

THE RECALL OF
CONNECTED DISCOURSE

by

John Aitken Mills, B.A. (Hons.), M.Sc.

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the requirements for the degree of Ph.D.

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S U M M A R Y

The first four chapters of the thesis are concerned with a discussion of theoretical issues relevant for the present investigation and include a review of the published literature on the recall of connected discourse and on individual differences in recall.

In dealing with Interference Theory, attention is focussed on Underwood's differentiation hypothesis and on two further concepts, generalized response competition and associative context. It is also shown that all-or-none coding applies to the learning of single verbal associations. There is a discussion of recent work which allows the equation of meaningfulness with familiarity, where familiarity is defined as the extent to which certain associations are likely to be experienced.

Speculations derived from Gestalt Theory are treated from two points of view. Firstly, there is a full discussion of those contributions by Bartlett which have direct relevance to memory for prose passages. Secondly, the latest developments of Koffka's notion that the processes controlling the preservation of memory for personal events are distinct from those determining the recall of formal materials are treated critically. It is surmised that this distinction originates in an attempt to deal with the way in which needs and interests affect recall.

Two major sources for individual differences in recall are distinguished: (i) a general tendency for the differential development of predisposition to interference and, (ii) the influence of needs and interests. Provisionally, it is suggested that the latter direct a particular person to one segment of the verbal universe rather than another.

The experimental work opens with a Pilot Study in which a possible association is explored between a personality measure (the Self-Rationalization Index) and the recall of passages of connected discourse. No relationship is found. However, a good relationship between reading speed and immediate recall is reported, while there is some evidence that the processes governing immediate recall differ from those controlling later memory. The most significant finding, in the sense that it stimulated four of the experiments which follow, is the marked difference in the ease of recall of the four passages used: a narrative was well retained, a complex description less well, while an argument and an introspective passage are retained equally badly.

The possible implications of the last finding are discussed in terms of two explanatory variables. Certain ambiguities in the concept of "form", as defined by Bartlett, are pointed out; and it is suggested that it would be preferable to use degree of familiarity with the words of the passages as the variable of choice.

In Experiment One, the relationships between a scale of visual imagery and the recall of the descriptive passage used in the Pilot Study are described. The hypothesis is that those who are able to form such an image relatively well would achieve better recall than those who form the image relatively badly. It is also suggested that those who form a good image would be 'visualizers', as defined by Bartlett, and that those who fail to form such an image would be 'vocalizers'. Bartlett's suggestions regarding assimilation tendencies and tendencies to alter the order of recall as related to the visualizer-vocalizer dimension are also examined. Although a positive and significant correlation is reported between recall and strength of image, it is impossible to demonstrate the validity of the hypothesis fully. It proves impossible to put the other hypotheses to the test.

In Experiment Two, a further attempt is made to test Bartlett's hypothesis with regard to form as a determining variable of the recall of prose. An effort is made to abstract this variable while keeping content constant. Two "forms" are extracted (argumentative and narrative) and passages were specially written to exhibit them. No difference in recall is found.

Experiment Three concerns the relationship between the recall of two passages identical in content but different in style of presentation. Evidence suggests that recall is greater for a conventional style than for a terse, note-form of presentation, despite the greater length of the former. Evidence is also quoted

to show that a conventional presentation induces greater changes in the order of recall, suggesting that subjects found it easier to incorporate material presented in this form into their memory systems.

Previous work has shown that subjects differ markedly in the extent to which they reproduce the original words of a passage (change tendency). Experiment Four examines the relationship between change tendency and ability to recall in different situations. A slight consistency between change tendencies as measured on prose passages of different types is reported but there appears to be no relationship between change tendency and degree of recall.

In Experiment Five the hypothesis concerning familiarity and recall is tested. It was the task of the subjects to rate a series of sentences on a 9-point scale. Recall scores were available for some of the sentences (experimental sentences). The remainder (filler sentences) were from reading matter that was well-known to the generality of the judges. Rated degree of familiarity is correlated with degree of recall of the experimental sentences, and a positive and significant coefficient obtained.

The results of Experiment One indicate that it is possible that some form of intrinsic structure is developed in the course of learning descriptive prose. It is therefore possible that the memory of such prose might be protected against influences arising from interference effects between the memory traces of the actual

words of the passage. The hypothesis is tested in Experiment Six by creating an RI design using two 29-word passages of descriptive prose as original and interpolated lists. Significant RI is found. Such evidence as there is suggests that the form of interference is generalized response competition. A significant warming-up or learning-how-to-learn effect of the original upon the interpolated passage is also reported.

The main conclusion of the thesis is that Association Theory provides the major theoretical source for an attack on the problem of individual differences in recall. An excursion beyond the limits of the topic of verbal memory is made with the conjecture that it might be possible to demonstrate the wide-ranging influence of differences in the degree to which interference between all forms of memory trace is developed in different people. Another broad source of individual differences reside in personality and motivational factors. The complex inter-dependence of these factors with linguistic habits is discussed.

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FOREWORD

The theoretical introduction which follows is centred around the topic of the recall of connected discourse, although very little of the material reviewed deals directly with this subject. It was found that adequate hypotheses could not be formulated on the basis of material relating purely to connected discourse and that it was necessary to go further afield. The work which was most valuable was that of modern Association Theorists. Not only did they provide suggestions which led to fruitful experimental designs but they also illuminated the various theoretical issues.

The general criterion governing the inclusion of work for review was that it should bear directly on verbal recall or that it should be connected closely with theoretical issues raised by such work. General theories of memory are not dealt with fully, although reference is made to such theories, especially to work in the Gestalt tradition. A review of general theories has been made by Gomulicki (1953) but this work was of no help in formulating experimental hypotheses.

Material dealing with the manner in which clinical disorders elucidate our understanding of

memory processes and the influence of needs, interests and motivational factors on recall were largely excluded. The best single reference to such work is still Rapaport (1950). Work on childhood memory is also excluded.

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ΣΠΕΡΟΔΟΥΣΙΟΝ

I. ASSOCIATION THEORY

I. 1. A. THE INTERFERENCE THEORY OF FORGETTING

I. 1. A. (1) Introduction In essence protagonists of this theory maintain that all forgetting can be accounted for in terms of interference between memory traces. In other words, if one can imagine installing an "engram" into an empty system, preserving it in this state and then measuring the degree of retention over time, absolutely no forgetting would occur. Of course, a system of such simplicity cannot occur naturally, so that a direct proof of the theory is impossible. This impossibility, although it may have obscured the essential simplicity of the "laws of memory", is at the same time the condition for their demonstration. Without interference there would be no forgetting and hence no problem to solve. Furthermore, the complexities of interaction of traces provide us with the possibility of unravelling the details of the memory process.

Interference takes two main forms - retroactive inhibition (RI) and proactive inhibition (PI). In addition, it has been suggested that there is another less important form - warm-up decrement (WUD). The possible importance of WUD was first realized by Irion

(1948), who performed the first experiments (Irion, 1949; Irion and Wham, 1949). WUD is reputedly caused by the decay of factors that initiate a general learning set. Such factors have nothing to do with specific traces of the experimental material as such. Conversely, warm-up provides the general condition for the raising of certain traces above the threshold necessary for recall. Such a formulation does very little injustice to those available (Irion, 1948; Adams, 1961). It is therefore not surprising that the position should be confused at present (Adams, 1961). Underwood and Richardson (1956) used no warm-up task in a verbal learning experiment. Yet, there was little evidence of WUD. "The first item (of a list) may be depressed a very small amount due to inadequate set, but it is certainly of little consequence for the overall retention of the list" (Underwood & Richardson, p. 124). It is not even true to say that warm-up is always a feature of verbal learning (Kurdock, 1960). The topic will not therefore be discussed further.

I. 1.A(ii) Experimental Background to RI No attempt will be made to define RI and PI, except in terms of their experimental paradigms (McGeoch and Irion, 1952). In recent years, little effort has been made to directly test the Skaggs-Robinson hypothesis (McGeoch and Irion, 1952; Postman and Egan, 1949), because it has proved impossible to define similarity in such a way as to produce functional relationships. Our understanding has

been advanced by studies in which variables concerning degree of learning and the length of the various time-intervals between the presentation of lists have been manipulated. It is true that these variables may be conceived as facets of similarity, but such speculation does not favour the formulation of strict hypotheses.

An issue which should be borne in mind throughout the discussion which follows is the differentiation between transfer effects upon learning and transfer effects upon retention. It should be stressed that we are interested here only in the latter. However, it is clear that rate of learning is one of the dependent variables in the designs to be described, and that it must be related to retention. Underwood (1945) has made a useful distinction between "associative inhibition", which is negative transfer in learning and "PI in retention" or true PI. It is important to realise that the relation between the two is not constant.

From an examination of the typical experimental paradigm for RI, it is apparent that the following variables can be manipulated:

- (a) degree of original learning (OL)
- (b) amount of OL
- (c) degree of interpolated learning (IL)
- (d) amount of IL

The above four variables must be considered together, since experiments examining their interrelationships have been crucially important. Little is known about the effect of varying the amount of OL, but it is probable that RI will increase as list length

increases. Except at very high levels of degree of OL, when total reinforcement of the list is high, a rise in degree of OL is accompanied by increases in the degree of absolute RI because of the presence of weakly reinforced middle items (Postman and Riley, 1959). RI is at a maximum when the degree of IL and the degree of OL are approximately equal (McGeoch, 1932b; Melton and Irwin, 1940; Melton, 1941; Thune and Underwood, 1943; Underwood, 1945; Briggs, 1957; Postman and Riley, 1959). The phrase "approximately equal" cannot be exactly defined, except to say that RI is usually greatest when IL has 1 - 8 reinforcements more than OL. Associative inhibition and practice effects cause this imprecision. In all the above studies, it was found that there was a curvilinear relationship between the number of interlist intrusions and the degree of IL, such intrusions being at their maximum when the degrees of IL and OL were approximately equal.

RI increases with both length and number of interpolated lists because a larger number of competing responses are provided (Underwood, 1945). Underwood (1945) and McGeoch (1936) showed that amount of IL has a greater effect than an equivalent degree of OL.

(e) temporal point of interpolation. Usually, IL follows directly after OL. A few studies have been made in which IL was placed at varying intervals after the end of OL, degree of IL being varied at the same time. Postman and Riley (1959) maintain that these two variables are not independent. With a constant retention interval, the temporal point of interpolation may influence either

the susceptibility of the OL to disruption, and/or the effective competitive strength of the IL at the time of recall. Which of these two effects is considered critical depends on the assumptions one wishes to make concerning the temporal locus of RI. Such evidence as there is points to a curvilinear relation, though the contradictions are manifold (Postman and Riley, 1959)

(f) the temporal course of RI. Present evidence shows that RI falls with time. Experiments by both Briggs (1954) and by Underwood (1950a) have shown that OL responses show spontaneous recovery, even if their recall is not demanded (it must be borne in mind that a recall test is also ^a learning test since it gives an opportunity for rehearsal). The problem is complicated by the fact that besides taking account of this natural change, the strength of OL and of IL at the end of learning and their relative degrees of reinforcement must be taken into account.

(g) the effect of response similarity. The Skaggs-Robinson hypothesis stated that with high degrees of response similarity, the interpolated responses would reinforce the original responses because of response generalization. As degree of similarity fell, so interference tendencies set in to an increasing extent. The essential phenomenon is degree of reinforcement so that, besides considering qualitative similarities, the factor of reinforcement must be considered at the same time.

