Journal of Experimental Psychology:
Learning, Memory, and Cognition
1986, Vol. 12, No. 2, 307-311

Copyright 1986 by the American Psychological Association, Inc.
0278-7393/86/$00.75

What Kind of a Hypothesis Is the Distinction Between Episodic and Semantic Memory?

Endel Tulving
University of Toronto

The hypothesis that episodic and semantic memory represent different memory systems is an attempt at *classification* of phenomena and processes of learning and memory. The hypothetico-deductive method of testing theories, as advocated by McKoon, Ratcliff, and Dell (1986), is not an appropriate procedure for evaluating the validity of such classification. Instead, a broadly based approach aimed at elucidating the brain/behavior and brain/cognition relations in learning and memory is called for.

Some time ago I published an essay in which I presented "a case for the possible heuristic usefulness of a taxonomic distinction between episodic and semantic memory as two parallel and partially overlapping memory systems" (Tulving, 1972, p. 401). Episodic memory, I suggested, deals with unique, concrete, personal, temporally dated events that the rememberer has witnessed, whereas semantic memory involves general, abstract, timeless knowledge that a person shares with others. Similar distinctions had been discussed by philosophers (e.g., Bergson, 1911) and students of memory pathology (e.g., Claparede, 1911/1951; Nielsen, 1958), but at the time of my essay these discussions had not exerted much influence on the thinking of experimental psychologists.

Like other ideas in science that are of more than passing interest, the idea of multiple memory systems, too, was not created in its final form at the outset. Since 1972 it has been revised and modified, and undoubtedly it will undergo further revisions and modifications in the future. In a progress report on the distinction some 10 years after the original essay (Tulving, 1983), I ventured the opinion that sufficient evidence had become available to warrant taking seriously the hypothesis that the two systems are differentiable not only in terms of their behavioral/cognitive functions but also in terms of brain structures or mechanisms subserving these functions. Such a separation between the systems, if true, means that one system is capable of operating independently of the other, that the operations of one system can be globally enhanced or suppressed without comparable changes in the activity of the other, and that the functioning of the two systems "is governed at least partially by different principles" (Tulving, 1983, p. 66). In a further development of the hypothesis, I have (a) elaborated on the concept of "memory system" (Tulving, 1984a); (b) proposed that the episodic system is embedded, as a unique subsystem, in semantic memory (Tulving, 1984b, 1985a); (c) suggested that episodic and semantic memories are characterized by different kinds of consciousness (Tulving, 1985b); and (d) related the episodic/semantic distinction to the broader problem of classification of learning and memory (Tulving, 1985c). As a result, what had been a "potentially useful" heuristic distinction in 1972 has now become a full-fledged hypothesis, or theory, of the basic nature of memory.

Criticism of the Hypothesis

The heuristic usefulness of the distinction seems to have been beyond dispute from the outset. As far as I know, not a single student of memory has raised any questions about it. However, the idea that the two systems are functionally and structurally different—which henceforth in this note will be referred to as "the distinction"—has run into a good deal of opposition and has engendered a certain amount of controversy. In the opinion of opponents and critics, it seems to violate the principle of parsimony. The critics argue that the postulation of the distinction is unwarranted not only because there is no convincing empirical evidence supporting it but also because the phenomena seen as relevant by the proponents of the distinction can be explained within the framework of a unitary memory (e.g., Anderson & Ross, 1980; Baddeley, 1984; Craik & Jacoby, 1979; Hintzman, 1984; Kihlstrom, 1984; Lachman & Naus, 1984; Roediger, 1984; Roediger & Blaxton, in press).[1]

McKoon, Ratcliff, and Dell (1986) have now added a strong voice to the chorus of dissent. They have assembled a large number of objections and criticisms of the distinction in a single article and have elaborated them with zeal and vigor. Although their review does not contain anything startlingly new—many putative difficulties with the distinction have been mentioned by other critics before—the McKoon et al. article is important because of its comprehensiveness and systematicity. McKoon and

The author's research is supported by the Natural Sciences and Engineering Research Council of Canada Grant No. A8632 and by a Special Research Program Grant from the Connaught Fund, University of Toronto.

