

Functional amnesia

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Introduction

Neuropsychological analyses of memory have traditionally relied on studies of patients with organic amnesias that are produced by lesions to specific brain structures, such as the medial temporal lobe memory system. The general goals of this research have been to decompose memory into component processes and systems by documenting selective patterns of deficit across different kinds of memory tests, and to make inferences about the neural organization of memory on the basis of such observations. Research concerning organic amnesias has yielded a rich harvest of empirical findings and has led to important new insights about the nature and composition of memory (for reviews, see Schacter, 1989; Squire and Knowlton, 2000; Markowitsch, 2000).

Not all amnesias, however, result from brain insult, injury, or disease. *Functional amnesia* may be defined as a memory loss that is attributable to an instigating event or process that does not result in damage to brain structures, and produces more forgetting than would normally occur in the absence of the instigating event or process (Schacter and Kihlstrom, 1989; Kihlstrom and Schacter, 1995). Of course, we recognize that functional amnesias are no doubt accompanied by correlated changes in brain state, and ultimately caused by those changes (Markowitsch, 1999). We also recog-

nize that it is not always a straightforward matter to determine what constitutes 'normal forgetting' in a particular situation. The purpose of the foregoing definition is merely to distinguish functional amnesia from organic amnesia on the one hand, and from 'ordinary' forgetting on the other (Schacter, 1999). The central characteristic of the functional amnesias, aside from the fact of amnesia itself, is the absence of demonstrable neuropathology that would account for the amnesia. The functional amnesias are sometimes labeled as *psychogenic*, reflecting the view that they are products of psychological processes rather than direct results of insult, injury or disease affecting brain tissue.

There are non-pathological as well as pathological functional amnesias (Kihlstrom and Evans, 1979). In these cases, amnesia is not a diagnostic symptom of psychopathology, nor does it occur within the context of a diagnosable psychological disorder. On the contrary, non-pathological functional amnesias either occur in the ordinary course of everyday living (e.g. infantile and childhood amnesia, or amnesia for dreams and other events of sleep) or are induced by psychological procedures in subjects who are free of any diagnosable psychopathology (e.g. *posthypnotic amnesia*). Our chapter in the first edition of this *Handbook* (Schacter and Kihlstrom, 1989) reviewed these non-pathological forms as well as the pathological forms of function-

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al amnesia, but in the present edition, this material has been deleted in the interests of space.

Functional amnesia in the dissociative disorders

Functional amnesia is the central feature of a group of psychiatric syndromes known as the *dissociative disorders* (American Psychiatric Association, 1994; for reviews, see Kihlstrom, Tatarzyn and Hoyt, 1993; Kihlstrom, 1994, 2000). In general, the clinical and experimental literature distinguishes among three such syndromes: *dissociative amnesia*, affecting the person's memory for specific events; *dissociative fugue*, covering a broader swath of time and affecting personal identity as well as autobiographical memory; and the interpersonality amnesia associated with *dissociative identity disorder* (formerly known as *multiple personality disorder*). Also relevant are the syndromes of *depersonalization* and *derealization*, which can be construed as failures of recognition (Reed, 1979, 1988). At a purely descriptive level, these amnesias are dissociative in the sense that they involve particular disruptions in conscious recollection. However, in psychiatry and clinical psychology the term *dissociation* also refers to a pathological process, in some ways analogous to Freud's (1915) concept of *repression*, which causes the amnesia to occur. In what follows, we use such terms as *dissociative* and *dissociation* in a purely descriptive fashion, without suggesting that 'dissociation' is a cause of the functional amnesia (for other recent reviews, see Kopelman, 1995, 1997; Loewenstein, 1991, 1996; for comprehensive coverage of the literature prior to 1989 and illustrative case studies, see Schacter and Kihlstrom, 1989; Kihlstrom and Schacter, 1995).

Dissociative amnesia

Dissociative amnesia, also known as *psychogenic amnesia* or *limited amnesia* (Schacter, 1986a), entails a loss of memory for specific, often traumatic, events in the individual's personal history. The patient has forgotten what he or she did, or what hap-

pened to him or her, during a relatively constricted period of time. As such, dissociative amnesia is a disorder of *episodic memory* (Tulving, 1983), affecting the person's ability to remember certain personal experiences. In contrast to the amnesic syndrome associated with brain damage, dissociative amnesia is not necessarily permanent: sometimes the lost memories can be recovered, either spontaneously or following some therapeutic intervention. For this reason, dissociative amnesia is usually considered to reflect a reversible retrieval deficit, affecting conscious access to memories that remain available in storage (hence the label 'dissociative').

Although dissociative amnesia has received considerable exposure in the popular press, there has actually been relatively little research documenting the nature of the memory loss, the conditions under which it occurs, and the circumstances that lead to recovery of the lost memories. Even Janet (1907) barely mentioned the syndrome, except for its occurrence in episodes of somnambulism. For example, while dissociative amnesia is usually considered to be retrograde in nature (e.g. Kapur, 1999), often including a traumatic experience and the events leading up to it, Janet (1893) described a case of anterograde amnesia which left memory for the trauma intact, but impaired memory for events which transpired afterward (for a more recent case, see Kessler, Markowitsch, Huber, Kalbe, Weber-Luxenberger and Kock, 1997). Patients with dissociative amnesia are rarely studied with controlled experimental procedures. Case studies reporting recovery from dissociative amnesia rarely report independent corroboration of the traumatic events themselves.

One important question, especially in the context of a handbook of neuropsychology, concerns the differentiation between organic and functional amnesias (for discussion and case illustrations, see Kopelman, Green, Guinan, Lewis and Stanhope, 1994; Kopelman, 1995, 1997; Markowitsch, 1996, 1999). Clinicians and researchers have long been concerned with the role played by 'organic' factors, such as epilepsy, sleepwalking, alcohol or drug in-

toxication, or even subclinical head injury, in what appear to be 'functional' amnesias. Given the known amnesic effects of alcohol and many psychoactive drugs, such as the barbiturates and benzodiazepines, it is possible that many apparent cases of functional amnesia represent organic amnesia instead. Yet, because of the association of these cases with high levels of stress, the potential role of organic factors is overlooked. The clinical picture is further complicated by cases where organic factors clearly play a role in the genesis of the amnesia, but the amnesia itself has features that give it a 'functional' flavor. For example, Treadwell and her colleagues have described two cases of 'organic' amnesia (induced by an electrical accident and a coronary aneurysm, respectively) where the retrograde amnesia effectively blocked memory for stressful periods in the patients' lives, and returned them to happier times (Treadwell, Cohen, McCloskey and Gordon, 1992). Just as organic factors should not be ignored in cases of apparently functional amnesia, so the contributions of psychosocial factors should not be overlooked in cases of organic amnesia.