In general, these predictions have been borne out (Osgood, 1946 and 1948; Young, 1955). Bugelski

and Cadwallader (1956) failed to find progressive increases in RI as the responses varied along the dimension identity - antagonism, but it is possible that their experimental technique was faulty (Postman and Riley, 1959). Some of Young's findings are of particular interest. He found that there is direct reinforcement in OL: according to the degree of similarity between OL and IL, there will be a varying degree of generalized reinforcement from OL to IL. There is also direct reinforcement of the IL accompanied by a generalized spread of this reinforcement back to the OL. In another context, Postman and Riley call this phenomenon "parasitic reinforcement" and there seems to be no reason for not using the term here. It follows that if OL and IL are learnt to the same criterion, that the recall of OL should be better (there will be retroactive facilitation). This is because, as the reinforcement of the IL is building up to its maximum, the parasitic reinforcement is spreading back to the OL, which has already reached the criterion. From this it follows that the major factor causing a difference in the ease of recall is the degree of similarity between the lists, since it is this which determines the amount of generalized reinforcement.

I. 1.A(iii) Work on PI The factors that are varied are very similar to those that are varied in experiments on RI. No experiments have been reported in which amount of original learning was varied. Experiments in which degree of original learning (Postman and Riley, 1959), degree of prior learning (Underwood, 1945; Atwater, 1953) and amount of prior learning (Underwood, 1945) were/
varied

yielded similar results to those obtained when the same variables are manipulated in RI experiments. It is necessary to stress at this point that it can now be accepted as a certainty that overt interlist intrusions are a more important source of error in PI than they are in RI. This was an important finding in Postman and Riley's work. The relationship between interlist intrusions and degree of prior learning (PL) is the same as that in RI - they reach a maximum when the degree of PL is slightly greater than that of OL. Similarly, Underwood (1945) found that the number of interlist intrusions remained constant and that such intrusions were derived mainly from immediately preceding lists.

The temporal course of PI is different from that of RI. A PI paradigm differs from a standard experiment in verbal learning, only in that the interval between the last learning trial and the first recall trial is lengthened considerably. It follows that direct negative transfer effects on learning must be dissipated rapidly but that negative transfer effects on retention must increase. If we limit ourselves to a consideration of experimental studies, it is also easy to understand that the interfering factor must be the recovery of the associative strength of first list or lists, once what has been said about "parasitic reinforcement" has been kept in mind.

Experiments using modified free recall tests (MFR) are important in this regard. In an MFR test, which can be used only with lists of paired

associates, the subject is given the stimulus common to both lists and required to give the first response which comes to mind. In experiments using this technique (Underwood, 1948 (a) and (b); Briggs, 1954), it has been shown that responses from the second list decline steadily in strength, while those from the first recover gradually. We are therefore justified in inferring that PI, unlike RI, should increase with time. So far, no studies using verbal materials have shown this incontrovertibly, since the recovery process is lengthy. However, one of Underwood's studies (Underwood, 1949) showed that PI was greater at 48 than at 5 hours. Of much more interest is a study by Duncan and Underwood (1953) which, although it concerned a motor task, has vital implications. Two recall intervals were used - 24 hours and 14 months. After 24 hours, the differences among the recall scores were small and insignificant; after 14 months the direct relationship between degree of PL and amount of forgetting became pronounced and significant.

I. 1. A. (iv) Proactive Inhibition and the Level of Retention

This section is entirely devoted to a review of a paper by Underwood (1957). This is the most important single piece of work which has so far appeared in the field and has far-reaching implications for the study of memory processes.

Underwood's first concern was to determine how much material is lost over a 24-hour retention period. He criticised all previous studies using serial lists and demonstrated that amount of forgetting is a negatively decelerated function of amount of practice on such lists.

The data were obtained by scrutinizing previous experimental records from the time of Luh (1922) onwards.

The usual estimate of forgetting over 24 hours is 75%. This result was first obtained by Ebbinghaus (1913) and has been repeatedly confirmed, especially in the classic study of Luh. However, such estimates were based on studies using subjects who had been rotated through complex counterbalanced designs. When results derived from experiments in which naive subjects were used are considered, the amount of forgetting falls to 25%. (Underwood and Richardson, 1956; Postman and Rau, 1957; Postman and Riley, 1959).

The story does not end there. This, in its turn, is too high an estimate. The usual criterion for learning is perfect recall in a single trial. The assumption is that, were a further immediate recall to be demanded, recall would again be perfect. However, this is not the case, amount of forgetting increasing as the task becomes more difficult. Underwood quotes studies done by himself and by Runquist (1957) showing that the amount of overestimation is at least 10%, so that only 15% remains unaccounted for.

A major conclusion of Underwood's paper is that the main source of interference lies not in RI, but in PI. McGeoch (1932a) had held previously that RI was the major factor on the basis that RI was always greater than PI in laboratory experiments. It must also follow that the major source of forgetting lies in factors

outside laboratory control.

A further inference is that there is a greater continuity among the various memory processes (for meaningful material, for motor tasks and for non-sense material) than had hitherto been suspected. The immediate inference from this is that the chief factor controlling the extent of retention is the direct degree of reinforcement of incoming material. Previously, it had been possible to hold that the superior retention of meaningful material was due to its greater ease of incorporation into the existing associational network. Now, the problem becomes why it is not so incorporated.

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I. 1. B. THEORIES OF RI AND PI

I. 1. B. (i) Introduction Only the most recent theories of RI and PI will be reviewed here; for a review of earlier theories see McGeoch and Irwin (1952) and Slamecka and Ceraso (1960), while Underwood (1961) gives a full discussion of Gibson's theory of verbal learning, which was influential at one time.

I. 1. B. (ii) Two-Factor Theories These theories were based largely on the work of Melton and Irwin (1940), Thune and Underwood (1943) and Underwood (1945). The hypothesis that such theories attempted to substantiate was that forgetting is caused by the specific interference

between the IL and the OL responses. The problems that had to be overcome were that a large portion of the measured RI consisted of omissions and that in the paired-associate paradigm it is evident that interlist intrusions do not occur as replacements for responses that have been given during OL.

Underwood overcame these difficulties and advanced a form of the two-factor theory, the differentiation hypothesis. To explain the importance of omissions, Melton and Irwin had advanced the concept of unlearning. Thune and Underwood showed that Melton and Irwin's formulation of the concept was invalid and Underwood greatly changed it.

The theory can be summarized as follows. In both PI and RI there is a two-way interference, i.e., that the necessity of having a set of first list responses available interferes with the learning of the second list, but that the first list exerts this interference at some cost to itself. The theory presents difficulty only because Underwood wished to explain interference solely in terms of intrusions.

The simplest deduction to be drawn from the unlearning hypothesis is that the weakening of the OL list left "holes" at particular "sites" which could be plugged by IL responses during RL. Thune and Underwood's detailed examination of their results showed the falsity of this deduction. To escape the dilemma they hit on the "change in type of intrusion" hypothesis. Briefly, this is that at low degrees of IL omissions will predomi-

nate because IL has weakened OL, but owing to low degrees of reinforcement it has not provided a replacement. With IL equal to and slightly greater than OL intrusions will be at their maximum because of the relatively high degree of reinforcement of the IL responses. Finally, with degree of IL much higher than that of OL, omissions will again predominate because the OL list has been weakened (the "hole" in the list is still there) but the degree of IL is so high that intralist associations prevent the subject from giving a response from the IL list (differentiation has developed).

In order to demonstrate the truth of the hypothesis Underwood had to maintain that the OL response is still "there". It does not seem, from a purely logical point of view, that this is a necessary part of the thesis. It would seem rather that the necessity is "scientific", since unless that assumption is made, it is impossible to either prove or disprove the assertions. It could be argued that the assumption is necessary to a competition of response theory, an essential feature of which is that both response classes should be available at the time of recall. But, again, this implies that the differentiation hypothesis is the only form of this theory.

Underwood (1950a) put the above deductions to the test. The following hypothesis was framed. It was held that if the time allowed for recall were increased then it would be possible for the subject to drop inappropriate responses and replace them by correct ones. Furthermore, the reduction in RI which would ensue should be directly related to a rise in the degree of IL, since, as IL rises, it is interlist intrusions which are supposedly contributing more to RI. The hypothesis was tested using

paired-associate lists and a design in which the recall time on the first trial of RI was lengthened from 2 to 8 seconds. The results were then compared with the previous experiment using the same lists and a conventional design. It was found that the increased recall time resulted in more frequent attempts at anticipation but that the rise in correct responses was associated with a rise in the number of intrusions. The form of the relationship between degree of IL and frequency of intrusions was not changed. Thus the differentiation between the two lists was not significantly changed by the increase in recall time. At the two higher levels of IL, RI was reduced but not eliminated. This does not provide the support for the hypothesis that might be anticipated at first sight, because the extent of the reduction was independent of the level of IL, and thus of the degree of differentiation. These findings were replicated for the PI paradigm (Underwood, 1950b).

Underwood was eventually able to rescue himself (Barnes and Underwood, 1959). The purpose of the study was to present the evidence necessary to choose between three possible hypotheses as to what happens to first list associations in an RI paradigm. The hypotheses are: (a) extinction, where the associations simply disappear, to recover spontaneously later; (b) the independence hypothesis - the associations of both lists continue to exist side by side; (c) mediation - the connection A-B is used in learning the connection A-C.

A design was created to fulfil these criteria. Two lists of paired associates were made up -

an A-B, A-C list and an A-B, A-B' list. The latter had low intra-list similarity but high similarity between pairs. The degree of learning of the first list was held constant, the degree of learning of the second was varied widely. Recall was measured by a "modified, modified free recall" (MMFR) test in which the subjects were presented with a sheet of paper on which the stimuli were listed with two spaces beneath each. The subject was asked to write all the responses that he could, in the order that they came to mind, then to go over the responses and indicate which list he thought they came from.

Now, if the first hypothesis is correct, one should get a progressive drop in list 1 responses with a rise of degree of IL in the A-B, A-C set-up, and a slight rise or constancy in the A-B, A-B' set-up. If this did not happen, it was possible to choose between the remaining hypotheses because, if mediation held, the order of omission should be A-B-C. If this were not the case, the second hypothesis would be the only one left.

It was found that in the A-B, A-C paradigm, list 1 responses were progressively extinguished as degree of IL rose. In the A-B, A-B' paradigm, learning of the B' list was perfect immediately. The extinction hypothesis was upheld. However, in the latter case, it does seem possible that A-B connections could be temporarily lost and then retrieved by B' responses acting as a crutch for B responses, but this seemed unlikely on the basis of observations of the recall processes of the subjects.

Barnes and Underwood criticize the notion of parasitic reinforcement, on the grounds that the facts can just as well be accounted for by mediation. Firstly, nearly all the subjects reported that the process they actually used was mediation. Secondly, after only one anticipation trial, recall of the second list was nearly perfect. This is quite a new finding, and was due to the method of free recall which was used. With the serial anticipation method of recall, recalls never attained that degree of perfection, and a gradient of reinforcement, which was thus an artefact, was assumed. However, Barnes and Underwood state that response generalization will appear when similarity between the responses is less. As similarity approaches zero, extinction takes over.

