

Memory observed and memory unobserved

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In his book *Memory Observed* (1982), Neisser claimed that almost all interesting questions about memory have been ignored by experimental psychologists. The conference that is documented by this book was meant to help remedy this situation by launching an ecological approach to memory research. Contributors were invited to attend the conference because their research was considered ecologically valid. When I received my invitation, I viewed this with some misgivings, because I identify with the "establishment" memory researchers who apparently have done uninteresting work. Also, my research addresses different issues and, perhaps, is less clearly ecologically valid than is the research other contributors are reporting here. However, I gained some comfort by noting at least a superficial similarity between the ecological approach to memory research and the approach advocated by functionalists such as Dewey (1910). The approaches agree in their claim that the functions of memory must be viewed as allowing adaptation of an organism to its environment and in their preference for talking in terms of processes or mental operations rather than in terms of mental structures. Most of the research of the early functionalists would seem to meet Neisser's criteria for ecological validity, although they conducted their research in the laboratory as well as in natural contexts. The advantage that I gain by noting these similarities is that the functionalists provide an excellent example of the coordination of laboratory research and ecological concerns. Not only did they avoid the excesses later shown by the behaviorists, but their approach was so loosely organized that I have no problem fitting in.

I begin by briefly contrasting questions about memory that have motivated my research with those highlighted by Neisser. Next, I provide an example to illustrate differences between the "structuralist" view of memory that has dominated cognitive psychology for the past several years and the functionalist view that has guided my research. I then give an overview of my recent research to further illustrate the types of questions that I think are important to ask about memory and its functions.

(1988). In U. Neisser & E. Winograd
(Eds.), Remembering reconsidered:
Ecological and traditional
approaches to the study of memory.
Cambridge: Cambridge Univ. Press.

In *Memory Observed*, Neisser emphasized the importance of studying remembering in natural contexts. The majority of the papers that he chose as satisfying his criteria can be described as investigations of autobiographical memory, that is, investigations of factors influencing the ability of people to recall or recognize events from their own past. The topic of autobiographical memory was also the dominant theme of our conference. The function of memory that is highlighted by investigations of this sort is that it allows one to be aware of and communicate with others about one's personal past. Although memory clearly does serve this function, it also serves other functions that are equally important but are not accompanied by awareness of the past.

The most dramatic examples of unaware uses of memory come from experiments revealing functions of memory that are preserved by amnesics. Very dense amnesia is the most striking symptom of the Korsakoff syndrome. My favorite example of memory preserved by a Korsakoff patient comes from a story told by Bruce Whittlesea. Before coming to McMaster University as a graduate student, Bruce encountered a Korsakoff patient while working in a hospital. The patient seemed unable to remember anything from his recent past. Bruce saw this as an ideal opportunity for a man with a limited repertoire of jokes. He reasoned that it should be possible to repeatedly tell the same joke to the patient and get a laugh every time. The first time he told his joke he was reinforced by the patient's laughing. When he told the same joke a day or so later, the patient did claim not to have heard the joke before. However, rather than laughing, the patient told Bruce that the joke was just "dumb," not funny. The patient's memory was apparently sufficient to allow him to anticipate the punch line, spoiling the joke, although he was unable to recall or recognize the joke as one that he had previously been told. A book edited by Squire and Butters (1984) includes several chapters that provide reviews of more formal experiments that reveal functions of memory that are preserved by amnesics.

These unobserved or unaware uses of memory are also evident in the performance of normals. Let me give a commonplace example as an attempt to show the pervasiveness of effects of this sort. Our choice of words during a conversation often seems to be influenced by the particular words used by others involved in the same conversation. At a meeting of a grant-selection committee that I recently attended, one member of the committee described a proposal as being "trite." Later in the same meeting, another member of the committee, discussing a different proposal, described the applicant as proposing to use "trite and true" procedures. This substitution of "trite" for "tried" was clearly unintended by the speaker. He was unaware of the substitution until it was signaled by the laughter of other members of the committee. Similar to the dissocia-

tion shown by amnesics, memory for the prior encounter with the word influenced later performance, with the use of memory being unaccompanied by either awareness of the past or intent. I shall later review research to show that memory for a prior presentation of an item can also influence its later perception and interpretation and that these effects can be independent of a person's ability to recognize the item as having been previously presented.

A popular account of dissociations of this sort is to claim that unaware uses of memory rely on a memory store separate from that used in performance on tests of autobiographical memory. Tulving (1983) has claimed that performance on tests of recognition memory or recall relies on episodic memory, whereas unaware uses of memory rely on semantic memory or some third memory system. Cohen and Squire (1980) also assume that two memory stores or types of representation are involved, but they identify aware uses of memory with declarative memory, and unaware uses with procedural memory. As an alternative, I have emphasized differences in the retrieval requirements of tasks and also stressed the importance of encoding-retrieval interactions. Arguments against the proposal of separate memory stores have been presented at length elsewhere (Jacoby & Brooks, 1984; McKoon, Ratcliff, & Dell, 1986). Rather than repeat all of those arguments here, I use an example from the history of psychology to illustrate two different sets of assumptions about the functions served by memory for particular prior events. Although the example deals with judgments of weight, the alternative sets of assumptions correspond to those that have been used to describe the relationship between aware and unaware uses of memory.

Marbe was a member of the Würzburg school and was interested in judgments of weight. By the structuralist account that was dominant at the time, differences in weight were judged by forming an image of a first weight that was lifted, forming an image of a second weight that was lifted, and then comparing the images to decide which of the two weights was the heavier. Marbe noted that when he judged weights, he had no awareness of comparing images; rather, the judgment of heavier or lighter seemed to be immediate when the second weight was lifted. This observation led to discussions of "imageless thought" and "determining tendencies" (Schultz, 1981, pp. 81-83). An account that is consistent with those notions appeals to differences in the adjustment of the musculature required to lift a weight. Consider a simpler case where the musculature is adjusted to support an object placed in the hand, and the first object is then replaced by a second object without the musculature being readjusted. If the second object is heavier, the hand will go down, whereas if it is lighter, the hand will go up. The "immediate" judgment of weight may rely on an assessment of adjust-

Table 6.1. *Structuralist versus functionalist views of cognition*

<i>Structuralist view</i>	
Perceiving relies on abstract representations and fixed procedures	
Events have transsituational identity	
Judgments are analytic: memory attributes	
<i>Functionalist view</i>	
Memory for prior episodes contributes to perception	
Emphasis on retrieval	
Events lack transsituational identity	
Judgments are nonanalytic: memory attributions	

ment to the local environment, that is, assessment of preparation to support the second object.

The assumptions that differentiate the two descriptions of judging weights are outlined in Table 6.1. An important difference between the two views is in their assumptions about the relationship between perception and memory for particular prior events. By the structuralist account, perceiving utilizes fixed procedures and abstract representations of prior experience that do not reflect memory for particular prior events. The fixed procedure that is used to assign a weight to an object is little influenced by context and does not reflect memory for any particular object that was previously lifted. Any influence of experience on perception is by means of abstract representations that record prior experience in a summarized form. These abstract representations may specify the general relationship between size, apparent density, and weight and may even represent the "typical" weight of objects of a given class. However, memory for particular events is stored separately from the fixed procedures and abstract representations used by perception and can be accessed only after an object has been perceived. The result of the use of fixed procedures and stable abstract representations is that the weight of an object has transsituational identity. Judgments of weight are analytic, because the transsituational identity of weight allows it to be treated as an attribute that is separable from other attributes of an object.

