# Where Did You Park Your Car? Analysis of a Naturalistic Long-term Recency Effect

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Three experiments studied the long-term retention of parking locations. In Experiment 1, members of the Applied Psychology Unit (APU) attempted to recall where they had parked during the morning and afternoon of each of the previous 12 working days. A marked recency effect was observed. In Experiment 2, members of the APU Subject Panel were invited for a single test session, and asked where they had parked after a delay of 2 hours, 1 week or 1 month. Recall was excellent and did not differ as a function of delay, allowing a simple trace decay interpretation to be ruled out. A third experiment invited subjects to attend on two occasions separated by a 2-week interval. The subjects were then required to recall their parking locations some 4 weeks after either their first visit or their second visit. Performance in both groups was inferior to that observed in Experiment 2, and declined over time. A temporal discrimination model, based on laboratory studies of both long-term and short-term recency in free recall, offers a plausible explanation of our results.

## INTRODUCTION

One of the most pervasive features of human memory is the recency effect whereby given a string of items, the most recent tends to be best recalled. The phenomenon has been explored most extensively in tests of immediate free recall (e.g. Glanzer, 1972), but occurs in a wide range of situations including delayed free recall (Baddeley & Hitch, 1977; Tzeng, 1973),

paired associate learning (Bjork & Whitten, 1974; Peterson, 1966) and serial recall (Jensen & Roden, 1963). While it seems unlikely that the identical processes are operative across all these tasks, it has been suggested that what many of them may have in common is the operation of a specific retrieval strategy involving a last-in-first-out process (Baddeley, 1986, ch. 7). Baddeley has suggested that recency may be a particularly basic and pervasive strategy because it plays an important role in orientation in time and place, something of fundamental importance not only to man but also to any organism that must find its way around in a complex environment. The experiments that follow describe one particular aspect of orientation, remembering where one has parked one's car, investigating to what extent recency occurs and exploring some of the variables that influence recall.

The first experiment is a naturalistic study of the capacity of people to remember where they parked over the previous 12 days. This is followed by two further experiments, one in which a relatively isolated parking incident is recalled after varying delays, while the other is concerned with forgetting when the subject is attempting to recall one of two similar occasions.

The task of remembering where you parked on a particular occasion does not conform to any of the standard experimental paradigms. For that reason, there is no ready-made model that might be taken from the laboratory and used to predict the results that would be obtained. There is, however, one model which has been developed in one form or another and applied to a number of tasks involving recency. This is the model that assumes that recall involves discriminating the item to be remembered from adjacent and potentially interfering items. It assumes that the probability of correct recall will be a function of the relationship between the delay in recalling the target item and the delay imposed by the potentially interfering items. As this discrimination ratio decreases, the probability of correct recall goes down. While the specific formulation of the model varies from one investigator to another, interpretations broadly based on the discrimination hypothesis have been presented for both free recall (Glenberg, Bradley, Kraus & Renzaglia, 1983; Hitch, Rejman & Turner, 1980) and for the Peterson task (Baddeley, 1976, pp. 127–131). We shall use the discrimination hypothesis to guide the questions asked about recalling car parking locations, using it however as a qualitative guide rather than a quantitative predictor.

The first experiment involved recording the parking location of cars within the car park of the APU over a period of 12 days, and subsequently asking members of APU staff to attempt to recollect where they parked on each of the previous days.

# EXPERIMENT 1

## Method

Over a period of 12 working days, starting on a Wednesday and excluding weekends, the parking location and registration number of all cars found inside the private parking area adjacent to the APU were recorded twice daily, at 11.30 a.m. and 3.30 p.m. A total of 112 different cars were recorded, of which rather less than half belonged to APU staff. On day 12, between 2.00 and 2.30 p.m., a letter and questionnaire was delivered to all APU staff asking for their help in a memory experiment. The subjects were asked to attempt to remember where they had parked their cars on each morning and afternoon for the last 12 working days. They were given a plan of the parking area with numbered locations. They were asked to attempt to record the parking location for each morning and afternoon, using either a location number, or two numbers if they had parked between two locations. If they had come by car but had no idea where they had parked, they should mark with a "/", whereas if they had not come by car they should record "0". They were asked to guess if uncertain and to complete the questionnaire in any order they wished. They were requested not to use diaries or external aids, and to return the questionnaire by 4.00 p.m. A total of 41 subjects returned completed questionnaires, their ages ranging from 20 to 64 years ($\bar{x}$ = 39.3 years, S.D. = 11.3 years).