I. 1. B. (iii) Generalized Response Competition This notion was put forward by Postman and Riley (1959) to overcome the difficulties raised for competition of response theory by a number of studies in which both degree of interpolated learning and the temporal point of interpolation were varied (McGeoch, 1933; Bunch, 1938; Archer and Underwood, 1951) and, especially, by the findings of Newton and Wickens, (1956). Newton and Wickens thought that contradictions inherent in their results might be overcome by postulating that "... subjects may acquire a tendency to give a certain class of response in addition to giving specific responses to a particular stimulus." (Newton and Wickens, 1956, p.153). Postman and Riley manage to demonstrate very effectively that all interference is a function of competition of

specific responses, while at the same time they introduce a new concept - associative context - which may be defined as an entity which is moulded out of specific responses but which acts as a unit to produce interference.

The concept of associative context can be summarized as follows. During the learning of a serial list a whole network of associations arises in the subject's mind. These centre predominantly around the actual words on the list, but extend beyond these: to synonyms of these words; to associations aroused by the words; to stimuli associated with the experimental procedure (such as the movements of the experimenter); and to the general state of mind of the subject at various stages of the experiment. The result of the growth of this associational network is not only that the responses which are labelled by the experimenter as "correct" are firmly imprinted on the subject's mind but also that he is given the necessary cues for evaluating the correctness of particular responses that he may wish to make.

This process of evaluation is called the "matching response" by Postman and Riley. Roughly what happens during the formation of a matching response is that some incipient response is rehearsed at the same time as a rejected one. At the same time there is "... rehearsal of differential responses serving to re-instate the associative context of the list itself". (Postman and Riley, 1959, p.359). They go on to say that, "Instructions to shift from one list to another as in a recall test under RI conditions, may be assumed to

favour the performance of matching responses" (p.359). The latter statement would appear to reflect only the inability of the association theorist to explain a phenomenon which is frequently ignored. This is that, no matter how meaningless the material making up a serial list may be, very few extralist errors occur, during recall. Underwood and Schulz (1960) briefly discuss the problem, but do no more than propose the existence of a hypothetical selector mechanism.. It seems more appropriate to replace this with the notion of associative context.

The associative context persists throughout the retention period. Thus, in the control conditions for both the PI and the RI paradigms and in the experimental conditions for the PI paradigm, the subject is set to respond with the original list. In the experimental condition for the RI paradigm, however, he is set for the IL list. Postman and Riley use a term, "generalized response competition", which was coined by Newton and Wickens (1956) to designate this situation. Thus, after IL, the experimental group should have difficulty in obeying the instruction to recall list 1. Postman and Riley claim that they have demonstrated the reality of their hypothesis by showing that on the first trial of RL the rest and PI groups have the typical bowed curves, whereas the curves were flat in the RI condition, the bowing starting on trial 2. This shows that, in the experimental group as a whole, the items are being recalled in the same random fashion as at the beginning of learning.

I. 1. B. (iv) Relationship Between PI and RI When associative context persists during the retention interval, the effect of such persistence depends upon which list has to be recalled. If the test is on the second list, as in PI, the persistence of the context continues to favour performance. If the test is on the first list, the persistence of the context of the second list creates the conditions necessary for generalized response competition. These conclusions can be applied directly to expectations relating to the difference between RI and PI. Only specific response competition is effective in PI because of the relatively good preservation of the associative context of the original list. That this is indeed the case is shown by the fact that interlist intrusions account for most of the retention loss of the original list. Therefore PI should be less than RI and should appear only when the degree of PL and OL is equal, (because only from this point on will interlist intrusions be able to make their appearance). The PI function should be flat when PL is greater than OL. Postman and Riley's experimental work showed that both assumptions were true. Thus, the pattern of differences between corresponding PI and RI work groups should change with the level of OL. At low levels of OL both types of competition are most effective when the IL is low. The difference between PI and RI should be constant after that. As the degree of OL rises, both PI and RI should develop more gradually with the degree of interfering learning. No prediction can be made about the constancy of the difference between the two, but RI should continue to be greater. Underwood (1945) showed that this was the case. It is extremely difficult to see why Postman and Riley should suggest that the PI-RI difference should be con-

stant at low levels of OL. They appear to find the point so obvious that they offer no discussion.

To round the theory, it is necessary to use it to make predictions about the long-term changes in interference. Postman and Riley point out that there is no necessity for an inverse relationship between speed of learning and speed of forgetting. Either by "parasitic reinforcement" or by mediation, the learning of one list may reinforce the learning of another. This should result in an improvement of the associative context of the first list at the expense of that of the second. Further, the process requires time, since it will become effective only after there has been some generalization. Thus, there should be an increase in PI and a decrease in RI with time. Although a certain amount of ambiguity attaches to the results of work on changes of RI with time and we have only Duncan and Underwood's work for PI, it would seem that the hypothesis is probably true.

I. 1. B.(v) Degree of Reinforcement This section is necessary in order to underline the differences between association theory and learning theory. Ebbinghaus (1913) showed that increasing degree of reinforcement of a total list continued to garner returns in retention, even when the list had been considerably overlearned, and found that speed of relearning to criterion was a direct positive function of degree of overlearning. This seems to close the subject; the hypothesis to be examined

appears to be derived not simply from common-sense, but to be common-sense. All that it is necessary to do, is to discover the nature of the function. Ebbinghaus appears to have solved the problem, and the beauty of his results is so great that it is almost improper to re-consider them.

It is only when we see that we are not concerned with the reinforcement of total lists, which has already been dealt with in the sections on PI and RI, that it becomes evident that discussion is necessary. The problem here is the reinforcement of single associations. Again, at first it seems a common-sense one. The more a particular association is experienced the more deeply it is "engraved". But, by this time it should be clear that such a position is not as simple-minded as it appears and that it creates formidable theoretical problems. It demands a knowledge of events in the central nervous system. But, the nature of the engram is a total mystery.

The only resolution of the problem, it seems, is to pretend that it is not there. This escape route is an easy one for the man interested in verbal learning. He can assume that stimulus and the form of the stimulus that is encoded in the human central nervous system are identical. There is no difference between the word "batty" and the neural representation of "batty". Once this is conceded, he can say with Deese (1961a) that the encoding process is all-or-none. No matter how many times the stimulus or association is reinforced, once it is encoded further reinforcements are of no further benefit. Re-

inforcement is of benefit only because, in natural conditions, any trace is in competition with many other traces.

It is, then, necessary to demonstrate that reinforcement of single associations does not give directly increasing benefits in retention and that the benefits upon the retention of total lists results from the removal of the effects of competition. The first point is a difficult one to demonstrate because it is impossible to present a single association to a subject. Associations differ in meaningfulness and hence in learning difficulty, while, most important of all, we are not pumping associations into empty systems (Underwood, 1957). Two recent papers, however, give us valuable indications that the position outlined here has considerable justification. Estes, Hopkins, and Crothers (1960) found in two studies of paired associate learning with individual subjects that acquisition occurs on an all-or-none basis, the repeated reinforcements merely providing an opportunity for the formation of an association between the stimulus pattern and the reinforced response. It was also found that retention did not increase with the number of reinforcements. Murdock and Babick (1961) used a method of free recall to study the effect of repetition upon learning. A critical word was placed in a list of words read once to the subject, who was then asked immediately to recall as many words as he could. Before the start of the experiment the probability of recalling the critical word by chance had been calculated. The critical word was placed in list after list until it had been recalled, when it was removed and replaced by another.

There was no apparent benefit of repetition on recall.

The second point is rather more easily attacked. Postman (1962) examined the effects of reinforcement on total lists, using unpracticed subjects. With practiced subjects, interference is massive and almost all the items must be overlearned in order to be recalled. With ^{un}practiced subjects only the difficult items have to be reinforced. Lists of words of high and low frequency of usage were used. For both types of material, amount recalled showed a positively accelerated increase with degree of overlearning. These increases in recall resulted from improved retention of relatively difficult parts of the lists. Speed of relearning to criterion was a direct function of degree of overlearning.

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I. 2. MEANINGFULNESS

I. 2. A. RECALL OF SERIAL LISTS

I. 2. A. (i) Introduction The title of this section should be noted; it is "meaningfulness", not "meaning". The word is used purposely in order to avoid confusing semantic discussions. Further, it indicates that a radical approach is being taken to an old problem. It has always been considered that the weak link in association theory was its failure to apply itself to meaningful material. At first sight, it seems that this is true

and that the pronouncements of the associationists on meaningfulness are remarkably sterile, (see McGeoch and Irion, for example). Meaningfulness is defined operationally and always with reference to nonsense syllables, a mode of attack which seems inappropriate.

I. 2. A. (ii) Experimental Work Nonsense syllables were chosen by Ebbinghaus because they seemed to represent segments of verbal material that were equivalent in learning difficulty and thus solved the problem of replicability. It should also be pointed out that an implicit assumption underlay his choice. It would seem that Ebbinghaus believed that his syllables were primary ideas, the primitive elements of the mind-stuff (see, for example, Deese, 1961). Further work exposed the falsity of the first, explicit, assumption. It was found that nonsense syllables differed considerably in the ease with which they could be learnt. The factor which caused this variability was called meaningfulness.

The first attempt to measure meaningfulness was made by Glaze (McGeoch and Irion, 1952; Underwood and Schulz, 1960). Meaningfulness was defined as the percentage of subjects who reported an association to a nonsense syllable. Similar techniques were used by Hull, by Krueger and by Witmer; and rather different ones by Noble, by Mandler and by Noble, Stockwell and Pryer (Underwood and Schulz, 1960). Underwood and Schulz found that, with the exception of techniques using poor designs, the meaningfulness values reported by different investigators intercorrelated highly. They then attempted to discover a possible underlying variable.

They chose familiarity, having dismissed other possibilities (pronunciability and number of associates), and having quoted three studies, which demonstrate that as material increases in actual frequency of occurrence there is a corresponding increase in judged familiarity. Attneave (1953), showed that people can predict the relative frequency of letters. Howes (1954), showed that they can do the same for words. One of their own studies demonstrated that the same applies to bigrams and trigrams.

The next step was to show the relationship between familiarity and recall. The issues here are by no means simple. Osgood (Underwood, 1957) has attacked association theory on the grounds that a reasonable prediction from it is that meaningful material should be recalled less well than meaningless material because of the larger number of associations of the former, with a consequent increase in the probability of developing of interference. Initially, the only reply that associationists could make to this criticism was that they could show that both types of material were recalled equally well (Underwood and Richardson, 1956). The issue, has, however, been carried further by Underwood and Postman (1960) and by Postman (1961b).

Two "natural" forms of interference are examined in the experiments - "letter-sequence" and "unit-sequence". The former is the interference which arises when a sequence of letters that occurs very rarely in the language has to be learnt. Such rare sequences occur in nonsense syllables of low meaningfulness. The latter is the interference which develops among units (whole nonsense syllables, or words

in a serial list). Again, the order of such sequences have certain "natural" probabilities. Underwood and Postman assess such probabilities solely on the basis of the simple frequency of occurrence of the unit itself, arguing that the more a unit occurs, the more likely it is to attract associates to itself, and the more of these associates there are, the more likely it is that there will be competition.