The author is grateful to Janine Law for editorial assistance.

Correspondence concerning this article should be addressed to Endel Tulving, Department of Psychology, University of Toronto, Toronto, Ontario, Canada MSS 1A1.

[1] Curiously enough, few people seem to have bothered to ask the question of why the distinction is so useful in the heuristic sense. The hypothesis that episodic and semantic memory represent different systems would provide a perfect answer to the question: "Because the distinction is real by the standards of nature." The unitary-memory theorists could presumably only scratch their collective heads in deep perplexity when confronted by the query.

her coauthors have raised a banner around which the forces of the unity of memory can rally, and under which they can make their stand.

The more general conclusions that McKoon et al. have drawn from their analysis are easy to concede. Thus, for instance, I agree that the evidence for the distinction is not strong, that many facts supportive of the distinction can be explained in a single-memory framework, and that the two systems are highly interdependent. But such a state of affairs means only that the hypothesis of the distinction is still open rather than closed.

A large number of specific objections that McKoon et al. raise against the distinction are questionable and debatable. However, an attempt at a point-by-point rebuttal of their arguments would constitute a wrong strategy for advancing knowledge. Sorting out fact from fiction in a complex issue such as the distinction requires the best efforts of a large number of people. Yet, on the contemporary psychological scene, nothing makes potential participants lose interest in a problem as effectively as does a flood of intricate technical and polemical arguments, charges and countercharges regarding points of logic, methods, procedures, data, and theory. The debate about episodic and semantic memory deserves a better fate than being drowned in such a flood. The specific points that McKoon and her coauthors have raised and that are deemed important by others will undoubtedly be dealt with in the course of the continuing debate, and the wheat will be separated from the chaff.

In this note, I touch on some of the general issues that McKoon et al. have raised. These issues have to do with the metatheoretical nature of the distinction, the appropriateness of the hypothetico-deductive method for the evaluation of the distinction, and relation between data and theory.

What Kind of a Hypothesis?

The idea of differentiable episodic and semantic memory systems, in its most rudimentary form, is simply a hunch that there is something basically different about the way people remember their own past and how they store and retrieve general information about the world. The hunch was originally based on casual observations made by the early, philosophically oriented memory typologists (Herrmann, 1982), and then reinforced by clinical observations of dissociations in memory pathology (e.g., Claparede, 1911/1951; Warrington & Weiskrantz, 1968, 1970). Thus, for instance, when Claparede's patient expressed her newly acquired "knowledge" that doctors sometimes hide pins in their hands, and refused to shake hands with him—without remembering the very recent episode in which she had acquired this knowledge—it seemed only logical for Claparede to conclude that remembering personal events is not quite the same thing as acquiring knowledge through such events, and that one of these forms of learning can be impaired as a consequence of brain damage, whereas the other seems to be less affected. (For a recent experimental analysis of the kind of dissociation noticed by Claparede, see Schacter, Harbluk, & McLachlan, 1984).

Dissociations observed as a consequence of brain damage, as well as those arising from experimentally controlled influences on the workings of the brain, imply the existence of different kinds, classes, or categories of learning and memory, subserved by different neural mechanisms that can be *selectively* impaired. Identification of such classes is the objective of an as yet nonexistent scientific discipline—systematics of learning and memory—that deals with *classification* of the myriad forms of learning and memory (Tulving, 1985c). Classification as a research objective or accomplishment constitutes an important part of scientific activity in many mature disciplines, but in the psychology of human learning and memory it has usually been conducted somewhat haphazardly and informally.[2] The hypothesis of the distinction between episodic and semantic memories (Cermak, 1984; Kinsbourne & Wood, 1975; Rozin, 1976; Schacter & Tulving, 1982; Tulving, 1983; Wood, Ebert, & Kinsbourne, 1982) can be regarded as part of an attempt to systematize the enterprise, as an operation that parallels similar attempts in the field of animal learning (e.g., Mishkin, Malamut, & Bachevalier, 1984; Oakley, 1981, 1983; Olton, 1985; Pribram, 1984; Ruggiero & Flagg, 1976).