## Results

The subjects tested proved to have parked on a mean of 52% of the 24 possible occasions, with the frequency of parking distributed equally across the period of the test. Their responses were scored using four separate criteria as follows:

1. *Precisely accurate responses*: here, the reported and actual locations were identical.
2. *Approximately correct responses*: these were recorded when the subjects were accurate to within one location. Hence, if the subject had parked in location 51, then 50, 51 or 52 would be scored as correct on this measure.
3. *Correct area*: the parking lot comprises 9 "natural" areas, marked by features such as trees, flower beds and gateways. A subject would be scored correct if his or her response came from the same area as that in which he or she had parked. For example, a subject who had actually parked at location 51 would be scored correct on this measure if he or

she recalled location 55, but not if he or she recalled location 44 or location 80.

4. *Correct regardless of location*: a subject would be scored as correct on this measure if he or she marked any location on a day when he or she had actually come in by car. An error on this score would occur when the subject either responded with a location on a day when he or she had not come by car, or reported that he or she had not come by car on an occasion when his or her car had been recorded.

Figure 1 shows the mean performance on the four measures as a function of elapsed time. Note that odd numbers refer to mornings and even numbers to afternoons. An examination of Fig. 1 suggests a tendency for the most recent occasions to give rise to the highest probability of recall on all four measures, with overall level of performance not surprisingly being a function of the degree of precision required by the measure. There is also clear evidence of a sawtooth effect in all four functions, with performance tending to be higher in the morning than in the afternoon. This is true of all 12 days for the most demanding measure of precisely correct location, 11 out of 12 days for the correct within one location measure, for all 12 days when the general area measure is used, and for 10 out of 11 days with one tie when subjects are scored on whether they are accurate in recalling whether they came by car or not on that occasion. In contrast, there are no very obvious effects of day of the week, other than a particularly poor performance on the first Friday, coupled with a particularly good performance on the following Monday. That Friday had a particularly heavy number of cars parked, and this may have disrupted parking habits.

Given that the four measures show a broadly equivalent pattern, we decided to select one as our principal indicator of recall. Because parking locations were not actually marked in the car park at that time, the most precise measure is probably rather too restricted, as the subjects do on occasion park across two hypothetical locations. On the other hand, the area measure is clearly too broad to convey detailed information. We therefore selected the second measure, counting a correct response as recalling either the location recorded or an adjacent location.