The alternative view is more functionalist in orientation and emphasizes rapid adaptation to local circumstances. By the functionalist view, memory for a particular prior event can influence later perception. Rather than perception and the use of memory for particular prior events being separate acts, memory for particular events contributes to later perception. When judging weights, the specific memory of the first weight is retrieved and used as a context for interpretation or as a basis

for dealing with the second weight. I say "retrieved" because there is no reason to think of these effects as being short-term. As an example of a relatively long-term influence of a particular prior experience on the later judgment of weight, consider a person in a bar who drinks half a bottle of beer prior to being called away. If, during his absence, a full or an empty bottle is substituted for the half-finished one, the result when he returns and lifts the bottle will be an immediate double take. The person is prepared to pick up the beer that he left in that context, not some "generic" bottle of beer. Preliminary processing of an event and the context in which it occurs serve as cues for retrieval of memory for relevant prior events, and those memories are then used to aid perception and interpretation of the later event. By this view, events lack transsituational identity because there is no fixed set of procedures used for their perception or interpretation. Also, judgments are nonanalytic in that a definitionally relevant attribute has not been abstracted and so cannot be used as a basis for an analytic decision. Continuing the example of judging weights, a change in the situation produces a global effect in performance, and that effect is then attributed to some source. The falling of the hand when the second weight is placed in it might commonly be attributed to the second weight being heavier than the first weight, but other factors such as fatigue can also contribute to the change in hand position. The basis used for the judgment of weight is not sufficient to separate the effects of a change in weight from those of other factors producing the same effect in performance.

The structuralist account clearly does adequately describe the way that some judgments are made. At the extreme, scales can be used to judge weights—a fixed procedure for assessing weight that will produce a value that has transsituational identity and that can serve as an analytic basis for a decision. However, it seems likely that the functionalist account better describes the way that judgments are commonly made. What is at issue here, of course, is not just the judgment of weights but the more general relationship between perception and memory for prior episodes. My claim is that memory for episodes not only is accessed after an event is perceived but also contributes to the earliest phases of perception and interpretation of an event.

The structuralist view has dominated cognitive theorizing. Perception is said to rely on abstract representations such as schemata and logogens (Friedman, 1979; Morton, 1979) that serve to represent extensive prior experience in a summarized form and that do not preserve the details of any particular event. Also, it is common to claim that performance on a test of recognition memory results from a person encoding an item and then searching through memory for a match (e.g., Glass & Holyoak, 1986), implying that the use of memory for particular prior experiences

is a separate act that follows that of perception. By this dominant view, a particular event can have a substantial influence on perception only by means of "priming" some abstract representation. Morton (1979), for example, proposed that a prior presentation of a word can serve to temporarily prime its corresponding logogen, resulting in a temporary reduction in the amount of information that must be collected before the subject can decide that the particular word has occurred. A great deal of additional experience is typically required to produce more permanent effects in perception. Effects of that sort require an amount and type of additional experience that is sufficient to have a substantial impact on the abstract representation that summarizes earlier experience. A single presentation of a word, for example, would not be expected to have a long-lasting influence on its later perception.

The functionalist view shares assumptions with the "exemplar" or "instances" account of concept learning advanced by Brooks (1978, 1986), Medin (Medin & Schaffer, 1978; Medin & Smith, 1984), and Hintzman (1986) and is, in some ways, similar to the "remembering operations" approach proposed by Kolers (Kolers & Roediger, 1984). The functionalist view is also similar to notions proposed by Kahneman and Miller (1986) in their argument that an event recruits or retrieves its own norms. By these accounts, variability in performance across situations reflects the differential contribution of memories for particular instances of a concept or type of event and is greater than could be produced by the use of fixed procedures. Kahneman and Miller, for example, use variability in judgments across situations to argue that an event is compared to a very local norm or set of alternatives, rather than invariably being compared to some global norm. Also, the role given memory by the functionalist view is similar to that described by Dewey (1910) and to the "stage-setting" metaphor used by Bransford, McCarrell, Franks, and Nitsch (1977). Memory for the past serves the function of setting the stage for perception and the interpretation of later events.

This stage-setting function of memory for a prior event is not necessarily accompanied by awareness of the past. What is the basis for awareness of the past? The "priming" account of effects of prior experience does not consider the question of awareness. By other accounts (e.g., Tulving, 1983), awareness of the past, as measured by performance on a test of recall or recognition memory, depends on events being represented in and retrieved from a particular memory store such as episodic memory. However, that solution does not seem satisfactory. If the functionalist view is correct, memory for a particular prior event, episodic memory, can be accessed and influence later perception without being accompanied by awareness of the past. Also, as noted by James (1892), awareness of the past necessarily requires an inference about the relationship be-

tween the past and the present. "Pastness" involves the present as much as the past and so cannot simply be retrieved as an attribute from some memory store. The feeling of nostalgia serves as an example. Nostalgia cannot be retrieved from memory, because one was not feeling nostalgic when one had the original experience. Rather, nostalgia must rely on an inference about the relationship between the past and the present.

When awareness of the past is treated as relying on an inference, the existence of unaware functions of memory is less surprising. Judgments of "pastness" may be similar to the nonanalytic judgments of weight described earlier. A global change in performance may be detected and then attributed to prior experience. Details of the test situation would be important for eliciting an attribution and for determining the particular attribution that is made (Harvey & Weary, 1984). Similar to the dissociation of effects of prior experience in perception and performance on a test of recall or recognition memory, change can be detected but not correctly attributed. A commonplace example is the detection of a change in appearance when an acquaintance shaves off his beard, followed by a failure to identify the particular aspect that has been changed. The change in appearance is commonly misattributed to some characteristic other than the beard having been changed. The functionalist view allows the effects of prior experience to be misattributed to some other source.

Treating awareness of the past in this way also allows one to predict a variable relationship between performances on different types of tests by considering differences in verification processes. A prior encounter with a fact, for example, might make that fact come to mind more readily regardless of whether the test is one of general knowledge or one of memory. This influence on availability may be used as a basis for responding for either type of test (Kahneman & Tversky, 1973), producing similar effects in performance. The effects of prior experience on performances on the two types of tests could be very different, however, if the persons being tested engage in substantial additional processing to verify their answers prior to responding. The processing done to verify that a fact is true can differ substantially from that done to verify that one remembers a particular prior encounter with a fact. Differences in the nature and extent of verification processes, then, are factors that determine the relationship between effects of prior experience on performances of difference types of tests.

Empirical issues

In the following sections, I use the contrast between the structuralist and the functionalist views of memory to examine empirical issues and to

show the value of the functionalist view. In a first section, research is reviewed to show that, in line with the functionalist approach, memory for a particular prior event can influence later problem solving and perception. Also, it is shown that these effects in cognitive and perceptual tasks can be independent of recognition-memory performance. Similar to amnesics, normals can use memory for a particular prior experience to aid perception and interpretation of later events without any accompanying awareness of the past. In a second major section, I consider the bases for awareness of the past. It is argued that an attribution process, similar to that described in the context of judgments of weights, can serve as a basis for memory judgments.

