Interference and Decay

We have seen two mechanisms that can produce forgetting. One is decay of trace strength and the other is interference from other memories. There has been some speculation in psychology that what appears to be decay may really reflect interference. That is, the reason why memories appear to decay is that over a retention interval, they are interfered with by additional memories that the subjects have learned. This led to research that studied whether material was better retained over an interval during which subjects slept or during which they were awake. The reasoning was that there would be fewer interfering memories learned during sleep. Ekstand (1972) reviews a great deal of research consistent with the conclusion that less is forgotten during the period of sleep. However, it seems that the critical variable is not sleep but rather the time of day during which material is learned. Hockey, Davies, and Gray (1972) found that subjects better remembered material that they learned at night even if they were kept up during the night and slept during the day. It seems that early evening is the period of highest arousal (at least for typical undergraduate subjects) and that retention is best for material learned in a high arousal state. See Anderson (1995) for a review of this literature.

There has been a long-standing controversy in psychology about whether retention functions, such as those in Figures 7.1 and 7.2, reflect decay in the absence of any interference or whether they reflect interference from unidentified sources. Objections have been raised to decay theories because they do not identify the psychological factors producing the forgetting, but rather assert that forgetting occurs spontaneously with time. It may be possible, however, that there is no explanation of decay at the purely psychological level. The explanation may be physiological as we saw with respect to the long-term potentiation data (see Figure 7.3). Thus, it seems that the best conclusion given the available data is that both interference and decay effects contribute to forgetting.

Forgetting is produced both by decay in trace strength and by interference from other memories.

Interference and Redundancy

There is a major restriction on the situations in which one gets interference effects: Such interference occurs only when one is learning multiple memories that have no intrinsic relationship to one another. Interference does not occur when the memories are somewhat redundant. An experiment by Bradshaw and Anderson (1982) illustrates the contrasting effects of redundant versus irrelevant information. These researchers looked at subjects' 2ability to learn some little-known information about some famous people. In one condition they had subjects study just a single fact:

- Newton became emotionally unstable and insecure as a child.

In the irrelevant condition they had subjects learn a target fact plus two unrelated facts about the individual:

- Locke was unhappy as a student at Westminister.

plus

- Locke felt fruits were unwholesome for children.
- Locke had a long history of back trouble.

In the third, relevant condition subjects learned two additional facts that were causally related to the target fact:

- Mozart made a long journey from Munich to Paris.

plus

- Mozart wanted to leave Munich to avoid a romantic entanglement.
- Mozart was intrigued by musical developments coming out of Paris.

Subjects were tested for their ability to recall the target facts immediately after studying them and at a week's delay. They were presented with names like Newton, Mozart, and Locke and asked to recall what they had studied. The results are displayed in Table 7.3. Comparing the irrelevant condition with the single condition, we see the standard interference effect, which is that recall is worse when there are more facts to be learned about an item. However, the conclusion is quite different when we compare the relevant

TABLE 7.3: PERCENTAGE OF RECALL AS A FUNCTION OF CONDITION AND TIME INTERVALS

	Immediate Recall	Recall at a Week
Single fact	92	62
Irrelevant facts	80	45
Relevant facts	94	73

From Bradshaw and Anderson, 1982.

condition to the single condition. Here, particularly at a week's delay, recall is better when the subject had to learn additional facts causally related to the target facts.

To understand why the effects of interference are eliminated or even reversed when there is redundancy among the materials to be learned requires that we move on to discussing the retrieval process and, in particular, the role of inferential processes in retrieval.

Learning redundant material does not interfere with a target memory and may even facilitate the target memory.

Retrieval and Inference

Often when subjects cannot remember a particular fact, they are able to retrieve related facts and so infer the target fact on the basis of that. Thus, in the case of the Mozart facts given above, even if the subjects could not recall that Mozart made a long journey from Munich to Paris, if they could retrieve the other two facts, they would be able to infer this target fact. There is considerable evidence that people make such inferences at the time of recall and are not even aware that they are making inferences rather than recalling what was actually studied.

Bransford, Barclay, and Franks (1972) reported another experiment that demonstrates how inference can lead to incorrect recall. They had subjects study one of the following sentences:

1. Three turtles rested beside a floating log, and a fish swam beneath them.

2. Three turtles rested on a floating log, and a fish swam beneath them.

Subjects who had studied sentence 1 were later asked whether they had studied this sentence:

3. Three turtles rested beside a floating log, and a fish swam beneath it.

Not many subjects thought they had studied this. Subjects who had studied sentence 2 were tested with:

4. Three turtles rested on a floating log, and a fish swam beneath it.