While Fig. 1 is broadly consistent with the idea of a recency effect in memory for parking locations, the data should be treated with caution, because they differ from the traditional recency paradigm in two important respects. The first of these is based on the fact that subjects do not park at random, and indeed some subjects park fairly regularly in the same location. Such a subject would be able to score very highly without having any true recollection of particular parking instances, simply by always marking the favoured parking spot. Some evidence for this possibility is given by a correlation between number of different parking spots used by a
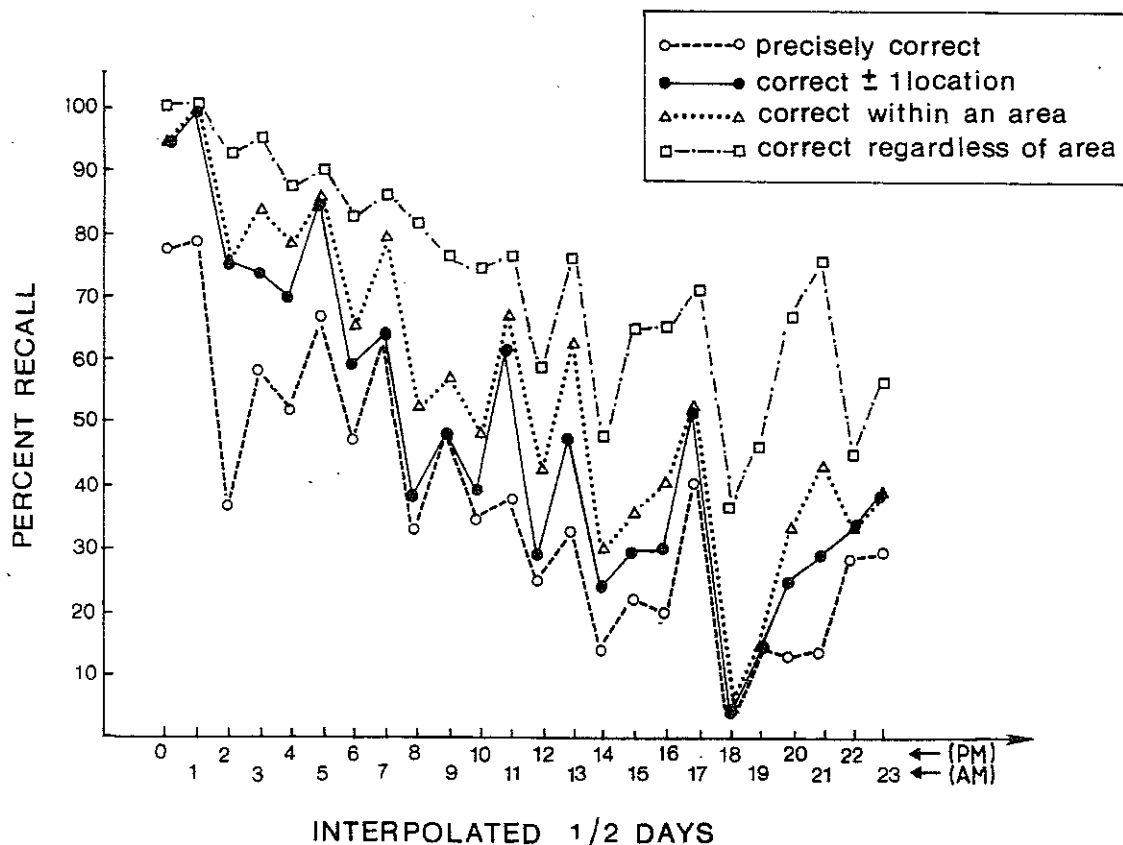
FIG. 1 Mean percentage correct recall of parking location over a period of 12 working days.

subject and the number of errors as measured by the second criterion (correct ± 1 location). This gave a Pearson correlation of 0.85 ($P < 0.001$).

In order to explore this point further, two subgroups were selected from the subjects tested. Group 1 comprised 11 subjects who were consistent in their parking habits, using a maximum of six different locations over the 24 possible occasions ($\bar{x} = 4.0$, S.D. = 1.5). They recorded a mean of 18.2 (S.D. = 5.6) occasions on which they had used their car out of the 24 possible. The second group comprised 11 subjects who were inconsistent in their parking habits, using between 7 and 11 different locations ($\bar{x} = 8.0$, S.D. = 2.4). They were matched in frequency with which they had parked their car during the test period with group 1 ($\bar{x} = 17.8$, S.D = 3.6). While both groups showed relatively good retention of the last two parking occasions, and both showed some evidence of a recency effect, the effect was very much clearer in the inconsistent parking group, the condition which more closely resembles the standard laboratory paradigm.

A second feature that differentiates the parking situation from the standard free recall paradigm stems from the fact that not all drivers remove their car at lunchtime. While the majority of cars would probably be driven away and back again after lunch, some staff members typically have a sandwich lunch

within the Unit, or go to lunch on foot or by bicycle, leaving their car in the same location. This would lead to a car being recorded as parking on two successive occasions in the same place, whereas in fact it would represent only a single parking occasion. Any such tendency would clearly add noise to the data by systematically over-representing the number of interpolated parking occasions for these subjects.

We therefore carried out a second partitioning of data, forming two separate groups, one comprising subjects whose cars were frequently in the same location in the morning and the afternoon, while the other consisted of subjects whose cars tended to have different locations between the morning and the afternoon. In order to select such groups, each subject was given a ratio score based on the number of occasions on which morning and afternoon parking locations were identical as a proportion of total number of parking occasions on which the subject's car had been recorded. Hence, if a given subject's car had been present for both the morning and afternoon on 5 days, and on only one of these the morning and afternoon location had been identical, then a value of 0.2 would be scored. The correlation between this ratio and the mean number of correct recall responses was calculated, and proved to be significant ($r = 0.43$, d.f. $= 40$, $P < 0.01$), suggesting that this variable is a potentially important determinant of performance.