Persistent effects of memory for a prior experience

The first issue examined is that of analyzing repetition effects in investigations of recall or recognition memory. By the structuralist view, encoding of an item remains stable across its repetitions, allowing some abstract form of the item to be represented in memory. Repetition serves to lower the threshold of this abstract representation or to "strengthen" the association between the abstract representation of the item and those of other items or the context. By the functionalist view, in contrast, memory for a prior encounter with an item influences its later processing. The encoding of an item is not expected to remain stable across its repetitions, but rather is expected to change in ways that reflect memory for its prior presentations.

Solving versus remembering: Analyzing repetition effects. Suppose you are asked to find the sum of $37 + 15$. Immediately after giving an answer, you are again asked to find the sum of the same two numbers. Although the same answer is given when the question is repeated, the processing required to arrive at that answer will differ radically across the two encounters. On the first encounter, you undoubtedly went through the process of addition to obtain the sum; on the second encounter, the sum is readily available and can be given without going back through the operations of adding the numbers. The use of memory for a prior encounter with a problem when the problem is repeated is not necessarily intentional and can be very difficult to avoid. The difficulty of avoiding memory is probably the rationale for the commonly prescribed procedure of checking an addition by adding the numbers in reverse order rather than simply adding them again in the same order. If added in the same order, the influence of memory for the prior encounter is sufficient to make it likely that errors will be repeated. Also, these effects of memory can be long-term, dependent on accessibility of the memory for the prior encounter when

the problem is repeated. Concerns such as these point toward the functionalist view of interpreting repetition effects. Rather than some fixed set of procedures being invariably applied to solve a problem and strengthened by their use, memory for a prior encounter with a problem influences its later processing.

This example of addition served as the basis for a series of experiments designed to analyze the effect of repetition on memory (Cuddy & Jacoby, 1982; Jacoby, 1978). Rather than addition problems, however, subjects in those experiments solved problems similar to those encountered in a crossword puzzle. A cue word was presented along with a few letters and a series of blanks representing the missing letters of a word that was related to the cue word (e.g., lawyer, c _ _ _ t). The subject's task was to report the word that could be produced by filling the blanks ("court" in this example). In some instances, the cue, along with the solution word, was presented to be read prior to the presentation of the puzzle. The influence of reading the solution on the later solving of the puzzle was assessed by giving an unexpected test of cued recall in the final phase of each experiment. For the final test, the cue word from each of the puzzles (e.g., lawyer) was given as a cue for recall of the solution words. Akin to the example of repeating an additional problem, preceding a problem with the presentation of its solution was meant to reduce the amount of processing required to obtain the solution. This reduction in processing was expected to produce a decrease in the probability of the solution word being recalled on the final test. A similar claim that the means by which a solution is obtained will influence subsequent retention performance was used by Bruner (1966) to recommend "discovery" learning as compared with "reception" learning. The suggestion is that working through a problem to its solution enhances memory, as compared with a situation where the solution is made easily accessible by means of its prior presentation.

Data from an experiment reported by Cuddy and Jacoby (1982) show that preceding a problem by presentation of its solution does influence the way that the problem is solved. In that experiment, the sequence of events was manipulated by presenting the cue, accompanied by the solution word, to be read either prior to presentation of the problem to be solved (Read-Construct) or after subjects had already constructed a solution for the problem (Construct-Read). Factorially combined with this manipulation, presentations of the problem and its solution either immediately followed one another (zero-spacing) or were separated by 20 intervening events that were a mix of other problems presented to be solved and other cue-solution pairs presented to be read. Memory for the encounter with the solution can trivialize solving of the problem only when that encounter precedes the problem (Read-Construct), not when

Bruner (1966), the notion is that generating a solution to a problem produces *better* memory than does reading a solution. Results that are described later, however, show that the advantage in retention performance produced by generating an item can be reversed when a different type of retention test is used. Generating an item does not produce better memory than does reading an item, but rather produces a difference in what is remembered. For retrieval, the similarity of the retrieval cues and the encoded trace is important, making it necessary to consider encoding and retrieval jointly rather than in isolation (Tulving & Thomson, 1973). In a similar vein, Kolers (1979) emphasized the importance of processing by speaking of remembering operations rather than of memory traces. He stressed the uniqueness of the way an item is treated in a processing episode and argued that good transfer depends on the similarity of the specific operations required at test and those that were applied earlier. These micro encoding–retrieval interactions make transfer performance, cued-recall performance in the foregoing experiment, extremely useful for analyzing changes in processing that are produced by repetition of an item.

The finding that memory for a particular prior event can influence the processing of a later event is important for theories of learning and those of problem solving. For learning, retention performance is typically plotted against the number of repetitions of an item. However, an objective repetition of an item may not result in a full repetition of the processing of that item. In line with the functionalist view, memory for a particular prior presentation of an item can result in a qualitative change in its later processing. These qualitative changes in processing limit the opportunity for any “strengthening” effect of repetition. Any strengthening effect should be expected to be limited to processing that is repeated across presentations of an item (Jacoby, Hartz, & Evans, 1978). The commonly observed effects of spacing repetitions in list-learning experiments (Melton, 1967) may, in part, reflect the influence of memory for a prior presentation of an item on its later processing.

For theories of problem solving, much effort has been directed toward specifying fixed procedures or algorithms that people invariably apply to solve a class of problems. Even if fixed procedures of this sort do exist, they may be used only for the first encounter with a problem in a particular context. Returning to the example of addition, the procedures for adding a set of numbers is not likely to be applied when memory for a prior encounter with the problem, including its solution, is readily accessible. A recent experiment by Brooks and Allen (Brooks, 1986) provides support for this argument. In their experiment, people were given a rule to be used to categorize stimuli. Despite knowledge of this adequate explicit rule, experience with prior instances facilitated later categoriza-

Table 6.2. Mean probability of correct cued recall

Condition	Spacing	
	0	20
Read–Construct (R–C)	.30	.54
Construct–Read (C–R)	.61	.69

it follows the problem (Construct–Read). Even in the Read–Construct condition, an influence on problem solving would require that memory for the previously read solution be accessible when the problem requiring the solution is presented. The manipulation of spacing was meant to influence this accessibility. Differences in later cued recall were expected to reflect the influence of the sequence of events on their processing.

The probability of final cued recall of the solution words, for each of the combinations of conditions, is shown in Table 6.2. The disadvantage in cued recall of the Read–Construct condition as compared with the Construct–Read condition provides evidence that memory for a previously read solution does influence later problem solving. This disadvantage was largest when memory for the previously read solution was made readily accessible by presenting the solution to be read immediately prior to the problem requiring the solution (zero-spacing). The effect of spacing in the Read–Construct condition was more pronounced than that in the Construct–Read condition and can be interpreted as being due to memory for the solution becoming less accessible as spacing was increased. This decrease in accessibility had the effect of increasing the amount of processing required to construct a solution to a problem, and, thereby, enhanced later cued recall. However, even at the greater spacing, later cued-recall performance in the Read–Construct condition was still poorer than that in the Construct–Read condition. Memory for the prior reading of a solution still influenced later problem solving even when the two events were widely spaced. Varying the spacing of repetitions corresponds to a manipulation of retention interval and is only one of several means of varying the accessibility of memory for a prior presentation. Other experiments in the same series showed that factors such as similarity of repetitions, the type of intervening material, and cue effectiveness also influenced the processing of repetitions through their effects on accessibility.

The reduction in final cued recall that came from reading a solution to a problem prior to its presentation could be described as being a “generation” effect (Slamecka & Graf, 1978). Similar to arguments made by

tion of old and new similar instances. Subjects used memory for previously encountered instances as analogies for categorizing later-presented instances, rather than totally relying on the rule.