The two types of interference are related in the following manner. The units to be learned can be placed along a continuum from the most improbable letter sequences (low end) up to the most frequent words (high end). At the low end, only letter-sequence will operate. The gradient of unit-sequence interference first comes into operation when the letters begin to constitute syllables or words that have the same probability as those in the language. It then increases and reaches its maximum at the high end of the scale. Interference should be maximal at the two extremes of the scale. It would be minimal in the centre of the scale because the units found there would have frequent combinations of letters but not be of such common occurrence that numerous associates could form to them.

The prediction was that letter-sequence interference would cause actual extinction of the responses. It was supposed that unit-sequence, on the other hand, would lead to confusions in sequence of emission. Deese (1959a) has shown that strong inter-item associations may, under some conditions, help recall when serial order is ignored.

The experimental design was simple. Four lists were made up and learnt by serial anticipation. One

was of high frequency words (Hi-W), the second of low frequency words (Lo-W), the third of high frequency trigrams (Hi-T) and the last of low frequency trigrams (Lo-T).

Recall was measured at 30 seconds and at one week. The recall of the meaningful material at both retention intervals was only very slightly better than that of the nonsense material. The initial and middle sections of the list Hi-T were better retained than the corresponding sections of the list Hi-W. When speed of relearning was used as a measure of recall, the list Hi-T gave the highest level of retention. When intralist errors per trial in the course of relearning were measured, it was found that, at the 30 second interval, the list Hi-T had far more than the other three, which had an equivalent number. At the one week interval, the number of errors from greatest to least was to be found in Hi-W, then Lo-W, then Hi-T and with Lo-T the lowest. Finally, the increase in letter-sequence errors was greatest in both the Lo lists. The hypotheses are therefore confirmed.

Postman's study was less successful. The purpose was to explore the gradient of unit-sequence reinforcement in the retention of meaningful words. It was found that the curves of forgetting of high - and low - frequency word-lists were almost identical. A control study using a free-recall method showed that the serial anticipation method used initially was not obscuring the greater availability of the high-frequency material. However, it was found that errors of a high degree of remoteness were more prevalent in the high-frequency

recall protocols. From the little that is known about the long-term effects of interference, it could thus be predicted that such effects would exert a greater relative influence with time.

Other experimental work has supported the major studies reported above. Hunt (1959) found that only variations in response meaningfulness affected recall, which is in line with a two-stage learning theory advocated by Underwood and Schulz. Crannell and Parrish (1957) tested the immediate memory span for digits, letters, and words. It was found that the span was longer for digits than for letters or words, and that more letters than words could be perceived. Subjects tended to shorten their span for words by introducing likely words into the list, which illustrates the operation of unit-sequence interference. Finally, Downing and Braun (1957) found that recall of serial lists of words was a negative function of meaningfulness.

I. 2. A. (iii) Appraisal of the above-mentioned Work The value of this work is considerable, and displays the predictive power and subtlety of association theory. Underwood and Postman, in particular, are able to resolve all the difficulties which their experimental results produced. The work has, moreover, an advantage which it shares with work using nonsense syllable lists. In both cases the subject is forced to create an associative context for himself. An analysis of the errors which result, gives the experimenter considerable insight into the processes of verbal memory. The work is far from lacking in limitations, especially in the range of meaningfulness sampled, and it is probably for this reason that the recall of the high-frequency material was not lower.

It is easy to imagine that more fundamental criticisms would be levelled at this work. It can be said that the material used in these experiments has just as little meaning as lists of nonsense syllables. Ordinarily, when we string together words, we do so with some end in view, and it is from this end, not from the individual words themselves, that the meaning is derived. This argument cannot be taken up here, since a consideration of it would be premature. The associationist position must be allowed to display itself fully before a fuller appraisal can be made.

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I. 2. B. WORK ON FREE RECALL OF ISOLATED WORDS

I. 2. B. (1) Work on the Spew Hypothesis: Clustering
 Work in this field was started by Bousfield (see Jenkins and Russell, 1952). He was interested in the general problem of verbal context. He noted that even when a subject is recalling isolated words in a free recall situation, the words tend to emerge in clusters that are grouped around definite concepts. For example, a randomised list of words drawn from four categories (animals, vegetables, names and professions) tended to be recalled in clusters of related words. He postulated a "relatedness increment" of habit to strength to account for the clustering.

This work was carried further by Jenkins and Russell (1952). They believed that simple word association strength was a more satisfactory explanation. Earlier work on word association norms was extended as follows. They followed up the hypothesis that the subject's own response could be the stimulus to the further production of verbal responses. Then, the commonly observed responses to the stimulus words of such word-association tests as the Kent-Rosanoff word list could be a function of the inherent associative strength between the stimulus and response words rather than an indicator of underlying emotional complexes.

On this basis, they framed three hypotheses. First, that during recall associative pairs should occur more commonly than nonsystematically related pairs. Second, that a response commonly related to a particular stimulus should elicit the stimulus commonly associated with it more frequently than it elicits a non-systematically related word. Third, because stimulus words are often chosen because they have been shown to elicit a particular response, the association stimulus-word-response word should occur more commonly than the association response word-stimulus word. All the hypotheses were confirmed.

Bousfield (1953) carried his work a little further in a study using the four categories mentioned above, and discovered that the extent of clustering varies in an orderly fashion as a function of the number of items already recalled. Bousfield and Cohen (1956) demonstrated that the extent of clustering is a positive function of the number of categories used. Cohen and Bousfield (1956) used what they called a "dual-level" stimulus word list

to increase the complexity of their analysis. They had 40 words, of which 10 were animals (5 feline and 5 canine), 10 countries (5 South American and 5 European), 10 names (5 male and 5 female), and 10 weapons (5 shooting and 5 cutting). It was found that recall, when compared ~~to~~ ^{with} results of an earlier study using single categories, was improved. Their interpretation of this was in terms of Hebb's theory of superordinate perceptions. The interpretation offered here is that implicit associations from related categories boost recall.

This interpretation receives further support from another study, this time by Bousfield, Cohen, and Whitmarsh (1958). It was planned as a test of "taxonomic norms" designed by them. Two stimulus word-lists with high and low taxonomic frequencies were selected. It was found that lists comprising items with higher taxonomic frequencies induced significantly more clustering and a higher recall. Bousfield and Cohen (1955) used their usual four categories, but with words of both high and low frequency of usage in each. The former type were recalled with greater ease and showed a higher degree of clustering than the latter.

Some limitations to the work which has just been reviewed are suggested by a recent study of Cofer's (1959). He showed that the use of synonyms does not produce the same effect as the use of groups based on category names, which are a more obvious system of classification.

A study by Holroyd and Holroyd (1961) has intriguing implications for work on RI. High-school

subjects learned, and recalled, lists in what is called a "clustering retroaction design". The word lists for one set of groups were composed of words that were high frequency associates of the category names of the lists, while the other lists were made up of low frequency associates to the same names. Both high and low frequency lists were used in original and interpolated learning. High frequency associative frequency yielded better absolute recall and more clustering than low frequency lists, which is in agreement with the work of Bousfield. Interpolation of both high and low frequency lists impaired absolute recall and clustering when high frequency material was used in original learning, but had no effect on low frequency material. A possible interpretation (not offered by Holroyd and Holroyd) is that the more numerous associations of the high frequency material yielded to the attack of the interpolated material more readily than the low frequency material did. The position is similar to that described by Postman and Riley (1959) when they were dealing with the relationship between degree of OL and amount of RI; the more items that have been learned, the stronger is the possibility that some of them will be weakly reinforced and thus yield to interference. Here, one has to extend the argument. Noble (Underwood and Schulz, 1960) has shown that high frequency material has associations in more diverse contexts than low frequency material. It is therefore more likely that inhibitory associations will be developed with interpolated material in this instance.

A study by King and Cofer (1960a) has similar implications. The materials here were 30-word passages consisting of zero, first, third, fifth, and seventh-order

approximations to the English language. The RI paradigm was used, using each passage both as OL and as IL. The results were complex, but there seemed to be the following tendency. "As order of approximation to English increases from low to high, the interference from interpolated approximations will first be greatest for low order approximations and finally be greatest for the interpolation of high order approximations". (King and Cofer, 1960 a, p. 158).

I. 2. B. (ii) Work on the Spew Hypothesis : Order of Recall

The issue here is simple and well proven. "It shall be concluded that the data thus far fully support a statement that in a relatively free responding situation the responses which have been most frequently experienced by the subjects are given most frequently, all subjects considered. Furthermore, the order in which the responses occur is predictable from the frequency with which the words have been experienced." (Underwood and Schulz, 1960, p. 91). Several studies are reported by Underwood and Schulz that support this contention. Further corroborative evidence comes from Sakoda (1956), and will be discussed in the section on Individual Differences.

I. 2. B. (iii) Interitem Associative Strength and Related Issues

This section concerns the work of one man, Deese, and is largely a discussion of the effects of varying the environment of words whose recall is to be tested. Work with the free recall of words which had differing degrees of inter-associations showed that there was a very strong relationship between a measure of the

strength of association (the index of interitem associative strength) and extent of free recall (Deese, 1959a). It was also shown that the tighter the inter-associations, the fewer were the errors.

Further work (Deese 1959b, 1961b) makes possible a fundamental reassessment of the pioneer work of Bartlett (1932). In particular, it seems that the production of errors is an attempt by the subject to bolster recall. Bartlett had called such a process rationalization and had related it to an attempt on the part of the subject to search among his schemata and produce material of a type that seems appropriate. The great difficulty with this position is that it is impossible to predict precisely what changes will occur in the reproduction of particular passages. It seems preferable to make use of word-association norms, since these draw on associations which will be common to large numbers of subjects. Such a position has the implication that the crucial intervening variable in verbal recall is not some private "inner model" but segments of the verbal universe which are incorporated in toto. It also suggests a re-interpretation of studies on the relationship between attitudes and recall. For example, a communist sympathizer may not necessarily recall material favourable to his cause because of the existence of some selector mechanism which rejected other forms of material but simply because he possesses the required associations (Deese, 1961a).

Deese maintains that the verbal encoding process is all-or-none, with the result that there should be no relationship between the frequency of occurrence of words taken purely as isolated units and the probability of recall. He was able to defend his position in one

study (Deese, 1961a) using lists of words showing increasing degrees of approximation to written English. He showed that the greatest difference in recall always occurred between the zero-and first-orders of approximation (for definitions of "orders of approximation", see Miller and Selfridge, 1950) and is due to guessing. Another study (Deese, 1960) was less successful. It showed that there was an increase in the percentage of recall as list-length increased and that there was an interaction between list-length and frequency, which seems to indicate that frequency affects recall. It is possible, however, that the inter-item associative strength of both long and high frequency lists is greater, which would account for the effect.

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I. 2. C. INTRASERIAL PHENOMENA

I. 2. C. (1) Introduction Most of this section will be concerned with a discussion of the serial position curve. The title is deliberately chosen to emphasise that a number of general issues are raised whenever this topic is discussed. The bowed curve typical of serial learning is too well known to require description. What is not generally realised is that it creates special problems for association theory and forces the realization of the general application of his theories upon the associationist. The serial position curve is merely one instance of the way in which habits are arranged into parts; of the way

in which the parts must follow one another in a particular sequence, and of the necessity that this sequence should be run off in the correct order before the habit can be learnt. Furthermore, once this order has been learnt, the habit can be run off at any time without the necessity of external stimulation. That is, each successive response becomes the stimulus for the response that immediately follows it.