In order to explore this factor further, we selected two groups, a same location group having a mean ratio of 0.91 (S.D. $= 0.09$), comprising subjects whose cars were present on a mean of 15.8 (S.D. $= 4.9$) of the 24 possible occasions, and a different location group comprising subjects with a mean ratio of 0.38 (S.D. $= 0.22$) whose cars were parked on a mean of 15.6 (S.D. $= 4.0$) of the 24 possible occasions. The consistent group were correct on a mean of 62% of occasions and the inconsistent a mean of 36%. The different location group showed a much clearer recency effect than the similar group. However, there was a tendency for subjects who were in the different location group to comprise subjects who had also been included in the varied parking location group analysed previously, and for the same location subjects to be in the previous consistent group. In order to avoid confounding the question of overall consistency of parking location and that of morning–afternoon consistency, we discarded such subjects.

This left us with two groups of 12 subjects. The group who tended to park in the same location in the morning and afternoon were present on a mean of 17.9 (S.D. $= 5.5$) of the 24 possible occasions. The inconsistent morning–afternoon group were parked at the APU on a mean of 17.0 (S.D. $= 4.2$) of the 24 possible occasions. While some tendency for performance to decline was shown in the group that tended to park in the

same location, the effect was not very consistent, possibly because the nominal number of interpolated parking occasions is greater than the actual number, because although recorded twice a day, the car is parked only once, that being a morning parking for which recall levels are consistently higher. Those subjects who tend to park in different locations in the morning and afternoon, however, showed a very clear recency effect.

In general, then, remembering a parking location tends to show evidence of recency. The evidence is particularly clear and striking in those conditions that most closely resemble the classic free recall paradigm in which subjects experience a number of different events. Those subjects who deviate from the standard pattern by consistently parking in the same location, whether between the morning and afternoon or across successive days, also show some evidence of recency, but the overall level is much higher and apparent forgetting as a function of interpolated time or events is much less.

At least two interpretations of this suggest themselves. First, it may simply be that subjects who park consistently are able to guess more accurately. The second is that repeated parking in a given location will strengthen the memory trace leading to enhanced recall rather than simply a higher guessing rate. Both of these effects would lead to a higher baseline level of performance, hence restricting the possible range of a recency effect. For the purpose of the investigation of recency, however, it is less important to know why such deviations cause less marked recency, than to take advantage of the clear recency effect found in this paradigm when subjects who habitually park in one location are excluded.

Having uncovered a clear recency effect, the next question was to analyse this in more detail. We began by attempting a partial correlation analysis, equivalent to that used by Baddeley and Hitch (1977), in order to separate out the question of whether forgetting is best explained by the amount of elapsed time, or by the number of interpolated events. In their study of a recency effect in rugby players' memory of the name of opposing teams, there was clear evidence that the crucial factor was interpolated events rather than elapsed time. Unfortunately, however, the correlation between elapsed time and number of interpolated events among our own subjects was too high (Kendall's $\tau = 0.992$) to make any attempt to use partial correlation to compare the effects of time and interpolated events feasible. Hence, having demonstrated that memory for parking locations is a suitable paradigm, we decided to carry out a further experiment directly aimed at comparing the relative effects of delay and number of interpolated parking occasions.

# EXPERIMENT 2

Experiment 1 clearly shows that those subjects who do not park regularly in the same location rapidly forget where they parked, producing a marked recency effect. Our data do not, however, allow us to decide whether the recency effect obeys approximately the same rule as apparently similar recency effects obtained within the laboratory, or rather represents a quite different phenomenon. Within the standard laboratory free recall paradigm, recency has been shown to depend on number of interpolated items rather than elapsed time, a phenomenon that has also proved to be the case for long-term recency effects in such tasks as the recall of earlier games by rugby players (Baddeley & Hitch, 1977). Experiment 2 was concerned with the question of whether this is also true of remembering a parking location.

The subjects attending the APU who participated in the experiments were tested for memory of their parking location after delays of 2 hours, 1 week and 1 month. We know that during this period they did not return to the APU, although they presumably parked regularly in other quite different environments during that time. Watkins and Peynircioglu (1983) have shown that activities that are very different in character do not interfere, with the result that subjects can simultaneously show clear recency effects for several different activities. By this analogy, one might expect the last occasion on which one has parked in a particular location to be relatively resistant to forgetting over time. On the other hand, if elapsed time is the crucial factor in forgetting in this context, or if parking anywhere is sufficient to override one's recollection of parking at the APU, then subjects tested after 4 weeks should remember substantially less than those tested after 1 week or 2 hours.