The use of memory for a particular prior experience to solve a later problem is not necessarily accompanied by awareness of the relevant prior experience. The prior presentation of solution words often seems to make it easier to "see" the solution when the corresponding word fragment is presented. That is, the effect sometimes seems perceptual in nature. Experiments that are described later (Jacoby & Dallas, 1981; Jacoby & Witherspoon, 1982) show that effects in perception can be independent of recognition-memory performance. Also, Tulving, Schachter, and Stark (1982) used a fragment-completion task and found effects of prior experience that were independent of recognition-memory performance. Although effects in fragment-completion performance are often similar to those in perceptual identification, we have preferred the perceptual identification task because it seems to better isolate effects in perception from those in problem solving. The rationale underlying experiments using the perceptual identification task, however, is the same as described for the "solving-versus-remembering" experiments. Measures of transfer are used to assess the effects of manipulations meant to influence the prior processing of an item, as well as to show that memory for a particular prior encounter with an item can influence its later processing.

Retrieving the past in perception of the present. In collaboration with colleagues, I have carried out a large number of experiments to examine the influence of a prior presentation of a word on its later perceptual identification and to assess the relationship between that effect and performance on a test of recognition memory. A few studies are described here to show that, in line with the functionalist view, memory for a particular prior presentation of a word does influence its later perception and that those effects in perception can be independent of recognition-memory performance (see Jacoby & Brooks, 1984, and Jacoby & Witherspoon, 1982, for more extensive reviews). Others (e.g., Kollers, 1976; Roediger & Blaxton, 1986) have used different tasks but have observed dissociations in performance that are similar to those that are described here.

Typically, subjects in our experiments were presented with words under various study conditions and were then given two types of tests. One test was a standard yes/no recognition-memory test in which words previously presented in the study phase of the experiment, old words, were intermixed with new words, and the task was to pick out the previously studied words. The second type of test was a perceptual identification test. For that test, old and new words were intermixed, and each word

was flashed for a very brief duration, such as 35 msec, followed by the presentation of a visual mask. The task was to identify words by reading them aloud; the probability of identification served as the dependent variable. An advantage in perceptual identification for old words over new words provides evidence of an influence of memory for a prior presentation of a word on its later perception. However, note that for an effect of this sort it is not logically necessary that old words be recognized as having been previously presented. For the perceptual identification task, subjects are asked only to report the word that has been presented without reference to whether it is an old word or a new one.

Memory for a prior presentation of a word can have a large and long-lasting influence on its later perception. A single prior presentation of a low-frequency word is sometimes sufficient to double its later probability of identification and greatly diminishes the influence of frequency of words in the natural language on their perceptual identification. Jacoby and Dallas (1981, Exp. 3) found that the probability of identifying a new low-frequency word was .37, whereas that of identifying an old low-frequency word was .73. The probability of identifying old low-frequency words was comparable to that of identifying new high-frequency words (.68) and not a great deal smaller than the probability of identifying old high-frequency words (.84). This effect of a prior presentation of a word lasts for at least 5 days (Jacoby, 1983a). Effects also remain when a word is read as one of an extremely long list of words. P. M. Merikle (personal communication) presented a list of 500 words to be read and found as large an effect in later identification as observed when only 100 words had been read. The motivation for Merikle's experiment was that studies of perception often use a fixed vocabulary of words and repeat those words under different viewing conditions across sessions. The common assumption has been that these repetitions do not influence performance, because perception relies on fixed procedures that do not reflect long-term memory for any particular prior encounter with a word. Merikle had hoped to show that this assumption was justified when the vocabulary of words was large. His finding of effects with a list of 500 words provides no comfort for those ignoring repetition effects.

These effects in perception are relatively specific to the details of the prior presentation of a word. The effect of prior presentation is largely modality-specific. Although reading a word greatly enhances its later identification, hearing the word (Jacoby & Dallas, 1981; Morton, 1979) or producing the word as a name for a picture (Winnick & Daniels, 1970) has little influence on visual perceptual identification. Effects are partially specific to the visual details of a presented word. Reading a word in lowercase letters rather than uppercase letters does more to enhance performance when the word is later presented in lowercase letters for

the test of perceptual identification. However, words read in uppercase letters are still more likely to be identified than are new words (Jacoby & Hayman, 1987). The effects are also partly specific to the list context, in that the advantage in identification of old words over new words is larger when the majority of the tested words are old (Jacoby, 1983a).

Consistent with the functionalist view, it seems safe to conclude that effects in perception can reflect the retrieval of memory for a particular prior encounter with an item. The effect of a prior presentation of a word on its later identification cannot be easily accounted for by claiming that the prior presentation served to "prime" some abstract representation of the word. The effects are too long-lasting and too specific to the details of the prior presentation of the word to be described as being due to priming (Jacoby & Brooks, 1984). Also, perceptual identification of nonwords can be enhanced by their prior presentation (Feustel, Shiffrin, & Salasoo, 1983; Jacoby & Witherspoon, 1982). Effects for these nonwords clearly cannot be explained as due to priming, because no abstract representation of the nonword existed in memory to be primed prior to its presentation in the experiment.

Perceiving and remembering: Encoding-retrieval interactions. Although long-lasting and relatively specific to the details of the prior presentation of a word, these effects in perception can be independent of recognition-memory performance. The levels-of-processing manipulation that has large effects in recognition-memory performance (Craik & Lockhart, 1972) does not influence perceptual identification. Superficial processing of a word required to answer a question about its constituent letters does as much to enhance later identification of the word as does the "deeper" processing that is required to answer a question about the meaning of the word (Jacoby & Dallas, 1981). Also, words that are not recognized as being old can gain as much in identification performance from their prior presentation as do words that are recognized as being old. However, this relationship between identification and recognition-memory performance is a modifiable one. Greater dependence between effects in identification and recognition-memory performance is found when the stimulus materials are nonwords rather than words (Johnston, Dark, & Jacoby, 1985; Witherspoon, 1984).

I have argued that the modifiable relationship between effects in perception and recognition-memory performance is better accounted for in terms of encoding-retrieval interactions rather than by proposing separate memory stores. The argument is that effects in perception can reflect memory for a different type of prior processing than does recognition-memory performance; so independence in performance on the two types of tests will sometimes be observed. However, under other

Table 6.3. *Probability of a correct response*

	No context	Context	Generate	New
Recognition	.56	.72	.78	—
Perceptual identification	.82	.75	.67	.60

conditions, performance on the two types of tests can rely on the same form of prior processing, and so dependence in performance will be observed. An encoding-retrieval interaction involving performance on the different types of tests was observed by Jacoby (1983b). Variations in the amounts of data-driven versus conceptually driven processing of a word during its prior presentation had effects in later identification that were opposite to those observed for recognition memory.

In that experiment, a word was presented to be read either with no context (xxxx, cold) or in the context of its antonym (hot, cold) or was not presented to be read but was generated from its antonym as a cue (hot, ???). As shown in Table 6.3, later perceptual identification of the target word (cold), presented individually, was highest when the word had previously been read without context, next highest when the word had been read in context, and poorest when the word had previously been generated but not read. An opposite ordering of conditions was found when a recognition memory rather than a perceptual identification test was given. Presumably, conceptually driven processing of target words was dominant when they were generated in the first phase of the experiment, whereas data-driven processing was dominant when words were read in isolation. As commonly claimed (e.g., McClelland & Rumelhart, 1981), a mix of data-driven and conceptually driven processing was used to read a word in context. In agreement with prior research, recognition memory improves from increases in "deeper," conceptually driven processing, the processing of meaning (Craik & Lockhart, 1972). Effects in perceptual identification are reliant on prior processing, as are those in recognition memory. For perception of words presented in isolation, however, it is the extent of data-driven processing rather than that of conceptually driven processing that is the important determinant of later performance.

