed earlier that there was a need for the representation of internal states and environmental features both in the headings of recalled records and in the descriptions used for that recall. The simplest conception for our purposes is to imagine a set of registers in which these states are noted. These will be updated automatically. In addition to indices of mood and physiological state, I would imagine there to be registers of time, place and purpose. Thus, we are usually aware of the day and the time. By being "aware," I mean to say that there is no need for reflection. The contrast is the archetypal American tourist in Europe: "If this is Amsterdam, it must be Tues-

day." Some people seem to be aware of the season, the month, and even the date. And we know who we are talking to even in silence with our eyes closed.

The Notion of Self

As we have seen, our memory includes records of a number of kinds. Some of these reflect our experience and, in effect, contain plans for action that are appropriate for us to use. In this respect, my records are (at least, in principle) appropriate for me to use. They reflect my age, size, weight, strength, degree of expertness, acceptable level of risk, experience, abilities, and a host of other personal factors. These records contrast not only with the records for the equivalent situation in someone else's memory—which would reflect their own particular characteristics, but also with the records in my own memory system of other people's experience. Such records could arise through my witnessing events in which others were the main characters, through witnessing events in which I was the recipient of a particular behavior or through hearing or reading about real or imaginary events. Although on occasions one might try to incorporate someone else's behavior into one's own routines, this is normally done with circumspection. To take an extreme view, faced with a crisis involving a crocodile infested river I would be very unlikely to dive boldly in no matter how many times I had seen Tarzan pull off the trick. At a more mundane level, while knowing about the possibility of sending a bottle of wine back in a restaurant, the first time I felt the wine deserved it I could not run the routine. Following the resulting humiliation in the form of an unforgiving companion I rehearsed the routine mentally until it was no longer something belonging to others. Then I could run it.

What is true about behavioral schema is also true about other kinds of records. My opinions of other people—and so the way I would react toward them—is not to be confused with the opinions of a third party, which I may be very familiar with. To be more precise, our behavior toward a friend, or even a close acquaintance, will be guided by a schema-like record or set of records.

To translate this into HR terms there are two possibilities. The first is that in the given situation a record is retrieved and then evaluated for its validity for oneself. There would be two ways of doing this, one by reference to some list of one's relevant characteristics and the other by noting whether there was a reference to self in the record. The second possibility is that one component of the Description indexes ⟨self⟩ and that this is matched by a component of the headings of appropriate records. Now, although the evaluation of a record is not to be strictly equated with consciousness, there is a relation between the two, and I am rarely aware of courses of action that I reject as being inappropriate for me. Consider, also, what happens when you are asked if you have ever been to Acapulco or Milan. The fact of knowing other people who have been to these places and who have told you about them in great detail, not to mention the films you have seen that have been located there, does not lead to error in report, so far

as I can see. It does not even seem to give rise to memories of the reports of others—at least, not before one has arrived at an answer for oneself. This is not, of course, evidence; it merely indicates why I choose the option of having a notion of self as a part of description and headings, used in the same way that the instantaneous present is used.

A further elaboration of the notion of self in the headings can be seen if one habitually spends time in distinct environments where there are gross differences in normative behavior. This is most striking with language, where habitual swearing may be the norm in one environment, but not in the other. The switch of language register is effortless for most people.

I am going to use the idea of (self), both in records and as a heading to provide the basis of an account of one case of functional amnesia and, then, the phenomenon of multiple personality.

"LUMBERJACK": A CASE OF MISLAID IDENTITY

The advantage of functional amnesia is that a subject can act as his or her own control. P.N. was a patient who was studied by Schacter, Wang, Tulving, and Freedman (1982). He was 21 at the time of the investigation, having left school 5 years earlier. He had approached a policeman in downtown Toronto complaining of excruciating back pains. When questioned at the hospital, P.N. could not remember his name, address, or scarcely anything else personal apart from a nickname, "Lumberjack," and that he had worked for a courier service in town a year earlier. The courier service later confirmed that the patient had worked for them and had been given the nickname "Lumberjack" by his fellow workers.