A related issue concerns feigning or simulation of amnesia. This is particularly important when amnesia is claimed by the perpetrators of violent crimes, raising the question of malingering (see Schacter, 1986a, for discussion). There are still no firm criteria for unequivocally distinguishing between genuine and simulated amnesias (Schacter, 1986b, 1986c; Wiggins and Brandt, 1988; Hanley, Baker and Ledson, 1999; Kapur, 1999). In the absence of definitive guidelines, investigators should carefully consider the circumstances surrounding each case in order to determine whether grounds for suspecting simulation exist. It would also be helpful to study non-amnesic subjects who are instructed to simulate amnesia, so as to determine whether features of an alleged instance of amnesia are intuitively obvious to naive individuals.

Finally, it should be noted that functional amnesia is clinically assessed in terms of the patient's ability to consciously recollect some event or peri-

od in their lives. While functional amnesia by definition impairs explicit expressions of episodic memory, it is possible that implicit memory is at least relatively spared – just as it is in other forms of amnesia (Schacter, 1987; Schacter and Curran, 2000). For example, Madam D, a patient studied by Janet (1904), had no conscious recollection for a cruel practical joke played on her by her husband's friends, but she relived the episode, unknowingly, in her dreams. Unfortunately, tests of dissociations between explicit and implicit memory are rare in the literature on dissociative amnesia. However, considerable evidence of such dissociations is available in the clinical and experimental literature on dissociative fugue and multiple personality disorder.

Dissociative fugue

Dissociative fugue, also known as *psychogenic fugue* or *functional retrograde amnesia* (Schacter, Wang, Tulving and Freedman, 1982) adds a loss or alteration in personal identity to the loss of personal memories. As such, dissociative fugue can be considered to be a disorder of semantic as well as episodic memory, with the understanding that the items of semantic knowledge affected by the amnesia are *self-referent*, such as the person's name, address, the names of family members, and the like. In actual practice, the distinction between dissociative amnesia and dissociative fugue is somewhat blurred. Nemiah (1979) described a 'generalized' form of dissociative amnesia which covers the person's entire life, thus bordering on fugue; similarly, Fisher (1945; Fisher and Joseph, 1949) described a type of fugue in which the patient reverts to an earlier period in his or her life, with an amnesia for subsequent events, thus verging on psychogenic amnesia. Traditionally, both dissociative amnesia and fugue have been characterized as retrograde in nature. This is clearest in the case of fugue: the fugue state entails an amnesia for events which occurred prior to the fugue, though memory is continuous during the fugue state itself. When the fugue state remits, the patient recovers his or her

prefugue memories but experiences a second amnesia, now covering the fugue itself.

Clinically, fugue occurs in several stages (e.g. Abeles and Schilder, 1935). Patients first enter a fugue state during which they may wander for variable periods of time, and are unaware of any memory loss. Because the fugue is defined as that period during which patients are unaware of memory loss, it almost never comes to the attention of appropriate professionals until awareness is achieved. Accordingly, information about fugue states is almost necessarily based on retrospective accounts. Some patients emerge directly from the fugue into a state of full recovery, whereas others proceed from the fugue to a second stage that is characterized by awareness of loss of personal identity and large sectors of autobiographical memory. In some cases, the amnesia clears in response to the appearance of a relative or to a cue that is related to the events associated with the fugue, whereas in others, hypnotic procedures or barbiturate drugs are employed in an effort to alleviate amnesia. In many cases, however, recovery of memory and identity is 'spontaneous' in the sense that no salient external cues are present when patients suddenly recover memory function. In the third stage, after patients have recovered their identity and personal past, the events of the second stage are accessible to conscious recall, whereas the events of the first stage (fugue) are not.

Given the large number of clinical studies of dissociative amnesia and fugue, it is surprising to discover that controlled experimental studies are almost non-existent. Instead, many investigators have focussed on issues of psychiatric and clinical concern, including the psychodynamic functions of amnesia and its relation to different forms of psychopathology, the time course of recovery and the most effective treatment methods, and the nature of the traumatic events associated with the syndrome. Despite the psychiatric orientation of much of the literature, several issues directly concerned with the nature of memory loss during dissociative amnesia and fugue have been addressed. Consider first the extent of patients' amnesia for

their personal past. Clinical reports suggest that most patients present with amnesia for their entire personal past, although some show 'spotty' recollection of particular incidents or autobiographical facts. Unfortunately, most clinical reports provide virtually no information concerning the procedures used to probe memory, so they are of limited value when attempting to assess the extent of amnesia.

Quantitative information on this point has been provided in a study of patient P.N. by Schacter et al. (1982) which used controlled cueing procedures for exploring autobiographical memory in a case of dense dissociative amnesia and fugue. When presented with a familiar word and asked to retrieve a specific personal experience related to it, 86% of P.N.'s memories concerned events that had transpired in the 4-day period where he was hospitalized during the period of his fugue. Several weeks later, after the fugue had cleared, 92% of the memories predated the onset of the amnesia. In the initial test, Schacter et al. included a second cueing condition in which P.N. was instructed to try to retrieve only memories that predated the onset of the amnesia. Under these conditions, P.N. was able to come up with autobiographical episodes in response to 17 of the 24 cues: the majority of these derived from an extremely happy period of his life, 1 year prior to the amnesia, when he worked for a courier service (and had received his nickname).