Because of the relative novelty of classification research in learning and memory, the rules by which it is conducted and the methods and procedures for determining what kinds of empirical facts are relevant are still being worked out. Lessons learned from other sciences, such as systematic biology (Tulving, 1985c), or from classification in psychology, exemplified by the distinction between short-term and long-term memory (McKoon et al., 1986), are only partly relevant. Some other methods that may have been useful within the field for other purposes, including procedures that McKoon and her coauthors seem to favor, however, are even less so.

Appropriateness of the Hypothetico-Deductive Method

What McKoon and her coauthors find wrong with the distinction derives largely from their limited view of what the science of memory—at least at the present stage of its development—is all about, and how our understanding of memory is to be advanced. In their article they seem to be saying that there is only one way of "doing science": One constructs a theory, preferably an "explicit model" (p. 304), from which specific predictions can be derived, or "clearly testable hypotheses" (p. 296) deduced, and then one tests the theory by comparing the outcome of the test with the prediction, or the hypothesis. In the absence of such a theory, McKoon et al. say, "we see no way in which the status of the episodic–semantic distinction can be clarified" (p. 304).

By implicitly advocating the use of the hypothetico-deductive method for the study of a relatively new yet complex brain/cognition problem, McKoon and her coauthors have made what Gilbert Ryle (1949) refers to as the *category mistake:* They treat a concept that belongs to one category as if it belonged to another. In McKoon's and her colleagues' case, the mistake is twofold: Not only do they treat the science of memory as if it were a science such as classical physics, but they also treat a problem in classification as if it were one of discovering the causal basis of a particular phenomenon. It is probably their unawareness of their dual category mistake that emboldens McKoon and her

[2] The distinction between short-term and long-term memory may be thought of as an exception to the assertion made, but it is still true that few theorists concerned with that issue perceived it as an exercise in the *systematics* of learning and memory.

coauthors to expect that everyone should study the episodic/semantic distinction in their way or not at all.

It is easy to agree that on rare occasions the hypthetico-deductive method *can* play a useful role even in today's science of learning and memory. But it is unlikely to get us anywhere in the task of working out a *natural* classificatory scheme for learning and memory, one that is based on neuropsychological criteria (Kinsbourne, 1976, in press; Tulving, 1985c). The rules by which data are related to theory are somewhat different in classification than they are in research aimed at elucidating the processes and mechanisms underlying behavioral/cognitive phenomena. McKoon and her colleagues' criteria for judging the validity of theoretical ideas are different, too, and make it difficult, if not impossible, to bring the empirical data to bear on the theoretical status of even those classificatory systems that are true by the standards of nature.

To illustrate the difficulty, let me use an analogy. Suppose a world exists in which people see and hear things as we do, but in which they have only a single sense organ for receiving both light and sound signals, and in which the higher brain structures mediating vision and audition have not been identified. The prevailing theory of sensation in this fictional world is a parsimonious one: Sensation is sensation is sensation (cf. Kihlstrom, 1984). Whatever differences exist between seeing and hearing are accounted for in terms of (a) differences in the kinds of stimuli, and (b) differences in the way the stimuli are internally processed. Suppose further that in such a world there lives a scientist who has a hunch that vision and audition represent separate sensory systems, each subserved by separate neural structures and mechanisms.[3]

