

Summary of Section 3

- Schemas are packets of stored knowledge (memory representations) derived from past experience.
- New memory representations of events, scenes and objects are the product of both stored schemas and current input.
- The bottom-up information derived from the senses about an on-going event is interpreted by the top-down influence of relevant schemas so as to construct a memory representation that fits in with prior expectations and past experience.
- As a result, memories of particular events tend to be transformed toward a typical or 'normalized' form.

4 Memory for scenes and events

Schema theory can be best evaluated by looking at some particular studies of everyday memory. How well do people remember the events and scenes they experience in everyday life? To what extent do pre-stored schemas influence what they recall?

4.1 Remembering scenes

The influence of schemas on memory for scenes has been neatly demonstrated in an experiment by Brewer and Treyens (1981) as described in Techniques Box D.

TECHNIQUES BOX D

Brewer and Treyens' Experiment Testing Memory for Objects in a Room (1981)

Rationale

The idea behind the experiment was that people's memory for a scene is influenced by the schema appropriate for that particular scene. In this experiment the scene was a room full of objects. Brewer and Treyens predicted that people would remember those aspects of the scene that they would expect to find in that context and forget items that they would not expect to be there.

Method

Thirty subjects attended one at a time to serve in the experiment. When they arrived they were asked to wait briefly in an office. The room was designed to look like a typical graduate student's

office with many of the items you would expect to find there (desk, typewriter, coffee-pot, calendar, etc.). Other items did not conform to the office schema (a skull, a piece of bark, a pair of pliers). Schema-expectancy ratings for each object were obtained previously by asking 15 different subjects to rate on a six-point scale 'how likely the object would be to appear in room of this kind'. After 35 seconds waiting in the office the experimental subjects were called into another room and given the unexpected task of writing down everything they could remember having seen in the office.

Results

Most subjects successfully recalled the items with high schema-expectancy ratings (like the desk), and few subjects recalled the items with low schema-ratings (like the pliers). Some subjects falsely recalled things likely to be in a typical office, but not actually present in this one, such as pens, books and a telephone. Memory for the scene was therefore strongly influenced by the pre-existing office schema and, when they came to recall, subjects were supplying default values from this schema. Nevertheless, one or two of the objects which had very low schema-expectancy ratings, like the skull, were recalled by a significant number of subjects, showing that recall is not entirely schema-based.

SAQ 2

Suppose you had been in somebody's kitchen and were later asked to recall objects in it. Which of the following would you be most likely to recall? Which would you be most likely to forget?

Cooker, sink, hat, teapot, stethoscope.
What other objects might you falsely recall having seen?

4.2 Modifications of schema theory

The *schema-plus-tag model* has been developed (Graesser and Nakamura, 1982) to account for the fact that schema-irrelevant information is sometimes retained as well or better than schema-relevant information. The unusual or atypical item or event may be more memorable than what is predictable or routine. You do remember the unexpected objects in a scene; you remember novel deviations from familiar experiences so, as noted before, of all your visits to the dentist, the one that is particularly memorable is the occasion when you fell down the dentist's stairs. And you also remember one-off unique experiences, like getting married or passing your driving test.

According to the schema-plus-tag model, the memory representation for a specific event includes both the general schema and distinctive tags or markers labelling any irrelevant or unexpected aspects of

the event. So the picnic schema in Figure 1.4 might carry the tag 'Sue fell in the river' to mark a specific occasion. This amended version of schema theory fits both the experimental findings and our common-sense intuitions. Schank (1981) has also modified his original ideas about scripts so as to clarify the relationship between general knowledge schemas and memory for specific episodes. He has proposed a hierarchical arrangement of memory representations called *MOPS*, or *Memory Organization Packets*. The lowest level of the hierarchy is the most specific and representations at this level store specific details about particular events. At higher levels the representations become progressively more general and schema-like. According to the model, low-level specific memories are not usually retained for very long. These specific event memories are absorbed into higher level generalized event memories (schemas) which store the features common to repeated experience. However, in Schank's model, details of particular events are retained if the event is peculiar or untypical in any way. So Schank's MOPs make provision for storing memories of specific episodes as well as general schemas. A model like this is clearly better fitted to account for everyday memory.