I. 2. C. (ii) Recent contributions by Associationists

It must be pointed out that in the field of verbal learning it can be maintained that where the recall of serial lists is concerned the subject learns by rote, not only the material of the list, but the framework in which the list is set, since this is arbitrarily imposed upon him by the whim of the experimenter. If this is granted, it can be said that in the case of the recall of meaningful prose, the subject can make use of a framework (the syntactical structure of his language) which he has learnt by rote long before the time that recall of a particular list is asked of him.

An inference from this position is that the serial position curve typical of meaningful prose should be a function of the statistical structure of the language. That this is the case has been illustrated by Deese and Kaufman (1957). Two experiments were performed. In the first, the order of recall of passages of random words was compared with the order of recall of a meaningful passage presented to different groups of subjects in a different word order. The results were that the serial position curves for the random words were

the same as those obtained previously by Raffell and by Welch and Burnett (Deese and Kaufman, 1957), while the curves obtained from all versions of the meaningful passage resembled curves obtained by the serial anticipation method.

Having shown that the expected end-product occurred, Deese and Kaufman performed another experiment to show the relationship between structure of the passage and form of the curve. A number of passages of increasing orders of approximation to English (using the technique of Miller and Selfridge, 1950) were prepared and given to subjects for free recall. The curve for the zero-order passage approximated to that for the free recall of unconnected words and as the order of approximation rose, so the curve showed an increasing tendency to approach the form characteristic of recall by the serial anticipation method. It was found that the mean level of recall rose with increasing degree of approximation to English, but that the greatest proportion of this increase comes from the first two-thirds of the list. The change from the free-recall to the serial-position type curve occurs in this way. At first, there is a fairly strong relationship between position in the list and frequency of recall, then an intermediate position when there is no such relationship, and finally, at the seventh order of approximation, the relationship appears again as the curve becomes markedly bowed.

If association theory has any validity, it should follow that the determinant of probability of recall of an item in a list should be the degree of its reinforcement or its degree of familiarity. There is plenty of

evidence to show that this is the case. Underwood and Richardson (1956) showed, by preparing lists of such a nature that each item occurred an equal number of times in each serial position (thus holding degree of reinforcement constant), that serial position as such does not influence recall. Deese (1957) postulated that the form of the serial position curve in free recall is primarily dependent on their order of strength, the last items being recalled first. Bousfield, Whitmarsh, and Esterson (1958) believe that another factor in free recall is the Marbe effect (Woodworth and Schlosberg, 1955). The Marbe effect is the position^{ve} relationship between reaction time and frequency of experience. Bousfield et al. deduce that besides the factor of reinforcement in the course of learning, order of emission should be controlled by degree of familiarity with an item and maintain that they could observe this effect from an inspection of their experimental records.

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I. 2. D. CONCLUDING STATEMENT

The radical position of the associationist with regard to the recall of verbal material has now been made clear. The subject is constrained by the associative context of the language, so that, in order to predict what the course of recall will be in the population at large, all that we need to know is this context. That the context is remarkably constant over time is shown by the high degree of relationship amongst the various measures of

meaningfulness from the time of Glaze onwards (Underwood and Schulz, 1960).

It should be noted that this position applies to verbal recall, but does not apply in the same radical sense to verbal learning. For example, when we are striving to understand or to formulate a logical argument, it is the understanding of the inner structure of the argument which is our primary concern, and, to achieve this end we attempt to find the words that will indicate our meaning with as much clarity as possible. It is the meaning, not the words, which is important. But in recall, the position is reversed. Bartlett (1932) passed a passage expressing ^{an} argument down a serial chain and the end product was a few unconnected sentences with no trace of the original structure. It might be thought that this structure would be preserved if the subjects were given some "scaffolding" around which to organize the material. Such an attempt was made by Vernon (1951) and failed lamentably.

We have the position, then, that in verbal recall the structure is inherent in the words themselves and that attempts to demonstrate that this structure lies elsewhere are bound to lead to failure. This could have been anticipated from work which has shown that rote learning militates against the comprehension of principles (Saugstad, 1952). It is also possible to draw attention to the sterility of attempts to formulate general principles explaining verbal memory (e.g. Ausubel, 1952; Bartlett, 1932).

The acceptance of the associationist position admittedly produces difficulties with regard to recall when the whole territory is surveyed. Work on transfer has shown over and over again that the comprehension of the relevant general principles and some understanding of the manner in which they should be applied greatly speeds up the learning of new tasks. This difficulty is easily resolved if it is borne in mind that the processes of learning are not necessarily related to those of retention. Once verbal material has been acquired, it is subject to the forces described previously. In this instance, the use of principles can be looked upon as an aid to reinforcement, directing the attention of the subject to the relevant associations and preventing him from wasting his time in attempting to acquire those that are irrelevant.

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II.

G E S T A L T T H E O R I E S

It is necessary to give a fairly full statement of theorizing of the Gestalt type because it continues to exert a control over the formulation of hypotheses regarding recall. This is particularly true of work with connected discourse. Since the object of a person who writes a passage of prose is to convey information, it seems self-evident that it is the information and not the symbols that convey information which is important, so that it is necessary to study the factors which enhance the retention of this, rather than the factors which enhance the recall of the symbols. In the same way, it seems that the direct reaction of the person to the information - its degree of consonance with his postulated psychic structure, his general feelings about it, or its relation to his needs and attitudes - is the crucial area of study.

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II. 1.

BARTLETT'S THEORY

A full review of Bartlett's theory will not be given. A discussion of the general theory has been produced by Oldfield and Zangwill (1943) and there is a good review of his general experimental work in

Blackburn (1953). Only those features of the theory relevant to the study of connected discourse will be dealt with.

II. 1. (1) Effort After Meaning Bartlett describes this concept as follows: "... it is fitting to speak of every human cognitive reaction as an effort after meaning. ... This pre-formed setting, scheme or pattern is utilized in a completely unreflecting, un-analytical and unwitting manner. Because it is utilized the immediate perceptual data have meaning, can be dealt with, and are assimilated." (Bartlett, pp. 44 - 45).

Bartlett continues, "In many other cases no such immediate match can be effected. Nevertheless the subject ... casts about for analogies with which to subdue the intractability of the perceptual data. He may succeed ... by the use of naming, or of simple descriptive phrases." (Bartlett, p. 45). In other cases, claims Bartlett, the same 'satisfaction' may be obtained by the use of an image. This may either be a good match or it may so entrance the subject that he is carried away, leaving the experimenter amazed that this bizarre choice has ended the search.

Two notions seem to be implicit in this passage. The first, presented in the first quotation, can possibly be elucidated as follows. According to Oldfield and Zangwill, Bartlett holds that, "The earliest principle of schematic organization is what we have called the modal" (Oldfield and Zangwill, p. 116). With

further development, a higher level is reached which Oldfield and Zangwill call "organization through continuity of interest" (p. 117). It would seem fair to say that the first level of development of the schemata is equivalent to the development of the requisite perceptual modes and the second to the acquisition of a conceptual framework whose structure is largely dictated by the associational structure of the language habitually spoken by a particular person. These external, objective frameworks then provide the context within which recall takes place. It can be said that Bartlett's own work provides some evidence in support of this point of view. The last protocols in a serial chain are inevitably stereotyped and seem to be the work of some device which reflects the normative associations of the society, not the intrinsic meaning or structure of the recalled passage.

The second part of the quotation paints a picture of idiosyncratic psychological functioning. Both quotations are taken from a section in "Remembering" in which Bartlett is dealing with the recall of visual forms and it seems reasonable to suggest that this activity would occur more commonly in that situation than in a situation where prose is being recalled.

II. 1. (ii) Form Form, again, is an important concept. Bartlett holds that "... the general form, or scheme, or plan" (Bartlett, p. 83) is apprehended directly and remains in the memory as the outstanding 'item' around which recall is developed. The process of

rationalization is supposedly related both to the apprehension of form and to "effort after meaning". That is, the subject demands that a story, for example, should have some general setting and that the setting should be conformable with his existing attitudes. Bartlett believes that the attempt to make a passage conform to existing attitudes does not reach a very high cognitive level, being primarily affective in nature. It is not, however, the passive selection of a frame of reference from those which are already available. Presumably, he would wish to say that aspects of the form of the entering material change the settings available to the subject, so that it is not possible to predict the course of recall in an individual on the basis of his past performance.

These statements are obviously in line with Bartlett's description of the schema. They illustrate his belief that the crucial determining element in recall is the individual structure of the recalling mind. Again, other statements by Bartlett enable us to set limitations on his beliefs. He himself says that, after a certain stage, stereotypy of schemata sets in. In the case of verbal recall, it is probable that this stereotypy sets in at an early developmental level. It is perhaps only among children that we see a free use of idiosyncratic patterns.

II. 1. (iii) Types of Recall For the purposes of discussions of memory, Bartlett distinguishes two groups of people - visualizers and vocalizers. The former supposedly has a high ability to form visual images; the latter has a low ability to form such images or to use them as an aid in recall. The term "vocalizer"

is unfortunate, since it does not seem that he wished to maintain that there is an inverse relationship between the ability to form visual and auditory (vocal) images. Gomulicki (1953) points out that other theorists have held similar views.

A few of the supposed characteristics of the groups are given. "The visualizers, on the whole, were consistently confident in their attitude, and when a subject who was not naturally of the visualizing type was able to use a visual image, he at once got an access of certainty" (Bartlett, p. 59). Bartlett also states that the use of visualization, when predominant, leads to confusions of order of recall and favours the introduction of extraneous material. Vocalizers were reputedly less confident in their judgements about recall, while vocalization was said to favour the preservation of the correct order of recall but to have no effect on the introduction of extraneous material.

II. 1. (iv) Experimental Work Despite the lip service paid to Bartlett, there have been few attempts to verify his hypotheses. Hall (1950) showed that the addition of a title to both pictorial and verbal materials affects recall. The title may be either given by the experimenter or implicitly added by the subject, either having similar effects. Whether recall is aided or depressed depends upon the relevance of the title. The processes of verbal and figural recall were found to be the same. Similar results were reported by Kurtz and Hovland (1953). The experimental material consisted of drawings of familiar objects; one group had to encircle and name aloud

the name of the object, the other merely encircled the drawings. The former group showed superior retention on a recognition test.

Ward (1949) observed the changes in an early Grecian coin as it was progressively copied by various neighbouring tribes. A representation of the original was then given to serial chains of university students and the changes noted. These were found to parallel those that had occurred in the original copying process. This seems to be a very good demonstration of the universality of the recall processes first recorded by Bartlett.

Drumwright (1957) used both pictorial material (photographs of one White American and four out-group people) and prose (the ubiquitous "War of the Ghosts"). Attitudes were measured by the use of the Bogardus Social Distance Scale. It was found that non-ethnocentric individuals had a better recall for the direction in which the faces were looking than did the more ethnocentric individuals, while the latter subjects showed a greater tendency to recall stereotypes. Unfortunately, no attempt seems to have been made to relate factors controlling the recall of prose to those controlling the recall of pictorial material, since the results of the experiments on prose seem merely to be a repetition of Bartlett's work.

The only attempt to extend Bartlett's theory that has been reported is by Gomulicki (1956b). He was dissatisfied with the theory because the concept of the schema as advanced by Bartlett renders it difficult to

explain recall of specific detail, and tried to find some intermediate concept. His experimental material was a series of prose passages of increasing length. His prime concern was not to determine the relative amounts of each that were remembered but, to determine which portions of each were remembered and why.