A second issue that has received some systematic investigation concerns whether dissociative amnesia and fugue is restricted to personal, autobiographical information or whether it also entails impaired access to general knowledge or semantic information on the one hand, and well-learned skills on the other. P.N. was given a test in which pictures of famous people from the past several decades are presented and the patient is required to identify them. On this test, P.N. performed about as well during the amnesia as he did after it cleared, and performed similarly to a matched control subject during both test sessions. In addition, P.N.'s vocabulary, as assessed by the Wechsler Adult Intelligence Scale (WAIS), was identical dur-

ing and after the amnesic episode. These data suggest that semantic knowledge was preserved in this case.

Similar observations were reported in the case of a male patient (M.R.) who became amnesic after homosexual rape (Kaszniak, Nussbaum, Berren and Santiago, 1988). M.R. exhibited an impressive spontaneous vocabulary while experiencing dense amnesia for all personal information, and performed similarly on the WAIS-R vocabulary sub-scale during the amnesia and after it cleared. Consistent with these findings, Gudjonsson and Taylor (1985) reported that the WAIS vocabulary performance of a man who developed a 20-year retrograde amnesia for personal information following a series of stressful events showed little change during and after the amnesia. Most clinical observers concur that previously acquired skills are preserved during episodes of fugue. Yet despite this generally accepted view – or perhaps because of it – we know of no systematic empirical studies of skill retention or utilization in patients with dissociative amnesia or fugue. It seems clear that careful testing of patients' ability to execute acquired skills is needed to provide an empirical foundation for evaluating this issue.

A related issue that also requires more systematic investigation concerns whether dissociative amnesia and fugue is accompanied by generalized impairments of cognitive function. Patient P.N. showed unchanged WAIS verbal IQ during and after his amnesic episode, whereas performance IQ was substantially lower during the amnesia than after it (Schacter et al., 1982). Because only 3 weeks separated the two test sessions, this latter improvement was attributed partly to practice effects that are known to influence WAIS performance tests. However, Kaszniak et al. (1988) found that their patient showed improvements on both WAIS-R verbal and performance IQ with a 15-month separation between the two tests. Similarly, Gudjonsson and Taylor (1985) reported a large gain in full-scale WAIS IQ by a patient who was tested during an amnesic episode and again 8 months later. These findings suggest some deteri-

oration of intellectual function during the amnesic episode. More extensive investigation of cognitive function during dissociative amnesia and fugue is clearly required.

An issue of longstanding concern in the literature is whether patients with dissociative amnesia and fugue also exhibit some degree of anterograde amnesia as well as retrograde amnesia. Several clinical observers have contended that patients remember reasonably well day-to-day events that occur while they are suffering from dissociative amnesia and fugue, but formal testing sometimes reveals mild to moderate deficits in memory for recently studied materials. P.N. showed significant impairment on the logical memory and paired-associate subtests of the Wechsler Memory Scale during amnesia relative to his performance several weeks later in a normal state (Schacter et al., 1982). However, he also showed excellent recall of day-to-day events while he was amnesic, as documented by his previously discussed performance on the autobiographical cueing task. Thus, it would be inappropriate to assert that this patient suffered from clinically significant anterograde amnesia. It is possible that subtle anterograde impairments observed during dissociative amnesia and fugue may be secondary to cognitive deficits or to depressed mood.

The amnesia that is the hallmark of dissociative amnesia and fugue is observed when patients are queried *explicitly* about their personal past. An important question concerns whether these patients can show *implicit* memory for autobiographical information that is inaccessible explicitly (Schacter, 1987). Although this issue has received scant attention, several intriguing observations have been made. For example, Coriat (1907) used a procedure in which patients focussed attention on a monotonous stimulus and reported whatever came to mind; no explicit reference was made to the patient's personal past. He found that under these conditions, a patient with apparently complete amnesia produced bits and pieces of information about her past, but was entirely unaware of their autobiographical nature. As Coriat related, "These

memory automatisms...are not looked upon as memories, but as strange, unfamiliar and isolated phenomena, which [the patient] well expressed by the term 'wonderments' (1907, pp. 106–107)'. Similarly, Jones (1909) observed that a densely amnesic patient who could not explicitly remember either his wife or daughter produced their names correctly – without any conscious experience of familiarity – when asked to guess what names might fit them.

More recent observations are consistent with this early evidence of implicit memory in dissociative amnesia and fugue. Gudjonsson and Haward (1982) found that a young woman who had threatened to commit suicide prior to the onset of amnesia showed a preoccupation with death-related themes on a Rorschach test, even though she did not explicitly remember her suicide threat or the circumstances that produced it (see Gudjonsson and Taylor, 1985, for similar observations). In an earlier report concerning this patient, Gudjonsson (1979) reported that she showed heightened electrodermal responses to some, but not all, items of personal relevance at a time when she was amnesic for them. Lyon (1985) described a case in which a patient's implicit memory proved therapeutically useful. This patient was utterly unable to retrieve explicitly any autobiographical information. But when asked to randomly dial numbers on a telephone, she unknowingly dialed the number of her mother, who then identified the patient.

In their study of functional amnesia following male rape, Kaszniak et al. (1988) found that patient M.R. experienced severe distress when shown a TAT card that depicted one person approaching another from behind. He then left the testing session to go to his room, and attempted unsuccessfully to commit suicide – yet was unable at the time to explicitly remember the rape incident. In addition, M.R. produced under hypnosis images that he later confirmed were from his personal past, but were not experienced as memories when they were retrieved. Christianson and Nilsson (1989), in a study of a woman who developed amnesia after an assault and rape, observed that she

became extremely upset when taken back to the scene of the assault, even though she did not explicitly remember what had happened or where. The foregoing observations were made under clinical testing conditions that necessarily lack the full set of appropriate experimental controls, but they clearly suggest that explicitly inaccessible autobiographical information can be expressed implicitly, and thereby encourage serious investigation of the phenomenon.