This encoding-retrieval interaction encourages the comparison of effects in perceptual identification with those in recognition memory as a means of analyzing reading in terms of differences in data-driven versus conceptually driven processing. The interaction also shows that the "gen-

eration" effect commonly observed in studies of recall or recognition memory (Slamecka & Graf, 1978) is reversed when a test of perceptual identification is used to measure retention. Reading a word has a larger effect in later identification than does generating the word; so generating does not produce better memory than does reading. Rather, it is the compatibility of the type of prior processing and that required by the retention test that is the important determinant of performance.

Roediger and Blaxton (1986) note that most experiments showing a dissociation between performances on different types of memory tests have used only two tests. They argue that the disadvantage of a design of this sort is that it does not allow one to compare effects in the performance of tests that supposedly rely on the same memory system. They also point out that there has been a confounding in most prior experiments such that the task chosen to tap episodic memory (recall or recognition memory) is likely to reflect prior conceptually driven processing, whereas that chosen to tap semantic memory (perceptual identification or fragment completion) is likely to reflect prior data-driven processing. Given this confounding, one cannot distinguish the memory-systems approach to explaining dissociations from an explanation in terms of encoding–retrieval interactions.

To remove the confounding, Blaxton (1985) varied the episodic-versus-semantic nature of tasks orthogonally with the type of processing the tasks required. Free recall was considered a conceptually driven episodic-memory test. The data-driven episodic test was cued recall with words that were graphemically similar to the target words being given as cues (e.g., CHOPPER for COPPER). Subjects were instructed to ignore the meanings of the cues and to recall words from the study list that looked like the cues. The data-driven semantic task was fragment completion. Subjects were simply told to give the first word that they could think of that would complete the fragment. The conceptually driven semantic test was a test of general knowledge. For both the fragment-completion test and the general-knowledge test, the correct answer for half the questions was a previously studied word, and for half it was not. Subjects in Blaxton's (1985) Experiment 1 studied a list of words under conditions analogous to those used to vary conceptually driven and data-driven processing in my experiments (Jacoby, 1983b). Words were read out of context, were read in the context of a semantic associate, or were generated given the semantic associate as a cue. In the second phase of the experiment, subjects were given one of the four different tests described earlier.

If the memory-systems approach to explaining dissociations is accurate, the patterns of results in the two episodic tasks (free recall and cued recall with graphemic cues) should be similar, and different from that in the two

semantic tasks (fragment completion and general knowledge). In contrast, if it is the type of processing that is required by a task that is important, encoding–retrieval interactions, the patterns of effects in the two data-driven tasks (fragment completion and cued recall with graphemic cues) should be similar, and different from that in the two conceptually driven tasks (free recall and general knowledge). The data support the account in terms of encoding–retrieval interactions. Generated items produced better performance than those read without context in both the free-recall and general-knowledge tests. The pattern of results was reversed for tasks that rely on prior data-driven processing—the fragment completion and cued recall with graphemic cues. For those tasks, reading a word out of context produced better performance than did generating the word. Performance on words that had been read in context was generally intermediate between the levels of performance produced by the other two study conditions.

These results can be used to argue that dissociation in the performance of different types of memory tests is due to encoding–retrieval interactions rather than the involvement of separate memory systems. It was the type of prior processing most relevant to a task, not the episodic-versus-semantic nature of the task, that determined the pattern of results. If the account of dissociations in terms of separate memory systems is to be maintained, it must be explained why tasks that supposedly tap the same memory system can produce such radically different patterns of results. By concentrating on the type of information used by a task, in contrast, highly modifiable relations among tasks are predicted. The variable relationship between performance on episodic and semantic tasks produced by using words versus nonwords as stimuli can also be understood in terms of encoding–retrieval interactions. Perceptual identification of words can reflect prior data-driven processing, whereas recognition memory of words can reflect prior conceptually driven processing; so independence in performance on the two types of test can be observed. Recognition memory of nonwords, however, cannot rely on prior conceptually driven processing, because nonwords have no meaning. The finding of dependence between perceptual identification and recognition-memory performance when nonwords are used as stimuli (Johnston et al., 1985; Witherspoon, 1984), then, is likely due to performance on both types of tests relying on memory for prior data-driven processing. That is, there is not a one-to-one mapping between the type of retention test and the type of prior processing that is most compatible with the test. Depending on the materials and other details of the situation, recognition-memory performance can rely on either prior conceptually driven processing or prior data-driven processing. Performance on a perceptual identification test also probably can rely on either of the

two types of prior processing. The testing of an item out of context results in prior data-driven processing being most relevant. However, if the context in which an item had been studied was re-presented at the time of test, prior conceptually driven processing would be expected to be important for perceptual identification performance.

Memory attributes versus memory attributions

Encoding—retrieval interactions are sometimes responsible for the dissociation in performances on different types of tests. However, to fully understand the relationship between aware and unaware uses of memory, it is necessary to more closely examine the basis for awareness of remembering. My argument that recognition-memory performance can rely on either memory for prior data-driven processing or that for prior conceptually driven processing is similar to an argument made by Mandler (1980). He suggests that the familiarity of the appearance of an item can serve as a basis for a fast-acting judgment process, whereas the use of interitem associations or meaning is a slower process that requires “memory search” for judgments of recognition memory (cf. Atkinson & Juola, 1974). I have tried to better specify the feeling of familiarity by relating it to effects in performance and by treating the feeling of familiarity as involving an attribution process. The feeling of familiarity is seen as arising from a nonanalytic judgment process that is typically fast but does not isolate attributes that are definitionally relevant to the task. Analytic judgments are often slower and involve more deliberate reflective processes and serve as a more sure basis for judgments by isolating attributes that are definitionally relevant. As discussed later, the distinction between nonanalytic and analytic judgments is widely applicable, rather than being restricted to judgments of recognition memory.

Judgments of familiarity may be similar to the nonanalytic judgments of weight described earlier in that some global difference in performance is noted and then attributed to a source. Awareness of remembering, then, would involve an attribution process that is similar to the process involved in using the availability heuristic to estimate probabilities (Kahneman & Tversky, 1973). When using the availability heuristic, a person infers that a class of events is a probable one if an instance of that class is highly available (i.e., it can be readily brought to mind). For awareness of remembering, fluency in performing a task, like availability, can serve as a basis for application of a heuristic. That is, subjective familiarity or awareness of remembering a particular event resembles probability in being a dimension that can be judged by application of a heuristic. If an item is fluently perceived or interpreted, it will be judged as having been previously presented. Subjects taking a recognition-

memory test, for example, often claim that the old items “jump out” at them and that they are basing their recognition-memory judgments on this difference in perception. The use of this fluency heuristic often will produce accurate recognition-memory performance, because a prior presentation of an item does enhance its later perception. Akin to the nonanalytic judgments of weight, however, this basis for recognition-memory judgments is error-prone because of the existence of other factors that have the same effects in global performance as does a prior presentation of an item. Although judgments commonly rely on non-analytic, attribution processes, more sure analytic bases for judgments are sometimes available to a subject and will be used when the situation demands a high level of accuracy.