## Method

During the period December–March, the parking location and car registration of 80 subjects who came by car were recorded. The subjects arrived at one of several times in the morning or afternoon, but none arrived after dark. Because the testing times coincided with the working period of the Unit, the subjects had to take whatever space was available, making it unlikely that even a subject who had been on the Panel for many years could reliably develop a favourite and consistent parking location. The subjects comprised 64 females and 16 males, ranging in age from 28 to 71 years ($\bar{x} = 42$ years). They were assigned to one of three groups, to be tested either 2 hours after arrival, or 1 week or 1 month later.

The 1-week and 1-month groups were sent a letter containing a plan of the parking area, instructions and a stamped addressed envelope. The letter was sent either 6 or 29 days after the subject had attended. The

instructions were the same as used in Experiment 1 with the addition that subjects were explicitly told that they could respond with two adjacent numbers if they thought they had parked between the two locations. A total of 26 subjects were approached after each of these two delays, all of whom returned the letter, although one subject in the 1-month delay condition refused to give a parking location on the grounds that he claimed to have no idea where he had parked. A third group of 29 subjects was asked for the recall of the parking location at the end of a 2-hour group test session, before leaving the APU.

## Results and Discussion

Table 1 shows the mean percentage recall of subjects in the three groups scored according to three of the four criteria outlined in Experiment 1. It is clear from this that recall is relatively good, with a level of 70% precisely correct responses, and is equivalent across the three groups. Such a result is clearly inconsistent with a simple trace decay interpretation of the forgetting observed in Experiment 1. The most appropriate comparison group would be those subjects in Experiment 1 who did not repeatedly park in the same location, because subjects are usually tested at times after most of the APU staff have already arrived and parked. An examination of Figs 1 and 2 suggests that a level of 70% recall is somewhere between what would be expected from subjects recalling on that specific day and subjects recalling their parking location on the previous day. In Experiment 1, level of performance after a week or more was in the region of 10–20%, very substantially lower than that shown by any of the three groups tested in Experiment 2.

There was, however, one measure which did suggest some forgetting over time. Although the number of occasions on which a subject's car was recorded as parking across two locations was small, there was an increase in the frequency with which subjects responded with two locations ($\chi^2 =$

TABLE 1
Percent Correct Recall for Parking Occasions as a Function of Retention Interval and Accuracy Levels

| Retention Interval | n | Accurate Responses | Correct ± One Location | Correct General Area |
|---|---|---|---|---|
| 2 hours | 29 | 72% | 93% | 93% |
| 1 week | 26 | 73% | 92% | 96% |
| 1 month | 25 | 72% | 92% | 92% |

TABLE 2

Total Number of Occasions when Subjects Parked Across Two Parking Locations, and Frequency with which Their Recall Responses Involved Two Locations

| | n | One Location | | Two Locations | |
|---|---|---|---|---|---|
| | | Recorded | Response | Recorded | Response |
| 2 hours | 29 | 21 | 25 | 8 | 4 |
| 1 week | 26 | 24 | 18 | 2 | 8 |
| 1 month | 25[a] | 23 | 9 | 2 | 15 |

[a]One subject said he had no idea where he parked and his response was not included in Table 2.

14.05, $P < 0.001$). As Table 2 shows, this tendency is particularly marked in the group tested after a 1-month delay. Whether this reflects a loss of information, or simply an increase in caution, is unclear. It could be argued that these dual responses exaggerated the level of recall of the 1-month group on the most specific measure. However, we have argued earlier that such a measure is probably inappropriately specific, as subjects do park across locations. A genuine effect of forgetting over time would be expected to show on the second measure (correct $\pm$ 1 location) as was the case in Experiment 1. It is clear that recall was uniformly high, being over 90% in all three conditions on this measure. The most likely interpretation would therefore seem to be that elapsed time reduces the subjects' level of confidence in their recall, although performance remains excellent.

The results of Experiment 2 therefore suggest that neither elapsed time nor the experience of parking in other locations is sufficient to cause substantial forgetting of the last occasion on which our subjects parked at the APU. This is broadly consistent with a temporal discrimination hypothesis, provided one makes the plausible assumption that any prior experience of parking at the Unit is likely to have occurred at a substantially more distant period than the maximum recall interval of 1 month. While detailed records of visits by car were unfortunately not available, we know that subjects typically have a gap of 3–6 months between visits to the Unit, suggesting that the discrimination hypothesis is at least broadly plausible. A more specific test of the hypothesis can, however, be carried out if subjects are expressly required to attend the Unit on more than one occasion. This should produce discrimination ratios that are substantially less favourable than those that are likely to have obtained in Experiment 2, hence leading to a lower overall level of performance. Secondly, recall under these circumstances should be a function of delay.