New data on functional retrograde amnesia have been provided by brain imaging techniques, such as positron emission tomography (PET), that measure changes in brain activity related to changes in regional cerebral blood flow. In one recent case (Markowitsch, Fink, Durwen, Thone, Kessler and Heiss, 1997), a patient referred to by the initials N.N. unexpectedly disappeared from home and turned up days later in a city hundreds of miles away unaware of his personal identity and suffering from retrograde amnesia covering most of his autobiographical memories. Subsequent identification by family revealed that N.N. had been suffering from various stresses in his daily life prior to his disappearance, but there was no sign of overt brain damage. Markowitsch et al. carried out PET scans while the patient listened to descriptions of events from various points in his past. When healthy control subjects carried out a similar task involving recollection of emotionally salient past experiences, the scans revealed increased activity in parts of the right cerebral hemisphere, especially in posterior regions of the frontal lobe and anterior regions of the temporal lobe (Fink, Markowitsch, Reinkemeier, Bruckbauer, Kessler and Heiss, 1996). But N.N. showed no signs of activation in these regions, and instead activated a much smaller part of frontal and temporal regions, mainly in the left hemisphere.

These observations may be related to studies of so-called 'isolated retrograde amnesia' in brain-injured patients, which presents much like functional retrograde amnesia: patients have little or no difficulty forming and retrieving new memories, but have great difficulty remembering large sectors of

their personal pasts (for review, see Kapur, 1999). Such patients are often characterized by damage to posterior right frontal and anterior right temporal regions. Interpretation of isolated retrograde amnesia remains controversial, in large part because of the possible contributions of psychological or 'functional' factors to the observed memory disorders (Kapur, 1999). However, this only serves to underscore the possible link between such patients and those traditionally described in terms of functional retrograde amnesia.

Amnesia in multiple personality disorder

Multiple personality disorder (MPD), also known as dissociative identity disorder (DID), is the 'crown jewel' of the dissociative disorders, and also of the functional amnesias. The abstracted psychological literature contains almost 2000 papers dealing with this syndrome, approximately two-thirds of them appearing since the first edition of this *Handbook* was published in 1989 (for comprehensive reviews, see Schacter and Kihlstrom, 1989; Kihlstrom and Schacter, 1995; Kihlstrom, 2000). Inexplicable memory lapses, producing confusion and even bewilderment in both patients and others, are frequent presenting symptoms in patients ultimately diagnosed with this disorder. Once the diagnosis has been established, one of the most striking features of these patients is an amnesia between and among personalities or *alter egos* (Taylor and Martin, 1944; Sutcliffe and Jones, 1962; Putnam, Guroff, Silberman, Barban and Post, 1986). Most contemporary investigators view between-personality amnesia as a cardinal symptom of multiple personality disorder (e.g. Ross, 1997), although, for a brief time, amnesia was removed from the *Diagnostic and Statistical Manual* as a diagnostic symptom (Kihlstrom, 1994, 2000).

Although the amnesia in MPD is readily apparent on clinical examination, it can also be studied quantitatively using laboratory techniques. For example, Patient I.C. displayed memory lacunae for various periods of time in her adult life – symptoms which ultimately led to the diagnosis of MPD

(Schacter, Kihlstrom, Canter Kihlstrom and Berren, 1989). Following procedures employed in the case of P.N. (Schacter et al., 1982), in a laboratory session she was presented with a list of familiar words, and asked to remember a personal experience related to each. In marked contrast with the performance of age-matched normal control subjects, I.C. produced almost no memories for the first 14 years of her life; her earliest recollection was dated to age 12. When instructed to confine her responses to this time period, all of her memories were from ages 10 to 12 – again in marked contrast to the controls. This pattern of memories suggested that I.C.'s primary personality was in fact an alter ego that developed sometime around adolescence, and so lacked memories for the first 10–12 years of I.C.'s life.

Interestingly, interpersonality amnesia appears to be *asymmetrical*. Although at least one personality shows dense amnesia for the experiences of the others, one or more typically has relatively unimpaired access to the experiences of some or all other personalities. In the classic case of *The Three Faces of Eve*, for example, Eve White was amnesic for the activities and experiences of Eve Black, but Eve Black knew all about Eve White (Thigpen and Cleckley, 1957). Although Schacter et al. (1989) were unable to gain access to any of I.C.'s alter egos for memory testing, Bryant (1995) was able to test two mutually amnesic personalities in another case of MPD, H.S. One alter ego, an adult woman considered to be the 'host' or primary personality, showed a strong recency bias, with more than 90% of her memories dated within the year immediately prior to testing; for the other alter ego, identified as 'Mary', a 9-year-old girl, all of the memories were dated before age 12. Interestingly, the child personality Mary was able to recognize about 50% of the host personality's adult memories. However, this recognition was indirect, based on inferences from knowledge of the host gained during therapy sessions, rather than direct, conscious recollection.

Even when a particular personality lacks explicit memory for what has happened to others, some im-

PLICIT memory can be observed. For instance, in his classic description of Miss Beauchamp, Prince (1910) reported that personality 'B IV' had involuntary 'visions' that depicted the experiences of personality 'B I', but "...the visions were pure automatism, excrescences in her mind, without conscious association with the other experiences of the life which they pictured. When seeing a vision she [B IV] did not recognize the pictorial experiences as her own, even though it was of B I's life; there was no sense of memory connected with it" (p. 265). Similarly, B IV experienced strong emotional reactions to people and places that had affective significance for B I; B IV, however, had no conscious recollection of the people or places that elicited the emotion and could not understand why she felt it.

Experimental investigations have generally confirmed and extended these clinical observations. In the first quantitative study of memory function in multiple personality, Ludwig and his colleagues described a case in which the core (or *host*) personality, Jonah, was completely amnesic for three alter egos – Sammy, Usoffa Abdulla, and King Young (Ludwig, Brandsma, Wilbur, Bendfeldt and Jameson, 1972). Using the paired-associate learning tests from the two alternate forms of the Wechsler Memory Scale, they found that having either Jonah or Usoffa Abdulla study a particular list facilitated learning of that same list by each of the other personalities. Similarly, exposing either Jonah or Usoffa Abdulla to one of the WMS stories facilitated subsequent memory for that story in the other personalities. Evidence for transfer between personalities was also obtained in procedures involving classical conditioning and the WAIS block design test. In two additional paradigms, however, transfer was observed only from Jonah to other personalities, and not vice versa: the influence of paired-associate learning on subsequent free association performance, and GSR responses to words that had emotional significance for each of the personalities. Based on these observations, Ludwig et al. suggested that affectively charged material transferred only from Jonah to other per-

sonalities, whereas affectively neutral material transferred among all personalities. However, all the tests that showed interpersonality transfer were implicit in nature: none of them required conscious recollection. Accordingly, it might be concluded that interpersonality amnesia impairs explicit, but not implicit, memory. Unfortunately, Ludwig et al. (1972) did not actually test whether any of the personalities could consciously remember material that another had studied, so this conclusion must remain speculative.