Several advantages can be gained by treating familiarity as an attribution rather than as an inherent characteristic of some memory system, such as episodic memory (Tulving, 1983), that is supposed to be responsible for recognition-memory performance. As argued in conjunction with the example of nostalgia, awareness of remembering involves the present as much as the past; so it cannot simply rely on the retrieval of some memory attribute. Also, feelings of familiarity do not invariably arise when we encounter previously experienced people, events, or objects. We do not experience a feeling of familiarity when we encounter a colleague at work, but would experience such a feeling and would be aware of recognizing the colleague if we encountered him in an unexpected location. The feeling of familiarity seems to rely on a discrepancy reaction of some sort or on a direct question about recognition that calls for an attribution to be made. Indeed, it would be incredibly disruptive if a subjective feeling of familiarity intruded every time we encountered a previously experienced person, location, object, or event.

Treating familiarity as an attribution also has the advantage of allowing for variability in the relation between effects in performance and a subject's attributions. In the example of nonanalytic judgments of weight, it was argued that effects in performance are sometimes misattributed to a change in weight, although some other factor is the true source of the effects. Effects in performance due to factors other than recent prior experience will also sometimes give rise to feelings of subjective familiarity. The higher probability of a false recognition of a high-frequency word than of a low-frequency word can be seen as due to subjects mistakenly attributing the performance effects of frequency in the language to prior study. By a structuralist view, errors of this sort have been taken as evidence that people base their memory reports on general knowledge or schemata, even when they are asked to report on their memory for a particular prior episode. By an attribution view, however, not only can the general be mistaken for the specific, but also

the specific can be mistaken for the general. That is, memory for a particular prior experience can influence perceptual performance or the interpretation of an event, and these effects can be mistakenly attributed to the operation of more general knowledge. When nonanalytic bases for judgments are used, people may be unable to discriminate the feeling of familiarity that is due to a particular encounter with an item from the feeling of familiarity that is due to more general knowledge. The effects of prior experience can be misattributed to "knowing," to a wild guess, to a feeling of intuition, or even to a difference in the physical stimulus. Experiments described in later sections provide evidence that these sources of effects in performance are sometimes confused.

Sources of fame: Becoming famous overnight. Is Sebastian Weisdorf famous? Most people will immediately respond "no" and support their decision by stating that the name is not a familiar one, claiming never to have encountered the name. If a name is familiar, in contrast, people may be willing to judge that the name is a famous one even if they cannot recall anything that the named person did to become famous. Judgments based on familiarity may be nonanalytic in that people are unable to discriminate between the general familiarity of a name that is due to its being a famous one and the "situational" familiarity that results from previously reading the name in the experimental setting. The familiarity used as a basis for judgments of fame, then, would not be discriminable from that used as a basis for judgments of recognition memory. For each of the two types of tests, however, there is a more sure analytic basis for judgments. The more analytic basis for judgments of fame is to judge a name to be famous only if one can recall what the named person did to become famous. For recognition memory, recall of the details surrounding the study encounter with an item would provide a more analytic basis for judgments than would familiarity. An experiment done in my laboratory examined the effect of a prior presentation of a name on later judgments of its fame.

In the first phase of that experiment, a list of nonfamous names was presented to be read. Subjects were informed that all of the names were nonfamous ones and were told that the intent of the experiment was to examine the effects of factors thought to influence the pronunciation of names. In a second phase of the experiment, these old nonfamous names were mixed with new nonfamous names and new famous names to be presented for judgments of fame. The famous names in this list were selected to be only "moderately" famous. The names were ones that a group of undergraduates judged to be famous, although the majority of the people in the group were unable to recall what the named person did to become famous. Examples of the famous and the nonfamous

Table 6.4. *Examples of names used*

Famous	Nonfamous
Arthur Rubenstein	Joseph Pacenti
Anne Hathaway	Sandra Brophy
Thomas Hobbes	Larry Jacoby
Marsha Mason	Adrian Marr
Helmut Schmidt	Sebastian Weisdorf

Table 6.5. *Probability of being judged famous*

	Type of name		
	Famous	Old	New
Immediate	.64	.12	.21
Delayed	.55	.16	.08

names used in the experiment are presented in Table 6.4. Note that for judgments of fame, if subjects recognized a name as one read in the first phase of the experiment, they could be sure that the name was nonfamous, because they were informed that all of those names were nonfamous ones. Recognition memory, then, could be used to "discount" any familiarity of a name gained by its having previously been read in the experimental context. As an attempt to manipulate the probability of recognition memory, the test requiring judgments of fame either immediately followed the reading of the list of nonfamous names or was delayed for 24 hours.

The probability of judging a name as being famous is displayed in Table 6.5 for each combination of conditions. On the immediate test, old nonfamous names were less likely to be judged famous than were new nonfamous names. On the delayed test, however, the pattern of results was reversed. Some of the old nonfamous names had become famous overnight, whereas the new nonfamous names were less likely to be judged famous on the delayed test than on the immediate test. Effects in reaction times mirrored those in the probability of a judgment of fame. Judgments that a name was nonfamous were more rapid on the immediate test for old nonfamous names, but slower on the delayed test for old nonfamous than for new nonfamous names.

The increase across retention interval in the probability of judging an old nonfamous name to be famous is similar to the sleeper effect observed in studies of social psychology (e.g., Cook, Gruder, Hennigan, & Flay, 1979; Hovland, Lumsdaine, & Sheffield, 1949). In those experiments, it was found that a communication from a low-reliability source had little impact on attitude change measured immediately after the communication, but did result in attitude change when the test was delayed. Hovland et al. (1949) suggested that on an immediate test the content of the communication is discounted because of its low-reliability source being readily retrieved. Across time, the content of the communication continues to be remembered, but its discounting becomes less possible because of forgetting of the source of the communication. Similarly, the increase across time in the probability of judging old nonfamous names to be famous presumably was due to subjects becoming less able to recognize the nonfamous names as having been previously presented and, thereby, being less able to discount the familiarity of those names when judging fame. These effects of familiarity in judgments of fame are similar to effects observed in experiments requiring subjects to answer questions (Glucksberg & McCloskey, 1981; Kollers & Paley, 1976). The results of those experiments show that lack of familiarity with the topic of a question can be a basis for a fast "no" or "don't know" response. For present purposes, the important point is that there is a basis for recognition memory of a name that can be inaccessible even when the name continues to be familiar. People are unable to discriminate the general familiarity of famous names from the situational familiarity produced by previously reading the name in the experimental context. Similar to effects observed in perceptual identification and other tasks, memory for the particular prior presentation of an item influenced judgments of fame, although people were unable to recognize the item as having been previously presented. Indeed, a failure to recognize an item as having been previously presented was a precondition for the effects observed in judgments of fame.