In Experiment 3, therefore, the subjects were required to attend the

Unit on two occasions separated by 2 weeks. They were then tested for recall of parking location on both visits, either 2 or 4 weeks after the last visit. The discrimination hypothesis predicts that under these circumstances, elapsed time will be an important variable. The 2-week recall group should have a higher discrimination ratio for its last visit than the 4-week group, leading to significantly better recall.

# EXPERIMENT 3

## Procedure

The subjects were invited to attend the APU for group testing, and on these occasions car locations were noted. The subjects were asked to note whether they had come to the test session by car, bus or bicycle, and those who came by car were asked for their car registration number and were invited to return again approximately 2 weeks later. A total of 28 male and 35 female subjects within the age range 25–71 years accepted the invitation and were tested. Almost all came to participate in early evening sessions during the months of April to June. This meant that they were likely to have slightly more choice in parking location than did subjects in Experiment 2, who typically came at a time when many parking locations would already have been occupied by APU staff. The subjects were randomly assigned to one of two groups, a 1-month delay group ($n = 30$) who were subsequently questioned 4 weeks after their second visit, while the second ($n = 33$) were tested 2 weeks after their second visit.

Testing was done by post, with each subject receiving a letter, two sealed envelopes, a map of the parking locations and an unsealed stamped addressed envelope for their reply. Their instructions were as for Experiment 2; responses to both were then to be posted back to the APU in the envelope provided. All 63 subjects responded as requested.

## Results

As in Experiment 1, a potential complicating factor is that of subjects who park on both occasions in the same location, because this is likely to influence probability of accurate recall. For that reason, the subjects who parked on both occasions in the same or an immediately adjacent parking spot were excluded, leaving 24 of the original 33 subjects in the short-delay group and 19 of the initial 30 subjects in the long-delay condition.

The mean percentage of responses that were correct within one location for the short- and long-delay conditions is shown in Table 3, which also shows the equivalent data from Experiment 2 for purposes of comparison.

TABLE 3

Percentage Correct Recall (± One Location) as a Function of Delay

| Condition | Delay (Weeks) | | | |
|---|---|---|---|---|
| | *1* | *2* | *4* | *6* |
| Expt 3: short-delay group | — | 79% | 63% | — |
| Expt 3: long-delay group | — | — | 53% | 32% |
| Expt 2: single-visit groups | 92% | — | 92% | — |

Considered overall, the subjects in the short-delay group were correct on 34 of a possible 48 recalls, whereas the long-delay group were correct on 16 of a possible 38 recalls ($\chi^2$ = 6.98, d.f. = 1, $P$ < 0.01). When the comparison is based upon the 4-week delay condition only, then the difference between the two conditions falls far short of significance ($\chi^2$ < 1), suggesting that the overall difference results from the poorer performance after a 6-week than after a 2-week delay, as indeed is the case ($\chi^2$ = 9.69, d.f. = 1, $P$ < 0.01).

When the 4-week delay conditions are compared with the 4-week delay condition in Experiment 2, clear differences occur for both the overall short-delay condition ($\chi^2$ = 5.19, d.f. = 1, $P$ < 0.05) and for the overall long-delay condition ($\chi^2$ = 6.95, d.f. = 1, $P$ < 0.01), supporting the prediction that trying to remember two events would lead to poorer recall than remembering one.

## Discussion

The results of Experiment 3 suggest that when subjects are attempting to recall two visits, then overall elapsed time is an important variable, with subjects for whom the visits occurred 2 and 4 weeks previously remembering significantly more accurately than those subjects attempting to recall visits that occurred 4 and 6 weeks before. When both groups were trying to remember where they had parked 1 month earlier, however, no difference was found, indicating that it is the better recall after 2 weeks in the short-delay group, and the poorer recall after 6 weeks in the long-delay group, that is creating the difference. Such results are therefore consistent with the hypothesis that temporal delay is an important factor, provided that the subjects are attempting to remember more than one incident.