Similar considerations apply to a more recent study by Dick-Barnes et al. (1987). They tested three different personalities out of a total of 16 that had been identified in a 28-year-old female patient. Like Ludwig et al., they found that having one of the personalities study a paired-associate list facilitated learning of that same list by any of the other personalities. Moreover, the amount of between-personality facilitation was roughly comparable to the amount of within-personality facilitation. A similar pattern of results was observed with a perceptual-motor learning task: Acquisition of skill at the task by one personality facilitated skill acquisition by the others. Although these observations can also be interpreted in terms of explicit and implicit memory, Dick-Barnes et al. also provided no data on whether the various personalities could explicitly remember the information studied by the others.

More direct evidence of a dissociation between explicit and implicit memory is provided in a study of interference in verbal learning by Silberman and his colleagues (Silberman, Putnam, Weingartner, Braun and Post, 1985). For each of nine MPD patients, these investigators selected two alter egos who were mutually amnesic, and examined performance in two different conditions: (1) similar categorized lists were studied successively by two different personalities; and (2) the lists were studied successively by the same personality. If information acquired by one personality does not interfere with performance in another, recall of individual list items should be higher in the first condition than in the second. However, Silberman et al. re-

ported evidence of retroactive and proactive interference across personalities: recall was lower in the first than the second condition. Silberman et al. found that "Subjectively, all MPD patients reported that all the words they remembered had been heard in the same personality state" (p.257). Thus, it seems reasonable to interpret the observed interference effects as implicit expressions of memory by one personality for the experiences of another.

The first study to specifically contrast implicit and explicit memory across alter egos was reported by Nissen, Ross, Willingham, Mackenzie and Schacter (1988), who tested a 45-year-old woman with 22 diagnosed personalities. Nissen et al. focussed on eight mutually amnesic personalities who could each be elicited in response to an appropriate request by the experimenter. Target materials were studied by one personality (which was elicited by the patient's psychiatrist), and after retention intervals of approximately 5–10 min, another personality was elicited for memory testing. Little or no evidence of between-personality explicit memory was observed on a variety of tests. Thus, when the personality named Alice studied a list of words, and a personality named Bonnie was subsequently given a Yes/No recognition test and asked to pick out the words shown previously to Alice, she circled none of them. By contrast, evidence of cross-personality implicit memory was observed on several tests. For example, on a word fragment completion test, Bonnie's performance was facilitated or primed by prior exposure of a word to Alice. Similar cross-personality implicit memory effects were observed on tasks that required perceptual identification of briefly exposed words, as well as a task requiring sequence learning. Interestingly, however, no evidence of cross-personality transfer was observed on several other implicit memory tasks, including solution of semantically ambiguous sentence and picture puzzles and free association to word stems. Moreover, repeated administration of the WMS logical memory passages did not yield any evidence of cross-personality facilitation of learning,

as had been observed in the Ludwig et al. (1972) study.

A more recent study also shows that testing memory implicitly is not sufficient for observing cross-personality memory transfer (Eich, Macaulay, Loewenstein and Dihle, 1996). In this study, involving nine patients, explicit memory tests of free and cued recall gave strong evidence of interpersonality amnesia. However, implicit memory was spared on a test of picture-fragment completion, but not on a test of word-fragment completion. It is not clear how to interpret these results. Studies of normal subjects reveal dissociations between implicit tests of memory, just as they reveal dissociations between implicit and explicit memory (e.g. Roediger and McDermott, 1993), and these are not yet well understood. It is possible that interpersonality transfer is limited to tasks that rely on relatively shallow perceptual processing at the time of encoding, as opposed to relatively deep semantic processing. Alternatively, implicit transfer may not have occurred on tasks which drew on prior knowledge that was somehow idiosyncratic to each personality (Nissen et al., 1988; Eich et al., 1995). Because this personality-specific knowledge would have been available only when the same personality performed at both study and test, cross-personality implicit memory may be observed only with tasks and materials that do not tap personality-specific knowledge. In the hopes of clarifying this situation, future research on implicit memory in MPD, and on the other functional amnesias as well, should include multiple implicit memory tasks.

Recent discussions of MPD have been plagued by controversy over whether the phenomenon is largely or entirely an iatrogenic disorder – the result of suggestive probing during psychotherapy that creates, rather than reveals, dissociated identities (for discussion, see Ofshe and Watters, 1994; Spanos, 1994, 1996; Pendergrast, 1995; Acocella, 1999; see also Gleaves, 1996; Lilienfeld, Lynn, Kirsch, Chaves, Sarbin, Ganaway and Powell, 1999). We share such concerns and believe that it is highly likely that many recent cases of MPD are

produced or influenced by iatrogenic factors. Social and cultural influences are also potent influences in the genesis of MPD (e.g. Kenny, 1986). Thus, the features of amnesia observed in experimental studies of MPD patients may be influenced to varying degrees by iatrogenic and sociocultural factors (for further discussion, see Schacter, 1996, Chapter 8).

Depersonalization and derealization

While dissociative amnesia, dissociative fugue, and multiple personality disorder all involve gross disruptions in autobiographical memory, memory problems are also encountered in the syndromes of depersonalization and derealization (for a recent review, see Coons, 1996). In depersonalization, the person experiences him- or herself as different than he was before; in derealization, it is the outside world that is perceived as changed. Both syndromes, then, may be considered to be anomalies of recognition – a failure to match current experience with past memories (Reed, 1979, 1988). Beyond this statement, however, the recognition deficits of depersonalization and derealization have completely escaped controlled experimental study.

Does trauma cause functional amnesia?