4.3 Eye-witness testimony

Eye-witness testimony has been investigated by means of naturalistic experiments — that is, experiments that try to mimic real-world situations while at the same time controlling the relevant variables. These experiments are concerned to assess the accuracy of eye-witness testimony. How accurately can people describe an event they witnessed some time previously? What factors are liable to make their reports more accurate or less accurate? These questions are not just academic. They are of paramount importance to the police and to the courts.

Much of the work on eye-witness testimony has been done by Elizabeth Loftus and her colleagues. Typical examples of her experiments are shown in Techniques Box E.

TECHNIQUES BOX E

Two Experiments in Eye-Witness Testimony

1 Loftus (1975)

Rationale

The experiment tests the theory that new information is integrated with pre-stored memory representations. Specifically, it tests whether people's memory of an event they have witnessed can be falsified if they are later given misleading information about the event.

Method

The experiment consisted of three phases:

Phase 1 150 people (the subjects in the experiment) viewed a film showing a car accident.

Phase 2 Immediately afterwards all the subjects answered ten questions about the event. Subjects had been divided into two groups, A and B. Subjects in Group A received questions, all of which incorporated accurate information about the event, and were *consistent* with what they had seen (e.g. 'How fast was the white sports car going when it passed the "Stop" sign?'). Subjects in Group B received the same questions except for one which contained inaccurate *misleading* information (i.e. 'How fast was the white sports car going when it passed the barn when travelling along the country road?'). (N.B. the film *had* shown the car passing a 'Stop' sign, but there was *no* barn. Mentioning a barn is misleading because it implies that there was a barn.)

Phase 3 One week later all the subjects were asked ten new questions about the accident. The final question was 'Did you see a barn?'

Results

In Group A only 2.7 per cent of the subjects responded 'Yes' to the Phase 3 question about the barn.

In Group B 17.3 per cent responded 'Yes'.

The misleading information had a significant influence on memory of the event. For a considerable number of Group B subjects, the fictitious barn had apparently been integrated with the memory representation of the filmed event.

2 Loftus, Miller and Burns (1978)

The rationale is the same as in the previous experiment.

Method

Phase 1 195 subjects viewed a sequence of 30 colour slides depicting events leading up to a car accident.

Group A saw the sequence with the upper picture in Figure 1.5 showing a red Datsun stopped at a 'Stop' sign.

Group B saw the same sequence except that it contained the lower picture showing the Datsun stopped at a 'Yield' sign.

Phase 2 Immediately afterwards all subjects answered 20 questions. For half the subjects in each group Question 17 was:

'Did another car pass the red Datsun while it was stopped at the "Stop" sign?'

For the other half Question 17 was:

'Did another car pass the red Datsun while it was stopped at the "Yield" sign?'

So for half the subjects the question was *consistent* with the slide they had seen and for half the subjects it was *misleading* (inconsistent).

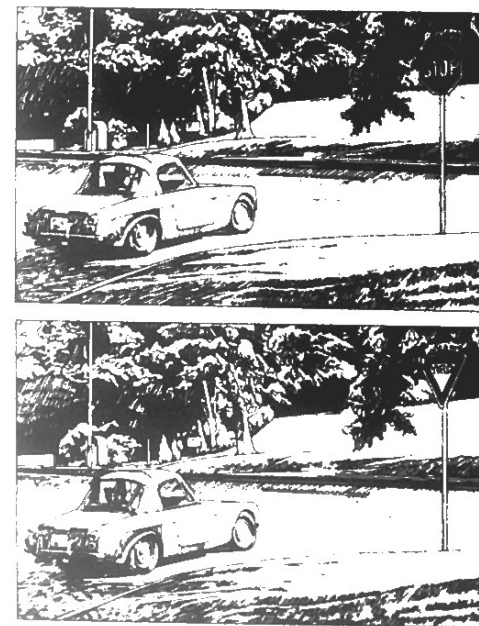


Figure 1.5 The red Datsun at the 'Stop' sign (top) and at the 'Yield' sign (bottom) (Drawings of the photos used by Loftus, Miller and Burns)

Phase 3 20 minutes later there was a forced-choice recognition test. 15 pairs of slides were presented. One of each pair was 'old' (i.e. it had been shown in the original sequence) and one was 'new' (i.e. it had not been seen before). Subjects had to select the 'old' slides. The critical pair of slides showed the 'Stop' sign and 'Yield' sign.