His conclusion is that the material is not incorporated with its original form and context, but that it is first interpreted and that it is the interpretation which is incorporated. He holds that the attention is free to wander over the "objective stimulus" and to select what is important. He found that as the length of the passage increased so the criterion for selection became more stringent, but that the general sense was always retained.

Gomulicki is aware of the danger of stating a tautology and asks if it is possible to predict which elements of a passage will not in fact be retained. From an inspection of his protocols he stated that in narrative the purely descriptive elements will be lost first; that the retention of descriptive passages as a whole is poorer than that of narratives; that verbs are the type of word that it is easiest to retain, although it is possible that this is because there are more synonyms for them; that if it is at all possible to convert a passage into a narrative form, the opportunity will be seized. His general interpretation of the process is that action is the easiest form of representation to retain. He believes that during the reading of a passage the attention is high until the first action word appears, this heightening of attention accounting for the uniformly good recall of the opening sections

of his passages. After this a series of "agent-action-affect" units is picked out to form a figure, the rest of the passage forming a ground. The ground elements do not merely disappear in all cases but may exert a modifying influence on some of the figure elements before doing so.

II. 1. (v) Conclusion The flavour of Bartlett's work is illustrated by the following quotation: "... man must learn how to resolve the 'scheme' into elements, and how to transcend the original order of occurrence of these elements. This he does, for he learns how to utilize the constituents of his own 'schemes', instead of being determined to action by the 'schemes' themselves, functioning as unbroken units." (Bartlett, p. 301). This shows plainly how Bartlett's notions could be adapted by those who wished to demonstrate the direct influence of personality factors on recall. It is certainly true to say that such people have gained nothing from him but an initial enthusiasm; but, on the other side, it can be said that that was all that he intended. Certainly, no other psychological work makes memory seem as exciting or even as interesting a topic.

It is also intriguing to reflect that Bartlett achieved the same end as Underwood (1957). He presented a very good case for the unity of the processes governing recall; but, whereas Underwood started from a basis of experiments on verbal learning and extrapolated to other types of memory, Bartlett extrapolated findings from the recall of visual forms to verbal material; and, whereas Underwood denies personality factors any place in recall, Bartlett asserts their pre-eminence. A suggested way around this dilemma will be presented later.

II. 2.

MODERN THEORIES

The most modern approach of the Gestalt type is by Reiff and Scheerer (1959). They stress an aspect of memory which received its first discussion in Psychology at the hands of James (1890). James gave an excellent description of ^{the} experience, obvious once it is pointed out, which Reiff and Scheerer call the "temporal index". This is the frame of reference in which memories for personal events are embedded. When I recall some past event I recall at the same time that it was I who had this experience and that this experience was related to others which follow in a particular sequence. In other words, personal experiences are embedded in a time-column which is the particular possession of the experiencing person. Initial reflection on this universal feature of human experience would seem to lead to the inescapable conclusion that the student of memory should concern himself primarily with the memorising agent, since it is he who determines what is incorporated and the manner of its incorporation. Of course he must at the same time consider the nature of the material which is being incorporated, since this will cause the agent to react in certain ways.

If this style of thinking is carried further, it is possible to make a distinction between two types of memory, one in which the temporal index plays a vital role and the other in which the temporal index is absent. Reiff and Scheerer propose the name "remembrances" for the

former and the name "memoria" for the latter. Synonyms for memoria are traces, unconscious memories, automatic memories, habits, and skills.

Remembrances are supposed to have two aspects. Firstly, they have a dual reference in time. The subject is experiencing something in his present that he has already experienced in the past. Secondly, although memoria may have a time-frame, this is never autobiographical as it is in remembrances.

Memoria are subdivided by Reiff and Scheerer as follows: (a) memoria in which there is no experience of the personal time-index, e.g. formulae, telephone numbers, etc.; (b) dates, which are set in a universal time-index; (c) habits and skills; (d) "memoria based on ego apparatuses which have formed in the course of psychological growth" (p. 26), e.g. perceptions, thoughts, the faculty of motility.

Reiff and Scheerer appeal to Koffka's (1935) distinction between environmental and experiential traces. Remembrances are related to the latter, memoria to the former. They concede that the two frames of reference are co-extensive and overlap. The difference between them lies in the extent to which the two are used in particular cases by particular subjects. They are also impressed by Koffka's concept of a memory-trace column which persists through time and preserves an ego-environment organization. The Ego is reputed to play a special role in this arrangement. "Inasmuch as the Ego is, as a rule, more or less in the centre of its environment, we can picture the Ego-part of the trace column as its core, and

the environmental part as the shaft, keeping in mind that core and shaft support each other". (Koffka, 1935, p. 609).

The distinction between rememberances and memoria is further complicated by the fact that Reiff and Scheerer say that the temporal index, which up to now has been the sole possession of rememberances, can be a property of memoria. Certain habits have, as a necessary property, a serial order. This means that both types of memory can share the possibility of being incorporated into a cognitive framework.

The main difference now becomes the relatively high stability of memoria. Reiff and Scheerer claim that the frequent poor retention of what they call "knowledge" is due to the fact that "... the original acquisition by the percipient person either lacked structural characteristics to begin with, or subsequent interferences affected the initial structure." (p. 38) Rememberances are much more fluid. Prevailing needs and attitudes control what is incorporated and retained, while changes in these factors cause different aspects of a particular rememberance to be prevalent at a particular time.

Reiff and Scheerer believe, with Freud, that the crucial question is not, "How is it that we remember anything?", but "How is it that we ever forget anything?". It is their opinion that Gestalt psychology has returned the most effective answer to this question and that its suppositions are backed by effective experimental evidence. The falsity of this belief has been demonstrated with crushing force, (Carmichael, Hogan and Walter, 1932; Brown,

1935; Hanawalt, 1937; Hanawalt and Demarest, 1939; Hanawalt, 1952; Karlin and Brennan, 1957; Lovibond, 1958; James, 1958; Solz and Wertheimer, 1959; Duncan, 1960; Postman, 1954). Reference will be made here only to Gestalt speculation as to the reasons for the well-known superiority of recognition over recall, which was strikingly demonstrated in the experiment by Rock and Engelstein (1959). The reason for the phenomenon is supposedly that recall forces a change and decay of memories because of the influence of the reproductive process. That is, the trace is forced to interact with other, similar, traces and new gestalten are created.

The work of Rock and Engelstein is typical of experiments from which this conclusion has been drawn. In such cases, the ease of recognition was greatly enhanced because the subject was not required to pick the correct stimulus from a large number which were similar to the correct one. In other words, we are faced with the probability that the supposed fundamental difference between the two processes is a product of the experimental design.

A very good experiment by Postman, Jenkins, and Postman (1948) is relevant here. Two groups of subjects learned a list of nonsense syllables under identical conditions of practice. One group was tested by a recall test followed by a recognition test, the other had the test order reversed. There was a high positive correlation between total scores on the two tests. Recognition was poorer after recall than before recall. On the other hand, recall was better after recognition than before recognition. This is easy to understand. The subject has had all the

responses given him in the recognition test, and some below-threshold responses may be improved, whereas they are weakened in the former case. The hypothesis that weak associations below the threshold for active recall contribute to correct recognition is supported by an analysis of subjects' wrong guesses in the recognition test. When the stimulus material contains syllables which had two letters in common with correct responses and the subject is forced to make guesses, such syllables are chosen more frequently than entirely new ones. Postman, Jenkins and Postman concluded that, "The basic difference between the two tests appears to lie in the minimal strength of association which they require for successful performance." (p. 519).

A general critique of the distinction between *memoria* and *rememberances* must be made. This position owes a great deal of its strength to the striking nature of the observations on Korsakow patients. However, it is highly probable that the symptoms are due to the destruction of the hippocampus and hippocampal gyrus, (Magoun, 1963), which is known to result in the loss of almost all recent memories. In patients with bilateral hippocampectomies (Walker, 1957; Scoville and Milner, 1957; Penfield and Milner, 1958; Milner, 1958), the loss of memory was general and complete, but did not extend to remote memories and well-established habits. The conclusion which has been drawn from these observations is that remote memories are stored in some different area, and not that they are qualitatively different. If recent memories are lost, then we must assume that the introspective feeling that ordinarily accompanies recent memories is lost as well.

This interpretation is given weight by the observations on a patient fully described by Victor et al. (1961). This person would occasionally recall small and unimportant events quite clearly. At the same time, there was sometimes reinforcement of well-established habit patterns. He had, at one time, operated a business for the sale of snow-moving equipment. During the period of the amnesia he inspected some equipment of this nature with one of his sons. For a few days there was no recall of the circumstances of the visit, but after a few days some memories spontaneously returned.

Finally, there is a piece of evidence from Ebbinghaus (1913) which neatly combines the anecdotal with the experimental. In the famous experiment on the relationship between degree of learning and extent of recall, Ebbinghaus found that with very high degrees of overlearning a particular list would become familiar to him. The introduction of this introspective element into the recall process did not alter the smooth form of the function which he obtained. Clearly, if there were a genuine difference between rememberances (a recognizable list) and memoria (a list which had been previously learned but which was unfamiliar), he could not have obtained this result.

To conclude, it is felt that the hypothesis that there are two different types of memory cannot be upheld. It is much more reasonable to assert, with Underwood (1957), that there is a continuity of the memory mechanism for all forms of recall. Underwood is scornful about attempts to show the influence of needs, interests, and personality factors on the recall process. The present discussion appears to lend weight to this assertion, since

the type of memory which has been shown to have no reality is the "rememberance".

At the same time, Reiff and Scheerer are not alone in their belief. Gomulicki (1953) has shown that very similar notions have a long history in Psychology. The work of Bartlett (1932) has already been discussed, while Rapaport (1950) has devoted an entire book to assessing all the evidence, both clinical and experimental, for the influence of emotive factors on recall. The suggestion which will now be made is that the notion of types of memory is a misdirected attempt to deal with an important problem. It is not enough to say that needs, interests and emotions affect recall. The discussion must proceed within a meaningful framework. A useful hint for the direction such a discussion should take is contained in a book by Schactel (1959, ch. 12), who makes the point that adaptation to our society requires the construction of a particular framework of schemata into which certain memories, especially those concerned with early childhood, simply cannot be fitted. Childhood amnesia is then the consequence of an inevitable rejection from a cognitive framework, rather than a repression which is the direct consequence of the operation of personal needs. It will be appreciated from what has been said in the section on Meaningfulness, that the same considerations apply to the recall of verbal material. The general framework of the language, internalised with insignificant changes by the experimental subject, is the crucial intervening variable. Needs and interests play their role, however.

The manner in which they do this is perhaps to direct a particular subject to a certain segment of the associative context of the language, which he then internalizes en bloc. If we knew more of the general associative context of events or incidents, we could apply a similar analysis to these.

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III. INDIVIDUAL DIFFERENCES

Individual differences have been the subject of considerable study in other areas of Psychology, but very little work has been done on recall. To some extent this is due to the fact that the personality theorists who are interested in this topic have made their initial attack in the fields of perception and psychophysics. It is also due to the fact that associationists have paid little attention to individual differences.