From the earliest days of psychiatry and psychology, clinical lore has held that the functional amnesias are caused by exposure to traumatic stress – a position that Kihlstrom (1996) has characterized as the *trauma-memory argument*. Pierre Janet (1889, 1907), argued that, especially in vulnerable individuals, mental trauma could cause a splitting of the normally unified stream of consciousness into two or more parallel streams – a condition that he labeled *desaggregation*, translated into English as ‘dissociation’. Only one of these streams was accessible to phenomenal awareness and voluntary control, resulting in amnesias affecting conscious recollection – what we now know as explicit memory. The other, dissociated, streams of consciousness existed as *fixed ideas* which influenced

experience, thought, and action unconsciously and involuntarily, much in the manner of implicit memories. Similarly, Breuer and Freud (1893/1895) argued that certain ideas, affects, and impulses were actively pushed out of consciousness as a defense against conflict and anxiety (see also Freud, 1915). In their famous formulation, ‘hysterics suffer from reminiscences’ – memories of traumatic experiences which, while inaccessible to conscious recollection, were manifested unconsciously in dreams, errors, and the symptoms of mental illness.

Even a cursory survey of 20th century Western culture shows that Freud’s ideas prevailed over Janet’s. More recently, however, many clinical practitioners have embraced an eclectic combination of Janet’s and Freud’s ideas, often characterizing dissociation as a defensive maneuver which wards off the emotional impact of trauma (Kihlstrom, 1996; Shobe and Kihlstrom, 1997). For example, Terr (1994) has suggested that children invoke processes such as denial, psychic numbing, and dissociation as defenses against repeated trauma, resulting in poor memory for the individual episodes. Similarly, van der Kolk (1994) has argued that traumatic stress interferes with the consolidation of explicit verbal narratives, leaving only fragmentary sensory, motor, or affective representations that can intrude on consciousness as implicit memories. Freyd (1996) has proposed that memories of ‘betrayal trauma’, associated with child sexual abuse and other violations of trust, are forgotten by virtue of an adaptive process of knowledge isolation analogous to dissociation or repression.

In all of these theories, as in the earlier theories of Janet and Freud, some mental process prevents conscious recollection of traumatic events. Nevertheless, representations of the events in question remain available in memory, and can affect the individual in much the same way as implicit memories do (Kihlstrom, 1997). For example, Frederickson (1992) has proposed that repression impairs *recall memory*, while the repressed memories can return in the form of images, feelings, bodily sensations, and ‘acting-out’ behaviors. As in the practice of Breuer and Freud (1893–1895/1953), one goal in

modern trauma therapy (sometimes known as 'recovered memory therapy'; Kihlstrom, 1997) is to help the patient to recover memories of traumatic events, employing a variety of techniques ranging from imagination to drugs and hypnosis (Kihlstrom, 1998; Shobe and Kihlstrom, 2000).

The twin proposals that trauma causes amnesia and that unconscious traumatic memories can be recovered into consciousness, have been important parts of popular as well as clinical folklore, as evidenced by Alfred Hitchcock's film *Spellbound* (1945) and Jane Smiley's novel, *A Thousand Acres* (1991). At the same time, this folklore is generally inconsistent with what is known about the emotional effects on memory (Christiansson, 1992; Schacter, 1996; Kihlstrom, Eich, Sandbrand and Tobias, 2000). In general, laboratory research finds that emotional arousal, whether positive or negative, enhances memory. In part, this may be because emotional events draw more attention, and thus result in more elaborate processing at the time of encoding; in addition, the presence of emotional valence may render memories more distinctive, and thus less subject to interference, and more accessible at the time of retrieval. Although ethical considerations do not permit traumatic levels of stress to be induced in human subjects, these conclusions are consistent with those from animal research. For example, Cahill and McGaugh (1998) have shown that enhanced memory for stressful events is mediated by the release of hormones, such as epinephrine, ACTH, and cortisol, which in turn activate the amygdala, which has projections to the hippocampus and other structures which support explicit memory (see also LeDoux, 1996; Davis, 1997). While traumatic memories may be special in that they involve the amygdala in ways that other memories do not (Nadel and Jacobs, 1998), the involvement of the amygdala enhances rather than impairs memory.

On the other hand, there is some evidence from both human and animal studies that prolonged exposure to stress has neurotoxic effects which destroy hippocampal tissue, and thus would impair explicit memory (for reviews see Sapolsky, 1996;

Nadel and Jacobs, 1998; Bremner, 1999, 2000). However, the time scale involved in these effects is such that stress-induced hippocampal damage could not account for amnesia for the traumatic event per se. In any event, hippocampal damage would produce a generalized anterograde amnesia, as in the classic case of H.M., rather than a specific deficit in memory for traumatic events. By the time the hippocampal damage occurred, memories for the traumatic event itself should have been well consolidated, and thus relatively invulnerable to amnesia.

In general, the notion that trauma causes amnesia rests on three classes of evidence (Schefflin and Brown, 1996; Arrigo and Pezdek, 1997; Brown, Schefflin and Hammond, 1998; Brown, Schefflin and Whitfield, 1999), all of which are equivocal (Piper, 1997; Pope and Hudson, 1995a-c; Kihlstrom, 1998; Pope, Oliva and Hudson, 1999). First, there are clinical case studies of psychogenic amnesia occurring in association with traumatic incidents such as disasters and accidents, combat, attempted suicide, criminal acts, the violent death of a parent, and rape (e.g. Arrigo and Pezdek, 1997). However, these case studies do not always succeed in ruling out organic factors such as head injury or intoxication. For example, in their classic study of war neurosis, Sargant and Slater (1941) noted that many of their amnesic patients had experienced severe sleep deprivation or profound fatigue. In a recent study, every one of a group of murders who claimed to be amnesic for their crime were intoxicated at the time of the act (Gudjonsson, Petersson, Skulasson and Siguroardottir, 1989). In other cases, evidence for the amnesia itself is equivocal. Many survivors of the 1989 Loma Prieta earthquake reported 'dissociative' symptoms such as depersonalization and derealization (Cardena and Spiegel, 1993), but there is no evidence that any of them ever forgot the earthquake itself, or their involvement in it. A recent case report claimed to document the recovery during psychotherapy of a repressed memory in a veteran of World War II (Karon and Widener, 1997, 1998; see also Giglio, 1998; Lilienfeld and Loftus, 1998; Pendergrast,

1998; Piper, 1998), but it is not clear that the patient was actually amnesic for the event in question. Furthermore, some details of the ostensibly recovered memory may have been contaminated by other information available to the patient, and still other details may have been historically inaccurate. Although some ostensible cases of trauma-induced amnesia may survive close analysis, it is not clear that they are representative of the vast majority of cases; trauma is usually remembered all too well (for a further discussion of relevant cases, see Schacter, 1996, Chapter 8).

