Roediger, H. L. (1984). The use of interference paradigms as a criterion for separating memory stores. *Behavioral and Brain Sciences, 7*, 78-79.

The use of interference paradigms as a criterion for separating memory stores

Henry L. Roediger III

Department of Psychology, Purdue University, West Lafayette, Ind. 47907

The primary novel feature in Broadbent's interesting Maltese cross model of memory and cognitive functioning is that an undifferentiated central processor shuttles information willy-nilly among four discrete memory stores. Although the rather amorphous nature of the model and the flexibility permitted the central processor (as indicated by the arrows in Figure 2) would seem to limit its testability, interesting predictions are possible. Since the central processor can convert a representation from any memory store into any other, it should be perfectly possible for, say, a long-term associative memory to be transformed into an iconic or echoic sensory memory, with (one assumes) the requisite peripheral sensory component. However, rather than focus on the model's implications for future research, I would like in my commentary to examine the logic by which Broadbent includes four separate memory stores and to question the need for and usefulness of such assumptions of mental structure.

In proposing the Maltese cross Broadbent follows the long tradition of assuming a sharp distinction between mental structures (or contents) and processes acting on those structures. He also adopts the newer notion that it is useful to account for remembering by postulating discrete storage systems. These ideas have a long history and are assumed by many current theorists, but, unfortunately, little agreement exists as to the number of memory stores that should be postulated, their arrangement, or even the need for introducing such entities. One reason for this state of affairs is that there are no generally accepted rules for determining whether or not a memory store should be postulated, or, more broadly, for determining the hypothesized structure or contents of mind. Broadbent proposes that interference can be used as the prime criterion for separating stores. For example, in the research of Crowder and Morton (1969), an auditory stimulus following a spoken list and matching it on critical features damages recall of the last few items in the list, whereas a visual stimulus (or a radically different auditory stimulus) does not. Hence there seems to be a short-lived auditory memory, a subcategory of the sensory memory store, which is subject to interference from similar auditory events but not from visual ones.

This logic may be plausible in the case of sensory memories, but if applied throughout the corpus of research on memory, the effect would be to multiply greatly the number of stores needed to account for all the interference effects that follow the same logic. For example, in experiments in which subjects are given a series of pictures or words to remember and then this material is tested after intervening study of irrelevant pictures or words, recall is poorer when the intervening material is similar rather than dissimilar to the studied material (e.g. R. L. Cohen & Granström 1970; Ternes & Yuille 1972). There is more mutual interference between pictures and other pictures (or words and other words) than between pictures and words. One way to account for this fact is to postulate separate stores or systems for pictures and words, with similar intervening material overloading the stores. Other experiments could show similar patterns of mutual interference between like events. If distracting nonsense patterns degrade memory for nonsense shapes more than do distracting pictures, do we then postulate a separate memory store for nonsense shapes? If subjects are given a list of famous names and then are shown to suffer more retroactive interference from the presentation of other famous names than from other words or pictures, do we then postulate a famous name store? Perhaps, in Broadbent's system, these could be classed as substores within the long-term store, much as the sensory store in Figure 2 is said to contain various substores.

Probably no one would want to account for the numerous patterns of interference in memory experiments by postulating a separate store for every demonstration of mutual interference among memories of similar events. Certainly Broadbent keeps his proposal down to only four stores, presumably the fundamental ones. But by what logic do we draw the line? Why are some patterns of interference said to reflect the operation of various stores, while other patterns are accounted for in different ways? What are the rules by which theorists arrive at these decisions? I am afraid that no explicit, generally accepted rules have been formulated, and neither are they offered by Broadbent - hence our proliferation of stores as explanatory devices. If interference is to be the criterion for proposing memory stores, the Maltese cross metaphor should be supplanted by some more appropriate form, perhaps a hydra.

The problem of determining mental structures or contents has a long history, but despite intensive inquiry no commonly agreed upon system of representation exists. Interference fails as a criterion for postulating memory stores, but other criteria are little better. Tulving and Bower (1974) reviewed ten other methods that have been used in attempts to determine mental structure (e.g. false positive recognition errors, clustering, release from proactive interference), but none is without problems. Thus postulation of mental structures remains largely a matter of the personal preference of the theorist, depending on the criteria chosen. Theories change, but it is difficult to note steady theoretical advance.

Since continued efforts to divine cognitive structure by many methods have apparently failed, it may be time to reexamine the assumptions on which such attempts are based, namely, that cognitive structure and process can and should be separated. Perhaps this assumption of a sharp separation between the two is a false one and a proper account of mental functioning ought to use different starting assumptions. One such assumption, one Broadbent expressly rejects, is to cast theories more purely in terms of mental processes rather than processes that act on static structures. Surely experience does leave a lasting representation in the nervous system – no one would contest that fact – but inventing numerous mental structures or stores may not be the best way to capture the essence of these lasting effects. It may be preferable to make as few assumptions as possible about mental structures and to account for cognitive phenomena in terms of mental procedures and the functions they serve.

The levels of processing framework of Craik and Lockhart (1972) was one proposal that emphasized mental processing to the relative neglect of mental structures. The failings of that approach are now well known (e.g. Cermak & Craik 1979), but they did not include a need to introduce mental structures.

Kolers (e.g. 1975; 1979a) has recently led the way in arguing for a procedural account of many memory phenomena. Although his proposal is still rather vague, a good deal of evidence can be interpreted within it (Kolers & Roediger, in press). Although rejection of static structures as a theoretical device in accounting for remembering runs against the grain of contemporary theorizing, this tactic seems worthy of pursuit as a means of detouring the seemingly intractable problem of determining the structure of memories. In addition, a good deal of evidence favors such an approach over competitors that assume static representations (see Kolers & Roediger, in press).