When the performance of the two groups at 1 month was compared with that of the 1-month group in Experiment 2, their overall level of recall proved to be significantly lower. This is consistent with evidence from other sources suggesting that as the number of events to be remembered

increases, the probability of correct recall declines (Shiffrin, 1970). However, while such a result is consistent with earlier observations, it should still be treated with caution, as the testing conditions for Experiments 2 and 3 were not identical. Experiment 2 occurred during the afternoon when the APU car park tends to be relatively full, whereas Experiment 3 took place in the early evening when more parking places are likely to be available. It is also possible that the subjects attending for testing at these two times of day may differ.

## GENERAL DISCUSSION

Experiment 1 demonstrated a clear recency effect in the recall of a parking location by subjects who habitually used the same car park. The observed forgetting was, however, open to at least three interpretations; in terms of elapsed time, in terms of interpolated events, or in terms of a discrimination hypothesis which assumes an interaction between both these variables.

Experiment 2 indicated that when the subjects were attempting to recall a single occasion, separated from other visits to the Unit by a substantial period of time, then level of performance was high, with no detectable effect of delay. In Experiment 3, however, when the subjects were attempting to recall their parking location on two visits separated by a 2-week gap, overall performance was poorer, and the effect of delay quite pronounced.

How could our results be explained? We will begin by considering two very simple mechanisms, namely elapsed time and interference from interpolated events. A simple effect of trace decay due to passage of time might be sufficient to explain the results of Experiment 1, but would have difficulty explaining the absence of any difference between the 2-hour, 2-week and 4-week conditions in Experiment 2, without calling in some additional factors such as interference or cue overload.

A very simple interference by displacement hypothesis could account for the forgetting in Experiment 1, and the comparative absence of forgetting in Experiment 2, provided one makes the plausible assumption that displacement only occurs when interpolated events are similar, so that parking in other locations does not disrupt memory for parking at the APU. Such a simple displacement hypothesis, however, has difficulty in explaining the results of Experiment 3, where the conditions both involve two events. A displacement hypothesis could successfully explain why performance in this experiment was lower than that obtained in Experiment 2, but would have difficulty explaining why the performance was so much worse when the two events occurred 4 and 6 weeks ago than when they were recalled after 2 and 4 weeks.

Our results would therefore seem to demand an explanation that involves both elapsed time and competition between events to be recalled.

As mentioned in the Introduction, models of this kind have already been proposed as offering an explanation of recency effects in terms of a temporal discrimination hypothesis. Such a hypothesis was outlined by Bjork and Whitten (1974) and developed by Hitch et al. (1980) and Glenberg et al. (1980; 1983), and is similar in spirit to a discrimination interpretation of the Peterson forgetting effect presented by Baddeley (1976, p. 127). All these interpretations assume that one cause of forgetting is the difficulty in retrieving a specified item from among a set of broadly similar items. The probability of correct retrieval depends on both the temporal interval between potentially competing items and also the delay between presentation and recall. A visual analogy is offered by the experience of looking back along a line of equally spaced telegraph poles. The poles nearest to the viewer are easily discriminated, but as they recede it becomes increasingly difficult to separate adjacent poles, much more difficult than it would be to identify a single post at a comparable distance.

How adequate is such a model to explain the present results? In the case of the 4-week delay, it would predict that the subjects in Experiment 3 who recalled two visits would show poorer recall than the 4-week delay group of Experiment 2, who recalled a single event. It would successfully predict the poorer performance of the 6-week delay condition and the enhanced recall of the 2-week delay condition at a qualitative level. A quantitative comparison can be made by computing the discrimination ratio based on a mean inter-parking interval of 2 weeks and delays of 2, 4 and 6 weeks. The relevant ratios are shown in Fig. 2, where $t$ is the time between the two recalled events and $T$ is the delay between retrieval and the time of occurrence of the event to be recalled. Although the fit is not very precise, our results are broadly as predicted. It would clearly be highly desirable to collect more extensive data, but unfortunately by this stage of the study the number of suitable subjects on the APU subject panel who had not been tested already had become prohibitively small.