How would our fictional wayward scientist go about evaluating his or her hypothesis? What kind of a specific model would the scientist construct, and what kinds of falsifiable predictions would he or she make? (What kind of *falsifiable* deductions would *we* draw from what kind of a model of visual and auditory systems as we know them in our world?) More important, given that the systems are in fact anatomically and physiologically separable, what would it mean if the scientist succeeded in falsifying a deduction from a particular theory of the two systems? For us, knowing that the hypothesis is in fact true, the finding would mean that the particular model was wrong or that the experiment provided an inadequate test of the model. For our fictional scientist's hypothetico-deductive colleagues, not privy to nature's secrets, the finding would mean that the hypothesis is weakened. After a number of such falsifications, they are likely to conclude that the hypothesis is completely untenable. They would have failed to discover the truth, because of their insistence on the application of inappropriate logic to experimental results spawned by incorrect particular models.[4]

By McKoon's and her colleagues' rules of the game, our mythical scientist with the idea of two sensory systems could not get away with something as simple and straightforward as "predicting" that it is possible for people to suffer brain damage that results in blindness and not in deafness, or vice versa. Such a state of affairs could readily be interpreted without invoking the concept of separate systems. (To find someone like Helen Keller would be downright embarrassing for our scientist, because simultaneous blindness and deafness lends itself to a ready interpretation as "similar" or "parallel" effects, supporting the "sensation is sensation" theory). Nor would our scientist get very far if he or she emulated Kihlstrom (1980) and did a study in which a reversible, selective loss of function of one system is created experimentally. Kihlstrom (1980) found that posthypnotic amnesia instructions for words learned in a list affected his subjects' ability to remember the studied words as self-referential, temporally coded events (episodic memory) but did not affect their ability to recall or produce the same words in a semantic task. McKoon and her coauthors claimed such findings to be irrelevant to the episodic–semantic distinction, since the self-referential nature and temporal coding of events is true of episodic memory "by definition" and hence cannot "speak to the reality of the episodic–semantic distinction independently of this definition" (McKoon et al., 1986, p. 296). Comparable data would probably be resisted by the hypothetico-deductive methodists in the case of the different sensory systems as well, on the same grounds.

Our imaginary scientist with the "unparsimonious" idea about different sensory systems would also have a hard time convincing critics like McKoon and her coauthors by other means. Thus, for instance, inspired by Wood, Taylor, Penny, and Stump (1980), the scientist might first predict the expected patterns and then measure the regional cerebral blood flow in people while they process visual or auditory information. If the scientist finds this prediction vindicated by the data, he or she runs the risk of being told that the hypothesis of two systems "is not well-formulated enough to present clearly testable hypotheses" (McKoon et al., 1986, p. 296), and also that because of the high cost of such studies, additional work of this kind would be unlikely and, therefore, the obtained finding merely "intriguing" (McKoon et al., 1986, p. 302). The scientist is unlikely to be told, however, exactly which kinds of "predictions" count and which ones do not.

Given the difficulties of pleasing the critics, what could our fictional scientist do? What can a harassed and beleaguered proponent of the episodic/semantic distinction do?

Relation Between Theory and Data

In the pursuit of the episodic–semantic hypothesis, we obviously have to be guided by empirical facts. No one is interested in a theory that makes no contact with the world of data. Fortunately, the problem of judging the fit between nature and our ideas about it is no more difficult for the hypothesis of differentiable episodic and semantic memory systems than it is for many other theories and hypotheses. Even McKoon and her

[3] The analogy holds only roughly, in that the hypothesized distinction between episodic and semantic memory, or at least one version of it (Tulving, 1985a), postulates one as a subsystem of the other, rather than viewing the two as parallel systems.