P.N. knew the city he was in and could name many downtown streets as well as the names of the local baseball and ice hockey teams. He knew the name of the prime minister of Canada and "possessed some information about recent political events." A cousin saw P.N.'s picture in the paper and reported that his grandfather, to whom he had been extremely close, had died the previous week. P.N. did not recognize his cousin, nor could he recall the funeral or anything about his grandfather.

The amnesia cleared shortly afterward while P.N. was watching an elaborate cremation and funeral in the final episode of "Shogun." P.N. reported that as he watched the scene, an image of his grandfather gradually appeared in his mind. He then remembered his grandfather's death as well as the funeral that followed.

A number of experimental tests were given during the amnesic episode and subsequently. One of these was the Famous Faces test, where the subject is asked to provide names to faces from the present and the past. In this test there was no difference in P.N.'s performance during the amnesic episode and after it.

A more revealing test was that of Episode Cuing. In this task, the subject is given a word and requested to retrieve a specific personal memory associated

with it. Retrieval was either constrained or not. In the constrained conditions the instructions were to recall something from before the onset of amnesia. In the unconstrained condition there were no restrictions. In the constrained condition P.N. failed to retrieve anything to 7 of the 24 cues. In addition, the median response time was 40 secs, more than twice the unconstrained mean. Most of these memories were drawn from the relatively intact "island" of episodic memories. Median unconstrained age was 1.5 days for P.N. compared with 5 months for a control. After recovery the figure increased to 60 months. In the unconstrained condition there was a massive change in the two sessions. During the amnesic episode only 14% of P.N.'s memories dated from before the onset of the amnesia, whereas in the second session the figure was 92%.

The period of his life that P.N. managed to recall during the amnesic episode was characterized by the nickname "Lumberjack" that was specific to that period, and by his reports, both during and after the amnesia, that this period was a very happy one. The Headed Records account is rather similar to Schacter et al.'s speculations on the matter. These authors picked up Estes' (1972) notion of hierarchically organized "control elements" that can activate or inhibit specific kinds of information that are nested under them. They speculate that the name is "the ultimate control element" that gave P.N. access to his "Lumberjack" days. They also suggest that the affective component might be an organizing principle.

In Headed Records terms, P.N. can be characterized as lacking one element of his set of possible Descriptions. This is the Descriptor ⟨self⟩. The mechanism of how this came about might be better described in psychodynamic terms. The result, however, is that the only personal records that could be retrieved were those with "Lumberjack" in the Headings. In addition, nonpersonal records, which contain general knowledge, would be unaffected because, for the retrieval of such information, usually in secondary records, there would be no task requirement to specify the ⟨self⟩ component.

MULTIPLE PERSONALITY—MULTIPLE ⟨SELF⟩

According to DSM-III (American Psychiatric Association, 1980), the Multiple Personality Disorder (MPD) is characterized by the existence within an individual of two or more distinct personalities, each of which is dominant at a particular time. The dominant personality determines the individual's behavior. In a survey of 100 MPD cases (Putnam, Guroff, Silberman, Barkan, & Post, 1986), episodes of amnesia were reported in 98% of the patients. Indeed, 72% of patients had one or more personalities who denied the existence of other personalities.

One such case that was studied experimentally was reported by Ludwig, Brandsma, Wilber, Bendfeldt, and Jameson (1972; Brandsma & Ludwig, 1974). The patient was a 27-year-old man called Jonah. When he was first admitted to

hospital Jonah had had a long history of episodes in which he had lost his memory. During one such incident he had attacked his wife with a butcher's knife, running both her and their daughter out of the house. At such times, his wife had informed him, he referred to himself as Usoffa Abdulla, Son of Omega.