A second line of evidence comes from retrospective studies of victims of incest and other forms of child sexual abuse. For example, Herman and Schatzow (1987) reported that 14 of 53 patients in an incest-survivor recovery group were amnesic for their abuse. However, these investigators presented no independent corroboration of the patient's self-reported abuse histories. Even taking the patients' self reports at face value, the average age at which the abuse occurred in the amnesics was less than five years. This suggests that any amnesia may have been the product of normal infantile and childhood amnesia, rather than any effect of trauma *per se* on memory. Similarly, Briere and Conte (1993) reported that 69% of a large group of psychotherapy patients with self-reported histories of child sexual abuse reported that there was some time in the past when they did not remember their abuse. However, these investigators provided no independent corroboration of the patients' self-reports of abuse (or, for that matter, their self-reports of forgetting). Nor, again taking the self-reports of forgetting at face value, were they able to distinguish between psychogenic amnesia and other causes of the claimed failure to remember, such as infantile and childhood amnesia, normal forgetting, or a failure to interpret the incident in question as abuse at the time it occurred. Finally, the studies do not include any comparison group which would show that childhood sexual abuse is forgotten at a different rate than other events of childhood, or that the mechanisms of forgetting differ between traumatic and non-traumatic events.

Brown et al. (1999) review '68 data-based studies' (p. 53), including random, community, clinical, and forensic samples, and conclude that these generally reveal "substantial forgetting of childhood sexual abuse" (p. 125). Because most of these studies suffer from the same sorts of methodological flaws as the pioneering studies of Herman and Schatzow (1987) and Briere and Conte (1993), including a failure to independently confirm the subjects' abuse histories, this conclusion is not supported by the available retrospective data.

The third form of evidence pertaining to the trauma-memory argument consists in prospective studies of individuals with documented trauma histories. The most prominent of these, by Williams (1994a,b), followed up a group of women who had been treated for child sexual abuse at a particular hospital some 17 years earlier. Under the cover of a survey concerned with their histories of medical care, these adults were asked questions about childhood sexual victimization. A total of 38% of informants failed to report their documented abuse history to the interviewer, leading Williams (1994a) to conclude that "having no memory of childhood sexual abuse is a common occurrence" (p. 1173). Unfortunately, Williams' methodology did not permit her to distinguish between memory failures and reporting failures (Loftus, Garry and Feldman, 1994). Nor, assuming that the subjects' reports represented genuine memory failures, was she able to distinguish functional amnesia caused by trauma from ordinary forgetting or normal infantile and childhood amnesia (the strongest predictor of reporting failure was age at the time of the abuse episode). Thus, the Williams study is equivocal with respect to the claim that amnesia frequently occurs in cases of child sexual abuse – much less that trauma is the cause of the amnesia.

More recent follow-up studies, cited favorably by Brown et al. (1999) as evidence of abuse-related amnesia, also are equivocal (Pope, Hudson, Bodkin and Oliva, 1998; see also Brewin, 1998). Not all failures to report documented experiences of abuse represent memory failures, and not all failures to remember documented abuse represent

trauma-induced functional amnesia. For example, Widom and Morris (1997), in a 20-year follow-up, observed substantial (37%) under-reporting of previous, documented sexual abuse. However, these authors specifically rejected the notion that this under-reporting represented a trauma-induced amnesia, as opposed to a reporting failure or benign failure of memory. In the final analysis, the fact that functional amnesia often occurs in association with trauma does not mean that trauma *causes* amnesia, either directly (like the mental equivalent of a concussive blow to the head) or through some psychological process like repression or dissociation. Certainly trauma does not *necessarily* cause amnesia: even in the studies of Herman and Schatzow (1987) and Briere and Conte (1993), only a minority of patients claimed amnesia for their abuse.

Can conscious recollection be restored?

The trauma-memory argument generally assumes that trauma-induced amnesia is retrograde in nature, reflecting a disruption in retrieval rather than encoding or storage processes. It follows, then, that traces of unremembered traumatic experiences remain available in memory. Accordingly, the practice of recovered memory therapy includes a number of techniques, collectively known as *memory work* (McCann and Pearlman, 1990), which are designed to gain access to these unconscious memories, and restore them to conscious recollection. Unfortunately, some of the most popular techniques, including guided imagery, dream interpretation, and bibliotherapy, increase the risk of distorted or false memory, by creating and capitalizing on the conditions, such as a closed social interaction between therapist and patient, and the use of highly suggestive procedures, under which interrogative suggestibility is enhanced (Gudjonsson and Clark, 1986; Shobe and Kihlstrom, 2000).

Since the time of Janet, Breuer and Freud, clinical practitioners have turned to hypnosis to aid the recovery of repressed or dissociated memories. Beginning in the 1930s, sedative drugs, such as barbiturates, were also used for this purpose – most fa-

mously, in cases of war neurosis (Sargant and Slater, 1941; Grinker and Spiegel, 1945). However the validity of these techniques for the recovery of traumatic memories is open to serious question (Kihlstrom, 1998). As it happens, there is no controlled clinical or laboratory research which attempts to verify memories recovered through the administration of barbiturates (for reviews, see Kihlstrom, 1998; Perry and Jacobs, 1982; Ruedrich, Chu and Wadle, 1985). The literature on hypnosis is more abundant (for reviews, see Smith, 1983; Orne, Whitehouse, Dinges and Orne, 1988; Kihlstrom and Barnhardt, 1993; Piper, 1993; Kihlstrom and Eich, 1994; Lynn and Nash, 1994; Kihlstrom, 1998).