Results

75 per cent of the subjects who had received consistent information in Phase 2 chose the correct slide (i.e. the one with the sign they had seen in the original sequence).

Only 41 per cent of the subjects who had received misleading information were correct (that is, 59 per cent chose the sign mentioned in the question although it was *not* the one seen in the original sequence).

A further experiment showed that if Phases 2 and 3 were both delayed for one week, and administered so that the misleading information came just before the test, then accuracy in the misleading condition fell to 20 per cent. Note that in Loftus (1975) false information was *added* to the memory representation. In Loftus *et al.* (1978) the correct information was *deleted* and *replaced* by the false information.

In another Loftus experiment, subjects watched a film of a car accident. Subjects in Group A were then asked, 'What speed was the car travelling when it smashed into the other car?' Group B were asked, 'What speed was the car travelling when it bumped into the other car?' Would both groups be likely to give similar estimates of the speed? If not, which group might give a higher estimate? Why?

Loftus interprets these findings as showing that the memory representation of an event can be modified by subsequent information. She claims that this new information is incorporated into the memory, updating it, and erasing any of the original information that is inconsistent with it. According to Loftus, once the new misleading information is integrated into the original memory the subject cannot distinguish its source. He or she actually believes that the non-existent barn or the non-existent 'Yield' sign was seen.

Witnesses cannot always be easily misled. Further experiments (e.g. Loftus, 1979) have revealed conditions which make the original memory more resistant to distortion. Integration does not occur if the misleading information is 'blatantly incorrect'. In one experiment, subjects saw colour slides showing a man stealing a red wallet from a woman's bag. When asked questions about this event, 98 per cent remembered the colour of the wallet correctly. They then read a narrative description of the event containing the misleading information that the wallet was brown. The final test showed that all but two of the subjects resisted this 'blatantly incorrect' information and continued to remember the wallet as red. Thus, memory for obviously important information which is accurately perceived at the time is not easily distorted. The colour of the wallet was correctly remembered because the wallet was the focus of the whole event, not just a peripheral detail, and its colour was correctly noted at the initial viewing. The experiment also demonstrated that once subjects recognized one piece of misleading information as false they were more distrustful and less likely to be misled by any other false information.

We can now summarize these findings. People are more likely to be misled by false information if:

- 1 It concerns insignificant details that are peripheral to the main event.
- 2 The false information is given after a delay, when the memory of the actual event has had time to fade.
- 3 They are not aware that they may be deliberately misinformed and so have no reason to distrust the information they receive.

So the integration of related memories is more likely to take place in some circumstances than in others. New information may sometimes be disregarded and the original memory representation may remain intact. Research on eye-witness testimony has concentrated on the fallibility of memory and so gives rather a one-sided picture.

How far do the findings about eye-witness testimony support the predictions from schema theory? They have often been cited as providing a demonstration of the sort of integration that is predicted by schema theory (Alba and Hasher, 1983). But it should be emphasized that Loftus's misled witnesses are not only integrating prior knowledge from internal schemas about car accidents or purse-snatching with knowledge derived from recently observed event. They are also combining information from two different external sources — an observed event and subsequent verbal information about it — so that the memory may sometimes be a composite based on different sources of information. This kind of integration is not necessarily schema-based.

Nevertheless, eye-witness testimony can be influenced by schemas. Just as Brewer and Treyens showed that schemas can induce people to 'remember' non-existent objects in a room, List (1986) showed that schemas can exert similar effects on memory for events. Her subjects watched videos of shop-lifting incidents. Each incident included some actions rated as having high probability in a shop-lifting scenario and some actions having low probability. The influence of the schema was evident when recall was tested one week later. The subjects recalled more high probability actions and also falsely recalled some actions which had not occurred at all but which were highly likely in a shop-lifting incident. Notice, however, that eye-witness memory is not all schema-based. In the Loftus experiment, recall of the colour of the red wallet is an instance of memory for highly specific information which could not be predicted from a general schema.