While in the hospital he experienced variable periods of memory lapse during which he would undergo a personality change. In fact, three personalities were identified, each with separate identities and different names. Communication with these personalities was facilitated by means of hypnosis, although they all emerged spontaneously for varying periods.

> *Jonah:* Jonah was regarded as the primary personality by the other ones. He claimed to be unaware of the existence of any of the other personalities. He described himself as shy, sensitive, passive, and highly conventional. He also tended to appear frightened and confused while being interviewed.
>
> *Sammy:* Unlike the other personalities, Sammy could coexist in consciousness with Jonah, in addition to taking over completely. He claimed awareness of the existence of the other personalities but knew most about Jonah. He claimed to be always ready to appear when Jonah needed legal advice or needed to get out of trouble. Indeed, when Jonah landed in jail, Sammy took over for a whole week. Sammy described himself as purely intellectual and rational. He is reported as displaying no emotion.
>
> *King Young:* Apparently, whenever Jonah cannot find the right words to say when chatting to women he has a sexual interest in, King Young takes over. He claims to know about the other personalities only "indirectly" but knows Jonah "mildly." He views himself as pleasure oriented and as a ladies' man.
>
> *Usoffa Abdulla:* Whenever Jonah is in any physical danger, Usoffa takes over completely and leaves as soon as the danger is over. He claims to know Jonah very well but the other personalities only "indirectly." His sworn duty is to watch over and to protect Jonah. Usoffa is described as a cold, belligerent, and angry person. "He is generally sullen, silent, occasionally sarcastic, and primed to respond aggressively to any threat or challenge. He views himself as physically powerful and immune to pain and from the vantage point of the authors can present himself as quite a formidable and scary person to interview." (p. 300)

A variety of tests were administered to the four alter personalities. On three intelligence scales all four came within the low normal range. Apparently the four gave exactly the same answers to content questions (equivalent to a context free "semantic" memory). Results on personality and diagnostic scales were in accordance with the clinical observations of the personalities.

Transfer of learning behaved as though what Jonah had learned was known to the other three, but no other knowledge was shared. The experiment involved

paired associate learning. One of the personalities was presented with a list of 10 words, each paired with a response word. The list was presented until learned to the criterion of three successive perfect trials. The other three personalities were called in turn and were required to respond to each stimulus word with "the one word that goes *best*" with it. Then the personality originally trained was retested. This procedure was repeated for all four personalities. The error data are given in the table with the scores for the personality originally tested on each list underlined. It can be seen in Table 14.1 that the other personalities appear to know something about Jonah's list. Apart from that there is no transfer.

In another experiment, a list of 10 paired associates was presented to Jonah. He was then tested with the stimulus words, making four errors. On the next presentation he was error free. The same list was then presented in the same way to King Young who made two errors on the first trial and one on the next. Usoffa and Sammy were then error free. With another list Usoffa had the list first and made four, two, and one error on three trials. King Young, Sammy, and Jonah were then all error free on their trials in spite of each personality claiming not to remember engaging in the task previously. We have then what looks like very good savings in a learning task to contrast with very poor transfer in a memory task. To account for these data I assume that, as with Lumberjack, Jonah's event records are headed differently for the four personalities. These headings will differentiate the selfs. In addition, I follow Mandler, Rabinowitz, and Simon (1981) in believing that word pairs are generally stored as units. The pairs would be represented in the headings in their stimulus form and in the records in a processed form. A typical HR for an S–R pair could be partially represented as:

$$A,\ S\text{-}R \rightarrow s\text{-}r,\ a$$

where A is the heading appropriate for the personality doing the current learning and s-r is the cognitive product of processing the pair that has a trace of the personality. The cued recall trials amount to creating a description of B, S for the change of personality. This will not match any element of the heading. Note that if there were variation in the form of the S–R representation and a record were retrieved, the contents would not pass the task specification and would thus be

TABLE 14.1
Errors/10 on PA Lists Learned by One Alter

	Responder			
Learner	*Jonah*	*K. Young*	*Sammy*	*Usoffa*
Jonah	*4*	3	4	5
K. Young	9	*1*	10	9
Sammy	9	10	*1*	7
Usoffa	10	10	10	*0*

rejected. In the learning task, on the other hand, the stimulus, and thus the description, consisted of the S–R pair. Records, then, would be retrieved automatically. Further, because the task specification did not demand (self) verification (as it does with the cued recall), the contents of the records from personality A could be transferred to another record labeled as B. Transfer was also found on the blocks subtest of the WAIS and with the Logical Memory task from the Weschler—stories of paragraph length.