Somewhat remarkably, many clinical practitioners seem disinclined to attempt independent corroboration of their patients' memories (Moen, 1995). In some cases (e.g., Grinker and Spiegel, 1945, p. 173), the memories are assumed to be valid because they are vivid and compelling. In other instances, as with Freud's 'tally argument' (Grunbaum, 1984), the therapist may assume that the memories are accurate because they fit with his or her theory of the case at hand. In still other cases, the therapist may be concerned only with the patient's 'personal', rather than historical, truth. However, when recovered memories of child sexual abuse or other traumatic experiences are the focus of therapy, and especially when they lead to civil or criminal actions in the courts, it would seem critical to establish their validity.

In an extension of her 1994 prospective study, Williams (1995) found that 16% of the women who reported the index incident of abuse (i.e. who were not in any sense amnesic for the abuse) also reported that they had forgotten the abuse incident for some period of time, and then recovered the memory later. Similarly Dahlenberg (1996) reported forgetting and subsequent recovery of abuse memories by a small group of psychotherapy patients. Unfortunately, this kind of evidence cannot be used to establish the reliability of recovered memories of abuse in general. In the first place, as noted in our earlier comments on the Briere and

Conte (1993) study, it is not clear whether the forgetting reported by these individuals resembles functional amnesia in any way. More important, such studies, which begin with a group of individuals with documented histories of trauma, cannot provide information about the reliability of recovered memories of trauma, because they provide no information about the incidence of recovered memories in individuals *without* trauma histories. In the absence of such a comparison, we have no way of assessing the accuracy of recovered memories. In the absence of independent corroboration, recovered memories of trauma have no probative value, either in the clinic or in the court. In the presence of independent corroboration, they are moot.

The future of functional amnesia

Functional amnesia, amnesia for trauma, and the recovery of traumatic memories have been part of the folklore of psychiatry and clinical psychology for more than a century. Yet we seem no closer to an understanding of these topics than we were 100 years ago. Most of the literature consists of uncontrolled case studies and speculative essays. There is very little by way of systematic clinical study or controlled experimental research investigating the nature of the functional disorders of memory. We still know nothing about the role of trauma in producing functional amnesia, or the mechanisms by which it might do so. There has been little research on the efficacy and reliability of some popular techniques, like memory work or barbiturate drugs, which are used to overcome functional amnesia. Everything about the functional amnesias is controversial.

This controversy developed largely in the 1990s, after the first edition of this *Handbook* was published. For salient examples of the controversy at play, see the exchanges between Frederick Crews (1995) and others in the *New York Review of Books*, published under the rubric of 'The Memory Wars' (see also Schacter, 1995). As another example, the American Psychological Association responded to

the controversy over recovered traumatic memories by convening a special 'Working Group on Investigation of Memories of Childhood Abuse'. The Working Group, consisting of three clinical practitioners and three research scientists, was unable to agree on any substantive issue, and their final report, which was never formally published, took the form of a debate (Alpert, Brown, Ceci, Courtois, Loftus and Ornstein, 1996). However, it is a mistake to view the 'memory wars' as merely a conflict between science and practice. There are reputable scientists who support the trauma-memory argument and recovered memory therapy (e.g. Freyd, 1996), and practicing psychoanalysts who do not (Brenneis, 1997a,b).

Most professional associations that have taken positions on the matter have cautioned practitioners against assuming that recovered memories of child sexual abuse and other trauma are reliable. These include the American Psychiatric Association, the American Medical Association, the Australian Psychological Society, the Canadian Psychiatric Association, and the Royal Psychiatric Society in the United Kingdom. Following the failure of its Working Group to achieve any semblance of consensus, the American Psychological Association has taken no official position on the matter of recovered memories. The British Psychological Society has taken a more positive view, which in turn has been severely criticized by a number of participants in the debate (Weiskrantz, 1995; Kihlstrom, 1997). By the fairly strict *Frye* standard which prevails in many American courtrooms, it would seem that the concepts of traumatic repression (or dissociation) and recovered memory would enjoy the degree of general acceptance required for admission into American courts of law. On the other hand, Brown et al. (1999, p. 6) argue that "the available scientific evidence on amnesia for childhood sexual abuse clearly meets the [more recent and more lenient] *Daubert* standards of admissibility" in American courts. Reagan (1999, p. 276), reviewing much the same body of evidence, finds that, under either standard, "the principle of memory repression does not have a scientific foundation

strong enough to warrant admitting into court expert testimony on memory repression” (see also Pope et al., 1999). The legal situation cries out for a definitive resolution by the U.S. Supreme Court.

Neuropsychologists and other memory researchers can expect to play an important role in whatever ruling is ultimately rendered, so properly controlled research on trauma and memory is a matter of some urgency. At the very least, we need further prospective studies of trauma victims. Beginning with independent evidence of their trauma, these individuals can then be followed up with focused inquiry into their memories for the traumatic events, taking care to distinguish between failures of memory and reporting failures, and between failures of memory that are due to normal processes, such as infantile and childhood amnesia, and those that are due to pathological processes, such as repression or dissociation. In addition, we need further studies of health outcomes in traumatized individuals, especially comparing those who do and do not remember their traumas.

Despite this controversy and the interpretive difficulties that arise when studying functional amnesias, further investigation of these phenomena promises to provide new and useful insights into the nature of remembering and forgetting. Study of functional amnesias may be particularly informative with respect to the distinction between implicit and explicit forms of memory. Despite the striking failure of explicit remembering that defines the various functional amnesias that we considered, at least some evidence for implicit memory was observed with each type. Moreover, since reversible functional amnesias necessarily involve failures of explicit access to available memory representations, these amnesias should provide extremely fertile grounds for investigating implicit memory. More generally, functional amnesias may belong to an emerging class of dissociations, observed in both intact and brain-damaged populations, in which various types of knowledge that are not consciously accessible can be expressed implicitly. Viewed within this context, further study of functional amnesias could provide important in-

sights into the nature of both memory and consciousness.

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