Although most of the work on eye-witness testimony has been concerned to demonstrate its unreliability, some attempts have also been made to improve witnesses' recall. Geiselman *et al.* (1985) have devised a technique for interviewing which incorporates four principles based on what cognitive psychologists know about retrieval, and this technique is now known as the *Cognitive Interview*. The principles are:

- 1 Mentally reinstating the environmental and personal context at the time the event was witnessed. The witnesses are encouraged to 'think back' and recall immediately preceding events, their own actions and their mood.
- 2 Encouraging them to report every detail however trivial.
- 3 Asking them to describe the event sequence in different orders, both forward and backward.
- 4 Asking them to describe the event from different viewpoints (e.g. to say what they would have seen if they had been standing the other side of the road).

These principles are designed to maximize the number of possible retrieval routes. The idea is that reactivating the context will cue the memory of the original event. Experimental tests comparing Geiselman's

method with standard interview techniques have shown that up to 30 per cent more information is recalled without loss of accuracy and some police forces in both the USA and the UK are being trained to use the cognitive interview. In the experiments on eye-witness testimony many of the errors occur because subjects are forced to respond 'Yes' or 'No' to direct questions. In real-life situations, when open-ended questions are used, and witnesses can respond 'Don't know' or 'Not sure', testimony is much more accurate.

The most important theoretical point to arise out of the work on eye-witness testimony concerns the fate of the original memory when recall has been influenced by misleading information. This question has relevance to general theories about memory, not just to the eye-witness situation. Do memories get discarded when they are proved false, or are they still retained along with the new revised version? In the context of the work on eye-witness memory several hypotheses have been considered:

- 1 *The vacant-slot hypothesis* claims that the original information was never stored at all, so the false misleading information is simply inserted into a vacant slot in the memory representation. This hypothesis has been rejected because 90 per cent of subjects who are tested immediately after witnessing an event, and are not exposed to any misleading information, do report the original information correctly.
- 2 *The co-existence hypothesis* states that both the original true version and the false misleading version are retained in memory and co-exist. According to this hypothesis subjects usually respond with the false version because this was presented more recently and is therefore more accessible.
- 3 *The substitution hypothesis* states that the false misleading information displaces or transforms the original true information which is then irrecoverably lost. This is the hypothesis favoured by Loftus. Note that according to (1) and (3) the original memory cannot be recovered but according to (2) the original memory is recoverable. Two techniques have been used to try to resolve this issue, the warnings technique and the second guess technique. In studies examining the effects of warnings, subjects are given false misleading information and then warned that it is false and should be disregarded. The question then is can they reinstate the original memory? This is an important issue which arises in the context of jury decisions. Can jurors discount the evidence of a witness who is later discredited? The answer seems to be that they cannot. Experiments have shown that subjects who were warned to disregard the false information did no better than subjects who were not warned. They could not discard the false information and recover the original memory.

Another way to test whether the original memory is intact is to offer subjects the chance of a second guess. According to the co-existence hypothesis, people whose first response was the false misleading information should be able to make the correct response if given a second guess. Loftus (1979) reported an experiment in which subjects saw, in phase 1, a man reading a green book. The misleading information in phase 2 described the book as yellow. When the subjects were tested in phase 3, they were offered the alternatives green, blue and yellow to choose from. Misled subjects whose first choice was yellow were given a second choice, but their performance on this second guess was only at chance level, showing that they could not recover the original memory of the green book.

On the whole, evidence for the recoverability of the original memory is very slight, so there is little support for the co-existence hypothesis and the substitution hypothesis is more likely to be correct.

4.4 Confusing implications and assertions

Besides confusing what we have seen with what we have been told, we also make similar confusions about the verbal information we receive.