These cases of transfer contrast with situations in which there is no transfer. We saw this with the cued recall task. Transfer was also missing from a GSR test for emotionally laden words. For each personality a couple of words were obtained that had strong personal significance. These words were combined together into a list with a number of neutral words. The list was then read out to each of the personalities. An appreciable GSR was found from each personality for the words that they had provided. Jonah's words provoked a response in the other three, but there were no other cross responses. The form of this transfer corresponds to that found in the paired associate task (Table 14.1).

Another case from whom relevant data have been obtained was studied by Nissen, Ross, Willingham, Mackenzie, and Schacter (1988). This was a 45-year-old woman with a number of mutually amnesic personalities. This patient showed no transfer in recognition memory for words or in interpretation of ambiguous texts. On the other hand she did show repetition priming of perceptual identification of words. These would have been expected from the position I have been putting forward or from Mandler's position (1980; Mandler, Pearlstone, & Koopmans, 1969, 1986). Recognition memory would be attributed to processes responsible for relational code, whereas perceptual identification is a function of integrative, perceptual processes, which are context independent. The latter would also be responsible for the perceptual familiarity effect that mediates transfer in a four-alternative forced-choice task involving faces. However, this patient also showed no priming with a stem completion task—where the subject is given a string of three letters and is required to produce a word. This task is not responsive to the level of processing in the priming task, unlike recognition memory (Graf & Mandler, 1984), and normally shows priming effects with amnesics (Graf, Squire, & Mandler, 1983; Warrington & Weizkrantz, 1970). Responsibility for this task, then, would be assigned to perceptual processes and one should find transfer across personalities. This result poses problems for everyone.

A NOTE ON AMNESIA

My assumption is that the breakdown in amnesia is multifaceted and variable, much as is breakdown in dyslexia (Coltheart, Patterson, & Marshall, 1980; Patterson et al., 1985). I only mention here some general principles of how

amnesia might be treated in the HR framework. The distinction is clear between perceptual processes and the HR system itself. As with Mandler, I take it that the former are intact, and that some of the tasks performed by amnesics rely on perceptual processes (see Graf et al., 1983). For example, it has been shown that amnesics suffer on a task requiring them to distinguish between recency and situational frequency (Huppert & Piercy, 1976). Items that have occurred more often seem to be more recent. But this is exactly the error made by normal subjects with an experimental design that prevents them from using records or span information (Morton, 1968).

Within an HR model there are a number of ways that apparent forgetting can take place. The material may not be laid down in either headings or in records. These problems would affect recognition and recall respectively. Particular kinds of information may not be represented in new records. This could have the effect of the record being rejected by the evaluation process on the basis of particular task specifications. This is the principle used to account for the failure of cued recall and the successful transfer of learning in the case of Jonah, described earlier. This could also account for the massive increase in proactive interference in list learning with amnesics except where the contexts are exaggeratedly distinct (Winocur & Kinsbourne, 1978).

Another possible feature is that heading or description formation might be altered. If both are altered then there would be no anterograde amnesia but there would be retrograde amnesia. This is the principle I have used to account for infantile amnesia (Morton, 1990). If heading formation alone is changed then there could be no retrograde amnesia but there would be anterograde amnesia. Then, of course, these factors, together with others, could co-occur in ways that are unique, and, again, as with acquired dyslexia, we will find the need to define a number of subtypes.

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