The importance of individual differences is stressed by Sakoda (1956). He examined Bousfield and Cohen's (1953) supposition that there was a correlation between degree of clustering and number of words recalled in their experiment, to which reference has already been made. (See Ch. I. p.32). An analysis of covariance in which the sources of variance were partitioned out into the categories within which clustering occurred, individual differences in preference of categories, and sequence of recall, showed the postulated relationship.

III. 1. PERSONALITY VARIABLES

III. 1. (1) Changers and Condensers This minor typology was introduced by Gomulicki (1956a). In a study in which the experimental material consisted of a number of short prose passages, he devised the following scores:

1. Change-omission tendencies:

- (a) Total number of deviations from the original wording (changes and omissions).
- (b) Change tendency - changes/omissions x 100.
- (c) Omission tendency - omissions/deviations x 100.

2. Success measures:

- (a) Number of words rendered verbatim, when expressed as a percentage of the original total words for all the passages used, was called the verbatim score.
- (b) The verbatim tendency was the number of words rendered verbatim, divided by the total number of words actually recalled, and expressed as a percentage.
- (c) The passage representation score was the percentage of the original text produced regardless of whether the words were reproduced verbatim or not.

Gomulicki said that those with a high change tendency were changers, whereas those with a low change and high omission tendency were condensers. He also points out that as passage length increases, the mean change score will be lower because the number of omissions will rise; and he maintained that his change and omission scores are independent of recall ability. Finally, he produced a histogram showing that change scores give him a bimodal distribution, and reported that all the other scores were normally distributed. It is his belief that a bimodal distribution is

necessary in order that he may affirm the existence of the two types. There was no relationship between change score and age, sex, or educational level.

Gomulicki's beliefs are open to very serious criticism. Eysenck (1953) has demonstrated that operationally defined typologies can be quite effectively based on normal distributions. Indeed, the presence of a bimodal distribution would make it impossible to use parametric statistics. Worse, Gomulicki's distribution is an arithmetic artefact, while change tendency as defined by him cannot be independent of recall. If a person has a low recall ability, his omission score will be high. Then, no matter how many of the remaining words he changes, the result must be a low change tendency. The artificiality of the bimodal distribution now follows, since it is caused by the interaction of two factors - "true" change tendency and recall ability. If both are low, change score (as defined by Gomulicki) will be falsely lowered. If both are high, the number of omissions will be low and the change tendency will be falsely raised. Both tendencies will cause a relative impoverishment of intermediate cases, since two normal distributions made up of scores derived from the same individuals are being robbed.

The only worthwhile finding from the study appeared to be that changers had higher verbatim scores. This seeming contradiction is explained by saying that the changers were determined to produce recalls at all costs. They thus frequently resorted to guessing, under which circumstances it could be predicted that the original words of the passage would be very likely to come to mind, though without being recognized.

An attempt to extend Gomulicki's findings was made by Paul (1959). "Condensing" is called "skeletonization" by Paul, but the meaning of the term is the same. "Changers" are called "importers", stress being laid upon the fact that such people, not only modify the wording when recalling but, also import new material, presumably in an attempt to bolster their recall. Paul endeavoured to separate groups differing both in type of retentive process and in general retentive ability and then to demonstrate that the importers have superior recall for passages of a type in which the material is unfamiliar and requires "filling out" to make it more meaningful. The importers are supposed to be able to strengthen the general structure of the version of the passage that they have incorporated into their memory systems. Paul's presentation of his results is remarkable in that it is extremely difficult to discern what in fact they were. The fairest conclusion seems to be that no significant differences were found. There is some evidence that the "skeletonizers" had more effective recall in some instances, but this finding is, of course, minimized by Paul.

III. 1. (ii). Levelling-Sharpening Some work on this concept has been done recently by Gardner and his co-workers as part of a large scale study of individual differences in processes governing cognition. Their general theoretical background is derived from both psychoanalysis and Gestalt psychology, but this particular concept has entirely Gestalt origins. The terms levelling and sharpening were first used by Wulf, by Carmichael, Hogan and Walter, and by Allport and Postman (Holzman and Gardner, 1960). In their original usage, the terms were applied

purely to memory functions. Recall was supposedly enhanced in a situation in which traces could easily be differentiated from one another (sharpening was occurring), while recall was poor when the traces were levelled to a state where it was difficult to differentiate one from the other.

In a study by Gardner and others, levelling was described as, "... Pertaining to the differentiation in memory organization as a function of the extent to which successive stimuli assimilate to each other." (Gardner et al, p. 116). This quotation shows that the usage of the terms has been considerably extended. They are now used to describe two of the principles that are enduring features of personality functioning and which control the patterns of action initiated by the activation of drives. Like the Gestalt psychologists (see, for example, Koffka, 1935), members of this school believe that there is a complete continuity between the processes of perception and those of recall. Thus, they suppose that principles such as levelling and sharpening have general expression in diverse fields of behaviour.

Gestalt views have been extended in another way. The terms now being discussed were originally formulated in order to describe recall processes in general. In this instance, the pattern characteristic of poor recall (the assimilation of memory traces) is said to be characteristic of a particular type of person (the leveller), while the pattern characteristic of good recall (the separation of memory traces) is said to be characteristic of his counterpart (the sharpener). The new element in the

analysis rests in the transference of the factors governing recall from the objective characteristics of the stimulus array to a postulated psychological structure. Koffka believed that the experiments of Von Restorff (Koffka, 1935) had shown that RI and PI were the consequence of the aggregation of similar stimulus traces, and that this factor accounted for the presumed low recall of nonsense material. Now, such aggregatory and differentiating factors are said to arise within the person.

Empirical demonstration of these assertions has not been extensive. A study by Gollin and Baron (1954) has shown the continuity between perceptual and recall processes and that these processes operate to equivalent extents in the same person. The Gottschald Figures, which entail the recognition of a particular figure hidden in an "interfering" background, were used to test degree of individual susceptibility for interfering tendencies in perception, and a standard RI paradigm for verbal recall to measure individual differences in the memory processes. It was found that subjects who more rapidly discovered the hidden figures in the Gottschald test showed less susceptibility to RI.

In a study by Gardner and Lohrenz (1960) individual differences along the dimension of levelling and sharpening, as measured by the Schematizing Test (Gardner et al., 1960) were shown to affect the serial reproduction of a story.

Holzman and Gardner (1960) used the same design as Gardner and Lohrenz. It was found that levelers showed worse recall and less grasp of the general

structure of the story than the sharpeners, or more fully, "... loss of overall structure of the story, loss of elements as a product of 'fusion' in the process of registration, relatively large numbers of elements (considering the number of recallable elements available) contaminated or changed by interaction with other memory elements-to-be during the registration process." (Holzman and Gardner, 1960, p. 179).

The authors set more store by these qualitative observations than by the quantitative finding. This is in line with their preoccupation with discovering evidence that will give them some direct insight into the nature of the memory processes of their subjects. Yet, an examination of the quotation above shows that what is described is simply poor recall, and, not some special form of poor recall. All that it is justifiable to infer from the results is that inhibitory processes are developed to an equivalent extent in the same subjects in diverse cognitive situations.

III.1. (iii) The Anal Retentive - Anal Expulsive

Dimension Only one study of this variable has been reported (Adelson and Redmond, 1958). The dimension was defined by scores on the Blacky test (Adelson and Redmond). The assumption was that the source of difference would lie in the differing ego-structures of extreme scores on the dimension. Anal-retentives, relying more on the defence mechanism of isolation, would have a greater capacity for concentration, while their great preoccupation with words would give them greater acquaintance with verbal material.

The hypothesis as to the presumed lower retentive ability of the anal-expulsive type was less firm, rather taking the form that this type would show less motivational efficiency.

The experimental material consisted of two fairly long prose passages. One was designed to be 'disturbing' and consisted of a very cursory account of Freud's theory of psychosexuality: in fact, it would disturb only those who are quite extraordinarily puritanical. Since the subjects were young ladies from Bennington, it is possible that the experimenters' presumption was justified. The other passage was a dry, matter-of-fact description of an historic residence. The hypothesis was substantiated in that the anal-retentives showed higher recall scores on both types of passage. A corroborative study is also reported. Further, when the recall scores (both immediate and delayed) of extreme scorers on the 10 other Blacky dimensions were compared, it was found that only two such differences were significant. It is therefore reasonable to ascribe these to chance.

No methodological fault can be found with the above results, but it is possible to give an alternative explanation of them. In recent years, attention has been focussed on the factor of response set as a source of disturbance in scores obtained on personality inventories (Vernon, 1964). A very good study (Couch and Keniston, 1960) has shown that there is a relationship between the converse of acquiescent response set and a mode of personality functioning. Couch and Keniston describe this as a generally stubborn and negativistic attitude,

with a relatively high degree of ego-control, inhibition of immediate responses, and repression of libidinal and aggressive tendencies. They equate the development of this attitude with the growth of an anally-retentive type of personality. Furthermore, they showed that acquiescent response set, which they attributed to the functioning of attitudes based on an anal-expulsive style of personality functioning, accounted for a very high proportion of the variance in the California F-scale. In turn, Vernon reports that a number of studies have shown a consistent negative relationship between F-scale scores and examination success. He relates this finding to the tendency among academic staff to award higher grades to students who are both tolerant and non-conformist in their opinions. A further possibility is that the anal-retentive types, as separated by both the Blacky test and by standard personality inventories, might have greater academic skills, including good retentiveness, which would account for their higher scores in the recall of the passages used by Adelson and Redmond. That is, the operation of personality factors is not denied; instead, the relatively direct causal influence postulated by Adelson and Redmond is replaced by a more lengthy causal chain.

III. 1. (iv) Psychopathy - General Neuroticism Sherman (1957), in a well-designed study, explored the hypothesis that the psychopath has a good memory. Psychopaths serving a prison sentence were compared both with ordinary prisoners and with hospitalized neurotics (none of whom were psychopaths). A standard RI paradigm was used with both nonsense material and meaningful words. The psychopaths showed significantly less RI than the other two

groups, who were comparable to each other. The results were interpreted in terms of the Spence-Taylor drive theory, which holds that anxiety is a learnt drive (Sherman, 1957). Sherman maintains that IL was only minimally strengthened in the psychopathic group, whose level of anxiety is supposedly low.

The results of this experiment raise awkward theoretical issues. First of all, there is no reason why it is only IL which should have been strengthened in the psychopathic group. Secondly, the experiment focusses attention on possible relations between RI and reactive inhibition. Eysenck (1957) has postulated that reactive inhibition is developed strongly and swiftly in psychopaths. The results of this experiment appear to indicate, then, that there is no relation between the two forms of interference.

III. 2. SEX DIFFERENCES

The only major study of this variable has been by Clark (1940). His theoretical framework was a psychoanalytic one, stressing the influence of needs and interests in moulding memory traces with time. His conclusions were as follows: "The recall of males and females of material primarily concerned with male-female conflict situations is significantly different. The females tend to recall the material from an orientation in terms of the particular man and particular woman of the paragraph. The males, on the other hand, tended towards personalization - to identify themselves with the man of the situation and make their recalls in terms of the

'affective dynamics' of the situation, particularly as related to the potential or actual damage to the prestige of the man. There is, therefore, evidence that basic attitudinal residues of the individual have a definite effect upon the remembering of appropriate meaningful prose material." (Clark, p. 61). No corroborative studies have been reported.

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III. 3.