[4] That such things can happen in real life is demonstrated by McKoon's and her coauthors' conclusion that "the difficulties overcame the distinction" (McKoon et al., 1986, p. 296) between short-term (primary) and long-term (secondary) memory, in the sense that a number of particular models of it were found wanting. I think that neuropsychological evidence for the existence of separate primary-memory and secondary-memory mechanisms is good enough to keep the issue very much alive (e.g., Baddeley & Warrington, 1970; Shallice, 1979; Warrington, 1982).

coauthors, despite their repeated complaints about the testability of the distinction, agree that empirical observations *can* speak for and against the theory. They make statements such as, "most evidence about processes does not support [the] distinction" (p. 298), "much of the research on amnesia seems to have important implications for the episodic–semantic distinction" (p. 303), and a certain pattern of results, from as yet undone experiments concerned with evoked potentials, "would provide quite strong evidence for a separation of systems" (McKoon et al., 1986, p. 302). One could not make claims of this kind about a theory that is impervious to empirical data. Clearly, then, adjudication of the debate about memory systems can be based on empirical evidence as much as on other relevant criteria.

But not all empirical evidence is equally valuable for the purpose of settling the dispute. For instance, the *complex* reaction-time experiments that McKoon and her colleagues, as well as others, have done (e.g., den Heyer, in press; McKoon & Ratcliff, 1979; Neely & Durgunoglu, 1985) are unlikely to turn out to be critical. The findings of dissociations between episodic and semantic tasks in such experiments may have stimulated thoughts about the two systems, and their interpretations can frequently be aided by the hypothesis of two kinds of memory. But because of the long chains of inferential reasoning that these experiments entail, and the sensitivity of their outcomes to apparently minor variations in procedure (Neely & Durgunoglu, 1985), their theoretical significance remains doubtful. If one tries to evaluate the distinction primarily in terms of the outcomes of these kinds of experiments, then McKoon and her colleagues' misgivings about the enterprise may well be justified.[5]

The kind of empirical evidence that is likely to turn out to be more critically relevant to the debate about the episodic and semantic memory issue is based on observations of brain/behavior and brain/cognition relations in learning and memory. The fact that everyone in our world is willing to refer to vision and audition as different sensory systems is largely attributable to the clear anatomical separation of their sense organs, neural pathways, and projection areas in the brain. Comparable "hard" evidence regarding episodic and semantic memories might go a long way toward settling the issue. Some of this evidence, in the form of dissociated learning and memory performances, will be gained from neuropsychological studies of patients with brain lesions. Dissociations resulting from brain lesions do not always illuminate our understanding of *processes* and *mechanisms* of learning and memory, but for the purposes of *classification* they are invaluable: If a lesion affects performances A, B, and C, but not X, Y, and Z, the former three have something in common that the latter three do not. Additional evidence will be provided by observations of the activity of the living brain through neuroimaging and electrophysiological recording techniques, pharmacological and chemical interventions in learning and memory, and other, as yet nonexistent and unanticipated, techniques. Cognitive psychologists will make an important contribution to working out the solution of the problem, but they will do so in collaboration with scientists representing a number of other disciplines.

A Final Word

I would like to conclude by endorsing a slightly modified final word of McKoon and her coauthors: "The episodic–semantic distinction is an interesting idea that has had much heuristic value for interpreting and generating data over the past 14 years. Now it needs logical, empirical, and theoretical development" (McKoon et al., 1986, p. 304). My modest contribution to this final word is "logical" and "empirical."

---

[5] For a more optimistic assessment of the value of experimental dissociations, see Shoben and Ross (in press).

References

Anderson, J. R., & Ross, B. H. (1980). Evidence against a semantic–episodic distinction. *Journal of Experimental Psychology: Human Learning and Memory, 6,* 441–465.

Baddeley, A. (1984). Neuropsychological evidence and the semantic/episodic distinction. *Behavioral and Brain Sciences, 7,* 238–239.

Baddeley, A., & Warrington, E. K. (1970). Amnesia and the distinction between long- and short-term memory. *Journal of Verbal Learning and Verbal Behavior, 9,* 176–189.

Bergson, H. (1911). *Matter and memory.* London: Allen & Unwin.