It may be argued that the results of this experiment only show that the content of an experience can be remembered separately from the context in which that experience took place (Tulving, 1983). That is, prior presentation of a nonfamous name may result in a semantic memory for the name that is separate from the episodic memory that preserves information about the particular prior encounter with the name and that is necessary for recognition memory. The issue here is the same as that encountered when considering the effects of a prior presentation of an item on its later perceptual identification. The specificity of effects is important. If it is semantic memory that is involved, effects should not be specific to the details of the prior presentation of a name. For example, changing modality between the prior presentation of a name and its later

presentation for the judgment of fame should have no effect. In contrast, finding an effect of changing modality would show that the "semantic" memory representation of a previously encountered nonfamous name is not totally general, but rather is modality-specific. Also relevant here is the question about the relationship between memory for context and that for the content of an experience. Although memory for the two may sometimes be separable, as claimed by Tulving, it seems likely that the content of an experience often is not separable from the context of that experience. For example, the meaning of a sentence is sometimes not separable from the speaker of the sentence and the context in which it was spoken. The importance of this issue is discussed more extensively by Jacoby and Brooks (1984).

If it is memory for a particular prior experience that is important, increasing the similarity between the conditions of study and those of test may aid retrieval and produce effects that are not accompanied by recognition memory. An example of unintentional plagiarism can serve to illustrate this possibility. Many of us have had the experience of presenting an idea to a colleague only to have the colleague thoroughly reject the idea. In a later conversation, however, the colleague may reintroduce the rejected idea and claim it as being an insight this colleague has recently had. The retrieval of memory for the prior conversation that is required for an unintentional act of plagiarism may rely on relatively specific cues. Nature may be so "perverse" as to make it likely that one will present a stolen idea as being one's own to the very person from whom one stole it. The physical cues offered by one's appearance and the content of a current conversation may be similar to those present during the prior conversation and serve as excellent cues for retrieval. This retrieval of an idea from the prior conversation, however, is not necessarily accompanied by awareness of the past and can be mistaken for a new insight.

Analytic versus nonanalytic judgments: When analysis fails. Familiarity does not specify its source; so nonanalytic judgments are prone to error. For judgments of fame, however, errors can be avoided by using the more sure analytic strategy of judging a name to be famous only if one can recall what the named person did to become famous. In the experiment that was just described, subjects in the delayed-test condition were generally less willing to call a name famous than were subjects in the immediate-test condition. Presumably, subjects receiving the delayed test were aware of their confusion of the general familiarity and the situational familiarity of names, and they partially protected themselves against that confusion by relying more heavily on the analytic basis for judgments of fame. The difference between the probabilities of famous

names and new nonfamous names being judged famous was actually slightly higher in the delayed-test condition than in the immediate-test condition. This increase in discrimination between the two types of names can be taken as evidence of a qualitative shift from reliance on the nonanalytic toward reliance on the more sure analytic basis for judgments. We have observed a similar, but larger, effect in other experiments that have also tampered with the validity of familiarity as a basis for judgments by presenting nonfamous names to be read prior to requiring judgments of fame.

Reducing the validity of familiarity by means of prior presentation of "foils" can result in improved accuracy when an analytic basis is available as an alternative to the nonanalytic basis for judgments. In many domains, however, there may be no analytic basis for judgments that can be relied on when the validity of nonanalytic judgments is made doubtful. In those domains, reducing a person's faith in the accuracy of nonanalytic judgments can have dramatic effects. Consider the "self-consciousness" that one sometimes feels in social situations. If we are made to doubt the effectiveness of our "natural" style of interaction with others, an attempt to be analytic often fails. There seems to be no set of rules for social interactions nor an analytic basis for social judgments that can be universally applied and that will always produce satisfactory results. Removing faith in nonanalytic judgments can result in a general loss of confidence and inaction, rather than increasing the accuracy of judgments.

We have observed effects of this sort in the task of spelling words. In a first phase of those experiments, a list of words that was presented to be read included some words that were misspelled. Subjects were required to spell those words as well as new words in a second phase of the experiments. Reading a misspelled version of a word slowed later correct spelling of the word and also increased the probability of an error in spelling. When asked to judge the spelling of a word, people often claim that they are reliant on the word "looking" right. A prior encounter with a misspelled version of a word may serve to lower confidence in this basis for judgments by making words sometimes look right for the wrong reason. Similar to the findings in judgments of fame, subjects are unable to discriminate between the familiarity produced by a prior presentation of a misspelled word and the familiarity that is due to a word being correctly spelled.

The most dramatic results were produced not by the subjects in the experiments, but rather by my technician, Ann Hollingshead, who collected the data for those experiments. Whereas subjects read the misspelled versions of words only once in an experiment, she had much more extensive experience with the misspellings. She claims that this extensive experience has had the effect of generally reducing her confi-

dence in her spelling and also has produced an increase in her spelling errors. Prior to working in my lab, Ann was an executive secretary and had a great deal of pride in the accuracy of her spelling. Her claim of a general deterioration in her spelling performance seems sufficiently well justified to make us hesitant to do further experiments of that sort. Any effects in her spelling performance, however, probably pale in comparison with those effects in our own spelling performance produced by repeatedly encountering misspelled words when reading students' essays. Ann also collected the data for the "fame" experiments and now sometimes mistakes the nonfamous names used in those experiments for famous ones. The use of an analytic basis for judgments of fame to correct these errors, however, is more convenient than is continually looking up words in the dictionary to check their spelling.

A recent experiment done by Begg, Armour, and Kerr (1985) has shown that a prior presentation of a statement to be read can increase people's later willingness to judge that the statement is true, and this influence on belief can be independent of subjects' ability to recognize the statement as one that was previously read. The material used in those experiments was a list of "trivia," isolated facts whose validity cannot be checked by examining their consistency with other known facts. The impossibility of this analytic basis for judgments makes people totally reliant on the familiarity of a statement to judge its truth. Zajonc (1980) found affective judgments to be influenced by previous presentations of an item, although subjects were unable to recognize the item as having been previously presented. He concluded that there is an affective system, separate from the cognitive system, that is responsible for recognition memory. The stimuli employed by Zajonc were typically meaningless and originally affectively neutral; so subjects had no alternative to using familiarity as a nonanalytic basis for judgments about affect.

Memory for a prior presentation of an item can influence performance on a wide variety of tasks. By the attribution view, the influence of a memory for a prior presentation of an item on its later perception and interpretation can be attributed to any of a number of sources dependent on the details of the test situation, including the question that is asked. People can be misled to claim that a statement is true, a name is famous, a misspelled word is correctly spelled, an old idea is a new insight, and so forth. The effects in fluency of perception and interpretation that serve as a basis for these nonanalytic judgments are the same as those that can be attributed to familiarity and that can serve as a basis for recognition-memory decisions.

These effects of memory for a prior experience can be largely independent of recognition-memory performance, however, because recognition-memory decisions can have a basis that is more analytic than are

judgments of familiarity. Rather than relying on familiarity, people can refuse to claim that they recognize an item as having been encountered in a particular context unless they can retrieve details of that prior encounter. In a similar vein, Lockhart (1984) considered how a present thought or image comes to be accepted as a valid account of past experience. Following Baldwin (1920), he suggests that memories can be validated by checking them against the physical world, comparing them to the memory claims of others, or they can be validated internally by checking them against other memories and known facts. Validation of these sorts, however, is likely to be expensive in terms of time and attention. We may often bypass validation of memory and rely instead on familiarity as a nonanalytic judgment.

Memory for the past in subjective experience of the present. Effects of memory for a particular prior experience can also appear to subjects as being perceptual in nature. That this is true became evident in our experiments investigating the influence of a prior presentation of a word on its later perceptual identification. Several subjects in those experiments told us that some words were obviously more easily identified than were other words because they stayed on the screen longer. As it turns out, the words thought to stay on the screen longer often were words that had been previously read in the experimental setting. Witherspoon and Allan (1985) did experiments that were similar to our earlier experiments, but required judgments of the duration of presentation. They found that words that had been previously read were judged as staying on the screen longer than were new words. Subjects apparently attribute the influence of a prior presentation of a word on its later identification to a difference in the physical stimulus.

