very much considerable evidence (e be used over and over a

Two i he method of loci. First, the technique impos se-unorganized list. We are guaranteed that if we follow the mental path a ne of recall, we will pass all the locations for which we created associations. The second principle is that generating imaginal connections between the locations and the items forces us to process the material meaningfully, elaboratively, and by use of visual imagery.

The method of loci works by using a fixed sequence of locations to cue retrieval of memories.

The Effects of Encoding Context

Among the cues that can become associated with a memory are cues from the context in which the memory was formed. If at test such contextual cues could be revived, the subject would have additional ways to reactivate the target memory. There is ample evidence that context can greatly influence memory. This section will review some of the ways in which context influences memory. These context effects are often referred to as **encoding effects** because the context is affecting what is encoded into the memory trace that records the event.

Smith, Glenberg, and Bjork (1978) performed an experiment that showed the importance of physical context. In their experiment, subjects learned two lists of paired associates on different days and in different physical settings. On day 1, subjects learned the paired associates in a windowless room in a building near the University of Michigan campus. The experimenter was neatly groomed, dressed in a coat and a tie, and the paired associates were shown on slides. On day 2, subjects learned the paired associates in a tiny room with windows on the main campus. The experimenter was dressed sloppily in a flannel shirt and jeans (it was the same experimenter, but some subjects did not recognize him) and presented the paired associates via a tape recorder. A day later, subjects made their recall of half the paired associates in one setting and half in the other setting. Subjects could recall 59 percent of the list learned in the same setting as tested, but only 46 percent of the list learned in the other setting. Thus, it seems that recall is better if the context at test is the same as the context at study.

Perhaps the most dramatic manipulation of context was performed by Godden and Baddeley (1975). They had divers learn a list of forty unrelated words either on the shore or 20 feet under the sea. The divers were then asked to recall the list in either the same or a different environment. Figure 7.8

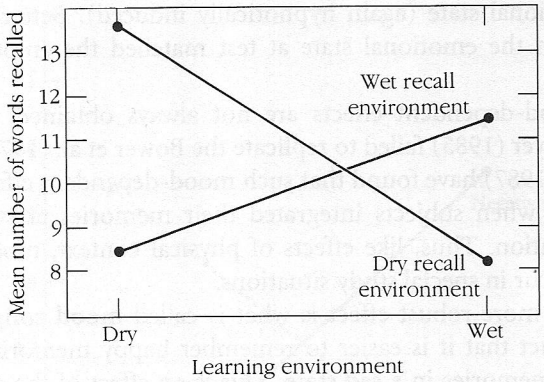

FIGURE 7.8: Mean number of words recalled as a function of environment in which learning took place. Word lists were recalled better in the same environment in which they were learned than in a different environment. (Data from Godden & Baddeley, 1975.)

displays the results of this study. Subjects clearly showed superior memory when they were asked to recall in the same context in which they studied. So, it seems that contextual elements get associated to memories, and that memory is improved when subjects are provided with these contextual elements again.

The degree to which such contextual effects are obtained has proved to be quite variable from experiment to experiment. Fernandez and Glenberg (1985) report a number of failures to find a context dependence, and Saufley, Otaka, and Bavaresco (1985) report a failure to find such effects in a classroom situation. Eich (1985) argues that the magnitude of such contextual effects depends on the degree to which the subject integrates the context with the memories. In his experiment he read lists to two groups of subjects. In one condition subjects were instructed to imagine the referents of the nouns alone, and in the other condition subjects were asked to imagine the referents integrated with the context. Eich found a much larger effect of a change of context when subjects were instructed to imagine the referent integrated with the context.

Research by Bower, Monteiro, and Gilligan (1978) shows that emotional context can have the same effect as physical context. They also instructed subjects to learn two lists. For one list they hypnotically induced a positive state by having subjects review a pleasant episode in their lives, and for the other list they hypnotically induced a negative state by having subjects review a traumatic event. A later recall test was given under either a positive or a

negative emotional state (again hypnotically induced). Better memory was obtained when the emotional state at test matched the emotional state at study.[1]

Such mood-dependent effects are not always obtained. For instance, Bower and Mayer (1985) failed to replicate the Bower et al. (1978) result. Eich and Metcalfe (1987) have found that such mood-dependent effects tend to be obtained only when subjects integrated their memories at study with the mood information. Thus, like effects of physical context, mood-dependent effects only occur in special study situations.