Cermak, L. S. (1984). The episodic–semantic distinction in amnesia. In L. R. Squire & N. Butters (Eds.), *The neuropsychology of memory* (pp. 55–62). New York: Guilford.

Claparede, E. (1951). Recognition and me-ness. Translated in D. Rapaport (Ed.), *Organization and pathology of thought* (pp. 58–75). New York: Columbia University Press. (Originally published, 1911)

Craik, F. I. M., & Jacoby, L. L. (1979). Elaboration and distinctiveness in episodic memory. In L.-G. Nilsson (Ed.), *Perspectives on memory research* (pp. 145–166). Hillsdale, NJ: Erlbaum.

den Heyer, K. (in press). Manipulating attention-induced priming in a lexical decision task by means of repeated prime-target pesentations. *Journal of Memory and Language.*

Herrmann, D. J. (1982). The semantic/episodic distinction and the history of long-term memory typologies. *Bulletin of the Psychonomic Society, 20,* 207–210.

Hintzman, D. L. (1984). Episodic versus semantic memory: A distinction whose time has come—and gone? *Behavioral and Brain Sciences, 7,* 240–241.

Kihlstrom, J. F. (1980). Posthypnotic amnesia for recently learned material: Interactions with "episodic" and "semantic" memory. *Cognitive Psychology, 12,* 227–251.

Kihlstrom, J. F. (1984). A fact is a fact is a fact. *Behavioral and Brain Sciences, 7,* 243–244.

Kinsbourne, M. (1976). The neuropsychological analysis of cognitive deficit. In R. G. Grenell & S. Gabay (Eds.), *Biological foundations of psychiatry* (pp. 527–589). New York: Raven Press.

Kinsbourne, M. (in press). Systematizing cognitive psychology. *Behavioral and Brain Sciences.*

Kinsbourne, M., & Wood, F. (1975). Short-term memory processes and the amnesic syndrome. In D. Deutsch & A. J. Deutsch (Eds.), *Short-term memory* (pp. 258–291). New York: Academic Press.

Lachman, R., & Naus, M. J. (1984). The episodic/semantic continuum in an evolved machine. *Behavioral and Brain Sciences, 7,* 244–246.

McKoon, G., & Ratcliff, R. (1979). Priming in episodic and semantic memory. *Journal of Verbal Learning and Verbal Behavior, 18,* 463–480.

McKoon, G., Ratcliff, R., & Dell, G. S. (1986). A critical evaluation of the semantic–episodic distinction. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 12,* 295–306.

Mishkin, M., Malamut, B., & Bachevalier, J. (1984). Memories and habits: Two neural systems. In G. Lynch, J. L. McGaugh, & N. M. Weinberger (Eds.), *The neurobiology of learning and memory* (pp. 65–77). New York: Guilford Press.

Neely, J. H., & Durgunoglu, A. Y. (1985). Dissociative episodic and semantic priming effects in episodic recognition and lexical decision tasks. *Journal of Memory and Language, 24*(4), 466–489.

Nielsen, J. M. (1958). *Memory and amnesia.* Los Angeles: San Lucas Press.

Oakley, D. A. (1981). Brain mechanisms of mammalian memory. *British Medical Bulletin, 37,* 175–180.

Oakley, D. A. (1983). The varieties of memory: A phylogenetic approach. In A. Mayes (Ed.), *Memory in animals and humans* (pp. 20–82). Wokingham, England: Van Nostrand Reinhold.

Olton, D. S. (1985). Memory: Neuropsychological and ethopsychological approaches to its classification. In L.-G. Nilsson & T. Archer (Eds.), *Perspectives on learning and memory* (pp. 95–117). Hillsdale, NJ: Erlbaum.

Pribram, K. H. (1984). Brain systems and cognitive learning processes. In H. L. Roitblat, T. G. Bever, & H. S. Terrace (Eds.), *Animal cognition* (pp. 627–656). Hillsdale, NJ: Erlbaum.