The long-delay group produced a total of 15 intrusion errors, in which the subject recalled a parking location correctly but attributed it to the wrong visit. Of these, eight were forward intrusions and seven backward. The short-delay group produced one backward and no forward intrusions. The discrimination model does not make any very specific predictions about intrusion errors. Our data would suggest that such errors are more likely to occur when subjects are attempting to recall items based on a moderate and a weak discrimination ratio rather than when a moderate and strong ratio are involved. This is plausible if one assumes that the 2-week recall condition produces a relatively strong and discriminable trace which is not subject to confusion with the weaker 4-week recall, in contrast to the condition where a moderate level of recall is competing with a weak level of recall, with neither being sufficiently strong to rule out intrusions.
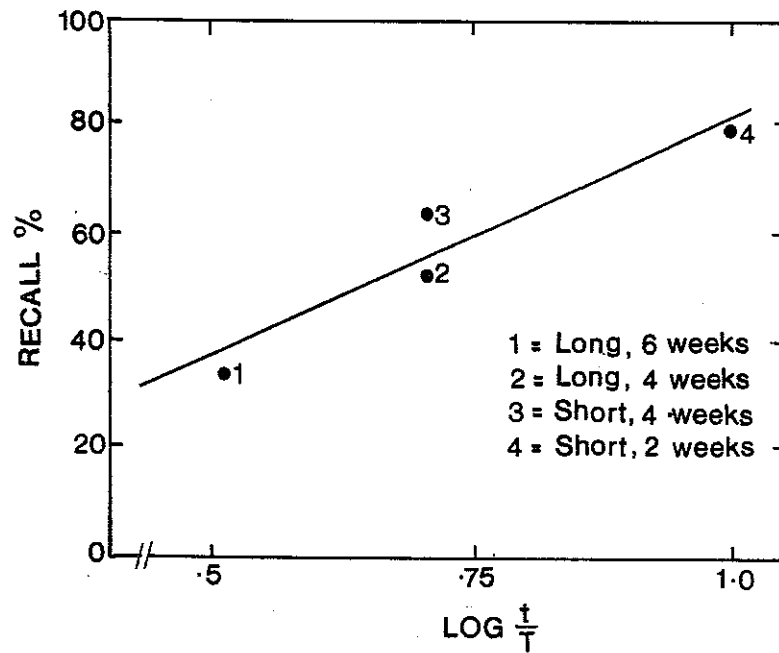
FIG. 2 Percentage correct recall of parking location and discrimination ratio (data from Experiment 3).

In conclusion, our results suggest first of all that an everyday activity or orientation such as remembering where one has parked one's car does appear to show a clear recency effect, an effect that broadly speaking behaves in a similar way to recency effects in the rather more constrained laboratory paradigms of the free recall, minimal paired associate learning and Peterson task performance. As such, they give some support to the idea that the recency is relevant to the basic process of orientation in time and space (Baddeley, 1986).

Furthermore, our results give support to the attempt to explain recency in terms of a discrimination hypothesis that takes into account both elapsed time and interference from competing traces. It is important to bear in mind, however, that the extent of this support is limited by the nature of the data that one can readily collect in contexts as complex as this. It would clearly be highly desirable to carry out further research in which much larger numbers of subjects are tested and in which a better control is exercised over the subjects' behaviour.

Given the logistic problems of carrying out research on problems such as memory for parking location, should we not confine our efforts to the laboratory, safe in the assumption that the general principles of memory will work just as well outside as inside the laboratory? Such an approach was presented vigorously by Banaji and Crowder (1989), who might suggest that our results were obvious to any knowledgeable cognitive psychologist. We believe that they are far from obvious and have indeed

attempted unsuccessfully to find everyday analogies of recency in other contexts. We tried, for example, asking psychology students to recall the various laboratory practical projects they had participated in during the previous year. Evidence of recency was sparse; the students appeared to retrieve mainly on the basis of either area (perception, memory, motor skill) or in terms of features that made a particular demonstration striking. We suspect that in everyday long-term memory, sheer temporal recency is often not a major determinant of recall probability, with semantic cues being much more important than temporal cues. We have demonstrated that recency effects can be found in an everyday memory task, and that they broadly fit a discrimination hypothesis. We have, however, no idea of how typical they are; the only way that we shall find out is by continuing to carry out experiments in naturalistic situations, preferably doing so in a more systematic and representative way than has so far been the case (e.g., Brunswik, 1956).

In conclusion, we believe that it is important to attempt to explore the generality of the findings of the memory laboratory, even when the conditions for testing specific models fall below what can be achieved within the much more artificial conditions of the laboratory. Both types of research are needed if we are to build a robust and general psychology of memory.

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