A recent experiment done in collaboration with Lorraine Allan and Linda Larwill reveals a similar effect in judgments of the loudness of noise. In that experiment, subjects heard a list of sentences that they were instructed to remember for a later test. These old sentences were then mixed with new sentences and presented against a background of white noise that varied in loudness. The task was to judge the loudness of the noise, using a 5-point scale. The results of that experiment are shown in Table 6.6. Increasing the loudness of white noise produced an increase in judged loudness for both old sentences and new sentences. At all levels, however, the noise accompanying old sentences was judged as being less loud than was that accompanying new sentences. Memory for the prior presentation of a sentence served to enhance its later perception through noise, and this influence on perception had the subjective effect of making the noise seem less loud. Effects of this sort are very compelling when one sits through the experiments. Indeed, my own

Table 6.6. Mean noise judgments

Noise levels	Sentence type	
	Old	New
Soft	1.86	2.16
Medium	2.54	3.01
Loud	3.38	3.78

judgments show the effects even when I try to guard against them. There is no impression that an inference is being drawn. Rather, the noise accompanying old sentences simply does not seem as loud.

These effects of memory for a prior experience in judgments of physical dimensions are similar to effects considered by Bruner (1957) in his discussion of perceptual readiness. Investigations of perceptual readiness, however, were typically designed to examine the influence of general needs or concepts and used differences in accuracy of perception as evidence of differences in perceptual readiness. Effects can be obtained that are much more specific to memory for a particular prior experience than are those effects considered by Bruner. Also, similar to the example of an effect in judgments of weight used to illustrate the functionalist approach, memory for a particular prior experience can influence the perceived duration, loudness, and, perhaps, other dimensions of a physical stimulus.

Summary and conclusions

The functionalist view of cognition has considerable heuristic value. By a structuralist view, cognition relies on fixed procedures that are invariably applied across a wide range of contexts. Those fixed procedures do not preserve memory for any particular prior experience; so the use of memory for specific events necessarily follows perception, concept utilization, and other cognitive activities that rely on general knowledge or fixed procedures. Counter to the structuralist view, however, there is evidence that memory for a prior encounter with an item does influence its later perception. These effects in perception are too specific and too long-lasting to be explained as due to the temporary "priming" of some general, abstract representation. Consistent with the functionalist view, memory for a particular prior experience can be retrieved and then contribute to the earliest phases of perception and interpretation of a later event.

Also, repetition does not, as the structuralist view would have it, only

serve to strengthen or to lower the threshold of some abstract representation. Rather, when an item is repeated, memory for a prior encounter with the item can be retrieved and can influence its later processing. Effects of this sort are important for understanding the influence of repetition on memory performance and are also important for theories of problem solving. Even if there is some general set of procedures or an algorithm that can be used to solve a particular class of problems, those procedures are unlikely to be invariably used to deal with repetitions of a problem, and also may not be used to solve problems that are similar to previously encountered problems. As in the examples involving arithmetic and the completion of word fragments, gaining a solution to a problem may rely on retrieval of memory for a prior encounter with the problem, or similar problems, rather than relying on the application of some general set of procedures. The structuralist view emphasizes the general by proposing abstract representations of knowledge; so it is poorly prepared to account for the rapid adaptation of processing to local circumstances that is commonly observed.

Memory for a prior encounter with an item, then, can be retrieved and can serve to set the stage for later perception or interpretation of the item. This stage-setting function of memory can be independent of recognition memory or recall of the item as having been previously presented. Amnesics reveal evidence of memory for a particular prior experience in their performance of a variety of tasks, although they are unaware of any memory for the prior experience. Normals also show effects of a particular prior experience in their perception and interpretation of later events, and those effects are sometimes independent of recognition-memory or recall performance. Dissociations of this sort can be due to encoding–retrieval interactions. Effects in perceptual identification, for example, can rely on prior data-driven processing, whereas recognition-memory performance can rely on prior conceptually driven processing, producing a dissociation in performance of the two types of tasks. The compatibility of prior processing with that demanded by a test is a more important determinant of the relationship between performances on different types of tasks than is the “episodic” versus “semantic” nature of the tasks. The emphasis on encoding–retrieval interactions also has the advantage of predicting variable relations among tasks.

Awareness of the past seems so commonplace as not to require an explanation until unaware functions of memory are noted. Prior research has been aimed at the importance of metamemory (e.g., Brown, 1975), awareness of how memory operates, and reality monitoring (Johnson & Raye, 1981), the ability to discriminate between memory for real events and that for imagined events. However, the more fundamental question about the basis for awareness of the past has been largely ig-

nored by researchers. Following James (1892) and others, I have claimed that awareness of the past necessarily relies on an inference about the relationship between the past and present and so cannot be viewed as relying on an “attribute” that is retrieved from memory. Similar to the example of judging weights, familiarity is seen as being a nonanalytic judgment that involves a global effect in performance being noted and then attributed to a source. The feeling of familiarity that is produced by memory for a prior presentation of an item has the same nonanalytic basis as do feelings of knowing, intuition, changes in affect, or even apparent changes in the physical stimulus, resulting in confusions among these sources. For some domains, however, there is also a surer, more analytic basis for judgments. Awareness of a particular past event, for example, can sometimes rely on validation by others or can be checked against other memories or the physical world. Manipulations that reduce a person’s confidence in a nonanalytic basis for judgments can either increase the accuracy of judgments or produce a general deterioration in performance dependent on the availability of a more analytic basis for judgments.

Do we need a revolution that results in an ecological approach to memory research? The work on autobiographical memory is fascinating. However, the goal of some of that work seems to be to specify *the* structure of autobiographical memory. Against the chances of success for these attempts, reports on the past are likely to be influenced by situational factors such as the particular person we are talking to, the question that is asked, our estimate of the person’s prior knowledge, whether or not the person has asked the same question previously, and so forth. That is, encoding–retrieval interactions are likely to be so important as to make it impossible to talk about the structure of autobiographical memory independent of the test of retention that is being used. Although I agree that it is important to study memory in natural contexts, the types of questions that are being asked do not seem radically different from those asked by more “traditional” investigators of memory. There is also the problem of specifying the basis for awareness of the past. It may be tempting to “solve” this problem by proposing that there is an autobiographical memory that is separate from other types of memory and that is responsible for awareness of the past. I have already discussed difficulties for an account of this sort. Also, identifying an ecological approach to memory with autobiographical memory ignores that many of the important functions of memory are not accompanied by awareness of the past.

I am not a great fan of revolutions or of separate memory systems. My main complaint against both is that they run the risk of imposing artificial boundaries that obscure the relationships among different “areas.” It is

the similarity of effects in perception, concept learning, social cognition, and memory that I find to be exciting. For each of these areas, there is evidence that performance is less stable across situations than would be predicted by the invariable application of fixed procedures or by total reliance on abstract representations of prior experience. People are impulsive in their ability to rapidly adapt their processing and judgments to local circumstances. Revolutions are designed to sever us from the past by providing "new" directions. My bias is that we should pay more attention to the older research and theorizing about memory, not less attention. Also, given that the use of memory for the past without awareness is commonplace, I hesitate to claim that any approach is revolutionary.

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