Roediger, H. L., III (1984). Does current evidence from dissociation experiments favor the episodic/semantic distinction? *Behavioral and Brain Sciences, 7,* 252–254.

Roediger, H. L., & Blaxton, T. (in press). Retrieval modes produce dissociations in memory for surface information. In D. S. Gorfein & R. R. Hoffman (Eds.), *Memory and learning: The Ebbinghaus centennial conference.* Hillsdale, NJ: Erlbaum.

Rozin, P. (1976). The psychobiological approach to human memory. In M. R. Rosenzweig & E. L. Bennett (Eds.), *Neural mechanisms of learning and memory* (pp. 3–46). Cambridge, MA: MIT Press.

Ruggiero, F. T., & Flagg, S. F. (1976). Do animals have memory? In D. L. Medin, W. A. Roberts, & R. T. Davis (Eds.), *Processes of animal memory* (pp. 1–19). Hillsdale, NJ: Erlbaum.

Ryle, G. (1949). *The concept of mind.* London: Hutchinson.

Schacter, D. L., Harbluk, J. L., & McLachlan, D. R. (1984). Retrieval without recollection: An experimental analysis of source amnesia. *Journal of Verbal Learning and Verbal Behavior, 23,* 593–611.

Schacter, D. L., & Tulving, E. (1982). Memory, amnesia, and the episodic/semantic distinction. In R. L. Isaacson & N. E. Spear (Eds.), *Expression of knowledge* (pp. 33–65). New York: Plenum Press.

Shallice, T. (1979). Neuropsychological research and the fractionation of memory systems. In L.-G. Nilsson (Ed.), *Perspectives on memory research* (pp. 257–277). Hillsdale, NJ: Erlbaum.

Shoben, E. J., & Ross, B. H. (in press). The crucial role of dissociations. *Behavioral and Brain Sciences.*

Tulving, E. (1972). Episodic and semantic memory. In E. Tulving and W. Donaldson (Eds.), *Organization of memory* (pp. 381–403). New York: Academic Press.

Tulving, E. (1983). *Elements of episodic memory.* Oxford: Clarendon Press.

Tulving, E. (1984a). Multiple learning and memory systems. In K. M. J. Lagerspetz & P. Niemi (Eds.), *Psychology in the 1990's* (pp. 163–184). North Holland: Elsevier Science Publishers B. V.

Tulving, E. (1984b). Relations among components and processes of memory. *Behavioral and Brain Sciences, 7,* 257–268.

Tulving, E. (1985a). How many memory systems are there? *American Psychologist, 40,* 385–398.

Tulving, E. (1985b). Memory and consciousness. *Canadian Psychology, 26,* 1–12.

Tulving, E. (1985c). On the classification problem in learning and memory. In L.-G. Nilsson & T. Archer (Eds.), *Perspectives on learning and memory* (pp. 67–94). Hillsdale, NJ: Erlbaum.

Warrington, E. K. (1982). The double dissociation of short- and long-term memory deficits. In L. S. Cermak (Ed.), *Human memory and amnesia* (pp. 61–76). Hillsdale, NJ: Erlbaum.

Warrington, E. K., & Weiskrantz, L. (1968). New method of testing long-term retention with special reference to amnesic patients. *Nature, 217,* 972–974.

Warrington, E. K., & Weiskrantz, L. (1970). The amnesic syndrome: Consolidation or retrieval? *Nature, 228,* 628–630.

Wood, F., Ebert, V., & Kinsbourne, M. (1982). The episodic–semantic distinction in memory and amnesia: Clinical and experimental observations. In L. S. Cermak (Ed.), *Human memory and amnesia* (pp. 167–193). Hillsdale, NJ: Erlbaum.

Wood, F., Taylor, B., Penny, R., & Stump, D. (1980). Regional cerebral blood flow response to recognition memory versus semantic classification tasks. *Brain and Language, 9,* 113–122.

Received July 22, 1985 ■