Perhaps a more robust effect is what is called **mood congruence.** This refers to the fact that it is easier to remember happy memories in a happy state and sad memories in a sad state. This is an effect of the content of the memories rather than the emotional state of the subject during study. For instance, Teasdale and Russell (1983) had subjects learn a list of positive, negative, and neutral words in a normal state. Then at test they either induced positive or negative states. Their results are illustrated in Figure 7.9. As can be seen, subjects recalled more of the words that matched their mood at test. When mood elements are activated at test, activation will spread to memories that share these mood elements. These elements will include memories whose inherent content matches the mood as in the Teasdale and Russell experiment and memories which have such mood elements integrated as part of the study procedure (as in Eich and Metcalfe).

A related phenomenon is referred to as **state-dependent learning.** People find it easier to recall information if they can return to the same emotional and physical state they were in when they learned the information. For instance, it is often casually claimed that heavy drinkers when sober are unable to remember where they hid their alcohol when drunk, and when drunk they are unable to remember where they hid their money when sober. In fact, some experimental evidence does exist for this state dependency of memory with respect to alcohol, but the more important factor seems to be that alcohol has a general debilitating effect on the acquisition of information (Parker, Birnbaum, & Noble, 1976). Marijuana has been shown to have similar state-dependent effects. In one experiment (Eich, Weingartner, Stillman, & Gillin, 1975) subjects learned a free-recall list after smoking either a marijuana cigarette or an ordinary cigarette. Subjects were tested 4 hours later—

[1]As an aside, it is worth commenting that, despite popular reports, the best evidence is that hypnosis per se does nothing to improve memory (see Hilgard, 1968; Smith, 1982), although it can help memory to the extent that it can be used to re-create the contextual factors at the time of test. However, much of a learning context can also be re-created by nonhypnotic means, such as through free association about the circumstances of the to-be-remembered event (e.g., Geiselman, Fisher, Mackinnon, & Holland, 1985).

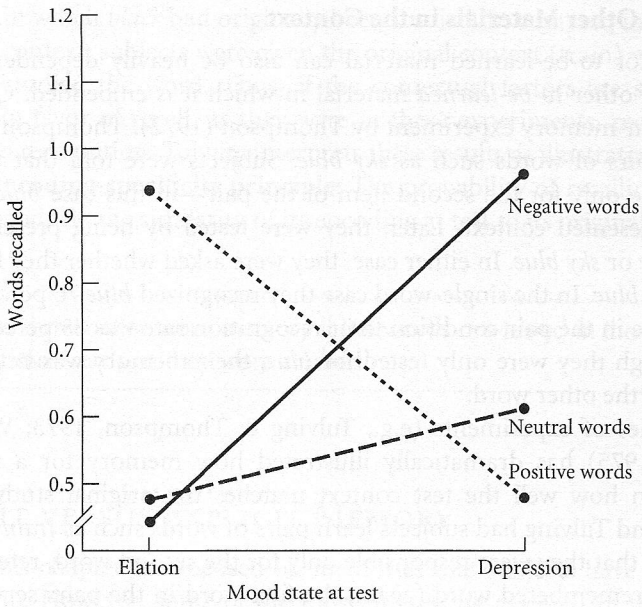

FIGURE 7.9: Recall of positive, negative and neutral trait words in elated and depressed mood states. (From Teasdale & Russell, 1987. Reprinted by permission of the British Psychological Society.)

again after smoking either a marijuana cigarette or a regular cigarette. Table 7.7 shows the results from this study. Two effects are shown in this table, typical of the research on the effects of psychoactive drugs on memory. First there is a state-dependent effect reflected by higher recall when state at test matched the state at study. Second, there is an overall higher level of recall when the material was studied in a nonintoxicated state.

People show better memory if their external contexts and internal states match at study and test.

TABLE 7.7: INTERACTION BETWEEN EFFECTS OF DRUGGED STATE AT STUDY AND TEST

	Test		
Study	Ordinary Cigarette	Marijuana Cigarette	Average
Ordinary cigarette	25%	20%	23%
Marijuana cigarette	12%	23%	18%

From Eich, Weingartner, Stillman, and Gillin, 1975.