A common form of confusion occurs when people make what are called *constructive errors* in the recall of verbal information. When information is comprehended and stored in memory, the memory representation includes what was directly asserted as well as additional information that is generated from pre-stored schemas. People later fail to remember what was actually asserted (the external source) and instead report what was only implied and then constructed internally. So sentences like:

- 1 *The housewife spoke to the manager about the increased meat prices.*
 - 2 *The paratrooper leaped out of the door.*
- may be remembered as:
- 3 *The housewife complained to the manager about the increased meat prices.*
 - 4 *The paratrooper jumped out of the plane.*
- (Harris and Monaco, 1976)

The new bits that have appeared in (3) and (4) are called *pragmatic implications*. The statement that the paratrooper leaped out of the door implies that he was jumping out of a plane. Schemas about what paratroopers normally do supply this information. People elaborate the information they receive by making inferences of this kind and cannot afterwards distinguish between what was explicitly stated and what was implied. If the inferences drawn are not correct (e.g. if the housewife was in fact only chatting and not complaining), an inaccurate memory is stored.

Harris (1978) ran an interesting experiment to investigate how the members of a jury may be influenced by pragmatic implications, and believe that something which has only been implied has actually been asserted as definitely true.

TECHNIQUES BOX F

Harris's (1978) Experiment on Courtroom Testimony

Rationale

Harris tried two ways of making people less inclined to believe that something had been asserted as true when it had only been implied. One was to instruct them not to confuse implications with assertions, and the other was to let them confer together like a real jury in the hope that at least one of the group would detect the implications.

Method

72 subjects listened to a simulated courtroom testimony lasting five minutes. Subjects were told to pretend they were members of a jury. They should listen to the evidence and would be asked questions. Half the subjects had no further instructions. Half were told to be careful not to be influenced by implications but only by the facts and were given detailed examples of how beliefs can be affected by implications. In the testimony some of the information was expressed as direct assertions and some was only implied. Subjects heard different versions of the testimony. For example, some of the subjects heard a version with the direct assertion 'I rang the burglar alarm in the hall', and some heard a version with the statement 'I ran up to the burglar alarm in the hall', which implies that the alarm was rung but does not actually say so. After hearing the testimony, subjects were asked to rate 36 test statements as true, false or of indeterminate truth value (i.e. uncertain). Some subjects worked on their own; others worked together in small groups.

For the test statement 'I rang the burglar alarm in the hall' subjects should have responded 'True' if they had heard the version of the testimony in which it was asserted. If they had heard the implied version they should have judged the truth value as indeterminate.

Results

The mean percentage of 'True' responses to Assertions and Implications are shown in the table.

	Groups	
	No instructions	Instructions
Assertions judged as 'True' (correct)	87.6	
Implications judged as 'True' (incorrect)	67.3	80.2 60.4

Altogether 64 per cent of the Implications were incorrectly judged 'True'. Moreover the instructions failed to reduce the number of 'True' responses to Implications by a significant extent. When subjects were allowed to make their decisions in small groups, there was also no significant improvement in accuracy.

Harris concluded that it is dangerously easy to mislead juries into believing that what is only implied is true. In his experiment subjects assumed that someone running up to a burglar alarm would ring it. An implication of this kind is incorporated into the memory representation and afterwards the information that was *heard* and the information that was *thought* (i.e. the implication) cannot be distinguished.

The results demonstrate integration of information from the senses with information derived from inferences based on the prior knowledge of what is likely to occur. Just as predicted by schema theory, it is often impossible to identify the original source of information in the memory representation.

Summary of Section 4

- When people remember a particular scene they are influenced by the schema appropriate for that type of scene. They remember things that fit the schema and forget the things that do not.
- Experiments on eye-witness testimony show that the memory of an event that was witnessed can be falsified if misleading information is presented later.
- It is not clear whether the original memory of the event is changed or whether it remains intact but is superseded by a new, inaccurate memory representation. However, the evidence suggests that it is rarely possible to recover the original memory once it has been tampered with.
- In remembering verbal information, facts that were only implied (and are not necessarily true) may be confused with facts that were actually stated.