THE POSITION OF ASSOCIATION THEORY

It had long been held by associationists that an important source of individual differences in recall was speed of learning, and that those who learned most rapidly retained best, (McGeoch and Irion, 1952). Underwood (1954) succeeded in demonstrating the falsity of this belief. He stated that the method of adjusted learning, in which an item, once learned, is not re-presented to the subject, implied that the increment of reinforcement for the slow subjects, who had more opportunities to learn each item, is greater than if no adjustment is made. He devised a method in which the probabilities of an item being correctly given on succeeding trials could be ascertained and found that equal numbers of reinforcements did not lead to the same probability of correctness in slow and fast learners. The former required more reinforcements to reach the same criterion than the fast learners. The technique made it possible to equate the degree of reinforcement for the two groups. When this was done it was found that their recall ability was equally good.

Underwood points out that it does not necessarily follow that the associative strength of an item is lower for slow learners than it is for fast learners. This is true only in a descriptive sense. What he found was that when the probabilities of response were equated, there were no differences in forgetting over a 24-hour period. However, it is possible that the slow learners suffered more from interference effects during the short inter-item intervals. Underwood chooses to say that differing amounts of reinforcement are added at the time of learning, not during the retention period. Thus, there is no relationship between individual differences in recall, and individual differences in learning.

Gregory and Bunch (1959) seem to have misunderstood Underwood's position, but nevertheless have produced results which offer him partial support. They examined the supposition that the slow learner develops a greater increment of habit strength due to overlearning. They did not use the drop-out technique, but not for Underwood's reason, maintaining instead that it was faulty because it changed the general nature of the task. Instead they used a variant of the paired-associate method in which geometrical drawings were associated with an arbitrary series of numbers from 1 to 10; the subjects had to keep guessing until they guessed the right number. Slow learners did make many more correct anticipations than the fast learners, but also made more errors. Furthermore, the rapid learners showed a consistent (though non-significant) superiority in recall over a 24-hour period.

Stroud and Schoer (1959) partially replicated Underwood's findings in that they could find no distinct relationship between learning and recall ability.

Stroud and Carter (1961) tried to show that slow learners were more susceptible to RI effects than were fast learners. The technique used was to introduce the learnt warm-up items into the experimental lists. Presumably this was done on relearning; this point is not clearly made in the description of their method. The slow learners correctly anticipated the warm-up items to a much less extent than the fast learners. The two groups did not differ significantly in recall ability. Two experimental lists of differing length were used and the interaction between list length and ability was significant. This is conformable with Stroud and Carter's hypothesis, though they do not state this.

It must be made plain that this line of thought is not/ⁱⁿconsistent with what has been said previously about degree of reinforcement. Inhibitory effects result from the interaction of coded items. There is no necessary relationship between the ease of coding (learning ability) and events that follow coding (PI and RI).

III. 4.

CONCLUDING STATEMENT

Suggestions have already been made at the end of chapter XI as to possible ways in which personality

factors influence recall and it has been shown in this chapter how the results obtained by Gardner and his co-workers can be interpreted so as to be consonant with this suggestion. It is apparent, however, that another source of individual differences has been revealed - the differing extents to which interfering tendencies are developed in different people. On the other hand, it is plain that this is no solution to the problem, but only the starting point for possible solutions. RI and PI are concepts whose power of explanation is constrained by the framework within which they operate. In part, these limits are prescribed by the associative context of the language and cannot be overcome. At the same time, the marked stability of the meaningfulness values obtained since the time of Glaze onwards show that this form of limitation is not as arbitrary as it appears at first sight.

Further reflection reveals that there is another more serious form of limitation which is best described as conceptual. RI and PI are strictly operational concepts designed for use within a strictly experimental context. Any attempt, such as that made by Koffka, to look upon them as "real factors" leads us to a dead end. As they manifest themselves in verbal material, interfering tendencies are a function of the structure of that material. But a general tendency on the part of a particular person to develop interfering tendencies may not be the same thing. The most likely suggestion seems to be simple limitations on storage abilities in general, resulting in confusion of traces with the result that interfering tendencies inherent in the material will be able to manifest themselves. The source of individual difference

would then be cognitive and inherited rather than a function of acquired personality structure. An indication that this analysis may have some worth is illustrated by the suggested interpretation of Adelson and Redmond's results.

It cannot be denied that there are serious difficulties in this point of view. Firstly, it directs our attention to other, presumably more basic sources of interference, such as reactive inhibition. Some indication of possible ambiguities has been given in the analysis of Sherman's conclusions and these multiply when the concept of the balance of excitation and inhibition is examined further (Beker, 1960). Secondly, it implies an unduly simple minded view of the development of cognitive abilities. Modern theorizing in this field rather tends to look upon the development of such skills as requiring the acquisition of complex internal structures rather than the mere possession of an effective neural mechanism. It is true that recent speculation (Magoun, 1963; Landauer, 1964) makes it apparent that the doctrine of the neural trace is by no means without foundation, but this does not settle the question of the possible organization of such traces. It is clear in the field of verbal recall at least that much of the organization resides in the material to be recalled rather than in the mind of the person.

It might seem, then, that the most effective step would be to turn attention, at least initially, to

the direct influence of personality factors on recall, (Ch. II, pp. 54 - 55). First of all, however, some means of assessing personality is required and here the outlook is gloomy indeed (Vernon, 1964). Moreover, it is apparent that personality assessment proceeds within a framework that is largely dictated by the stereotypes of language (Vernon, 1964), so that, in the type of memory that is of interest in this case, dependent and independent variables are confounded in a highly complex manner. Secondly, if we take up the suggested point of view with respect to the influence of personality variables on recall it is apparent that the manipulated variables will have to be very 'shallow' and have limited explanatory power. The consequence may well be that it will be impossible to escape from a situation where our variables are not explanatory but merely normative.

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IV.

REVIEW OF WORK ON
RECALL OF CONNECTED
DISCOURSE

This section consists largely of a review of work which is difficult to fit into any theoretical category, although an exception must be made in the case of the final sub-section on work on the RI and PI of prose material. Yet such a review is clearly demanded because of the subject-matter of this thesis.

IV. 1.

QUANTITATIVE ASPECTS

A review of early work in this field can be found in McGeoch and Irion (1952). The general conclusion to be reached from a scrutiny of the results is that the recall of meaningful material is higher than that of meaningless material. For example, Dietze and Jones (1931) found that after 6 days, retention of a passage of factual prose, read once, was 68%. This type of conclusion has, of course, to be accepted with care in the light of the work of Underwood (1957).

Gilbert (1957) is one of the few workers who has produced evidence that allows the direct deduction that the continuity between the memory processes for meaningful and meaningless material is complete. He used a drop-out technique in studying the influence of overlearning on the retention of prose. He found that

overlearning causes an increase in retention but does not affect the form of the recall curve, i.e. that it is not true to say that overlearning induces a higher degree of organization in the material. This is also demonstrated by the fact that the curves of the degrees of overlearning (0%, 100% and 200%) ran parallel. He could find no evidence for diminishing degrees of return with increasing overlearning.

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IV. 2.

GENERAL STRUCTURE AS A RELEVANT VARIABLE

Clark (1940) was the first person to do any work in this field. His other findings have been reported in the section on individual differences (see Ch. III, pp. 65 - 6). Here, we will be concerned with recall findings solely, based on two passages and an all-male sample, with 15, 1 and 2 week intervals. The first passage was called "emotional" by Clark. It seems better to call it a "narrative", since it described the behaviour in action of a unit of bloodthirsty Arab troops and contained a great deal of gory detail. Recall of this was contrasted with another passage classified by Clark as "matter-of-fact", which was a description of a room-full of meteorological instruments. Recall of the first passage was significantly better than that of the second at the 15 minute interval, the difference becoming insignificant at one week and being least pronounced at two weeks. The range of recall scores of the first passage also showed more variation.

Clark's general interpretation of these results is in line with those reported in the section on individual differences. He claimed that the emotive richness of the first passage increased its interest for the majority of his subjects. A more reasonable interpretation is that the greater ease of recall of the former is due to the greater familiarity of the subject-matter to the generality of male subjects, who have presumably been fed on an extensive diet of adventure stories.

Ausubel (1960) endeavoured to demonstrate that level of retention of a lengthy passage of^a technological nature would be enhanced by being preceded by what he called an "advance organizer". The passage concerned the metallurgical properties of plain-carbon steel, a topic which must certainly have been unfamiliar to the non-science university students who constituted his sample. The experimental group, before learning the passage, were required to read a short passage discussing the advantages of alloys in general. A control group was asked to study a passage, chiefly on the historical background such as the evolution of the methods used in processing iron and steel. The recall scores of the experimental group were significantly better than those of the control group.

Ausubel maintains that this superiority is due to the fact that the experimental subjects were able to organize the recall passage better than the controls. However, it seems necessary to look for other possibilities. It is possible that PI was developed in the control group, depressing their scores below a level that would have been attained by a group who had had no prior passage.

Secondly, Ausubel reports that a group who read the experimental "organizing" passage only scored at a slightly better than chance level on the questionnaire designed to test retention on the recall passage. This shows that there is some relation between the two. It is possible, therefore, that there was parasitic reinforcement of some of the organizer responses and facilitation of some of the responses in the recall passage, increasing recall in the experimental group. The two effects noted here would then summate to produce the difference which was observed.

The above criticism must remain speculative since the scores of a genuine control group are unavailable. However, in view of the well-substantiated evidence of the influence of PI on nonsense syllables and the fact that it seems perfectly reasonable to extend them to connected discourse, it is felt that it must be given considerable weight. Another error that Ausubel makes is to discuss the application of his technique to learning, when his experimental results refer to recall. It has already been pointed out that the two processes bear a complex relationship to each other, while it can never be assumed in any particular instance that if learning is aided that recall is necessarily assisted as well.

Vernon (1951) attempted to bolster the recall of a passage presenting simple arguments concerning demography by presenting an explanatory diagram, to an experimental group who had learnt and recalled the passage. But the control group, to whom the diagram was not presented, had better recall than the experimental group.

IV. 3.

THE EFFECT OF STYLE AND OF NATURE
OF MATERIAL

Studies in this area are scattered and do not follow any coherent pattern. The general type of interpretation which is made is that certain types of material or certain styles of presentation make for more effective organization and hence for improved recall. The most bizarre of all these studies is by Witzig (1957). He tested the hypothesis that material dealing with archetypal concepts as defined by Jung would be better retained than non-archetypal material and demonstrated the validity of the hypothesis. It is certainly difficult to see any difference in the level of difficulty of the two types of passage. It is possible that the results are due to methodological and statistical errors. Subjects were allowed to read the passages at their own rate and no record of the reading time for the two types of passage was kept. It is possible that the subjects spent more time over the more unfamiliar mythological material. Also, Witzig used three groups of subjects (first-year university, later university, and post-graduate students) for each type of material. There is no report that the members of these groups were matched for recall under the two conditions.

Nias and Kay (1954) used a random sample of 81 as a "listeners jury" to hear a recording of a half-hour BBC dramatised programme designed to give legal information regarding the rights and responsibilities of inn-keepers. Answers to 30 specific questions relating to the story, to the legal points, and to various trivial details were collected. A comparison of the memory scores with

intelligence test scores and with a ranking scale for occupational level showed a fairly consistent relation for the law and trivial items, but a more limited range for the story items, which were retained to some extent at least by all the groups.

Klare, Shuford, and Nichols (1957) examined the relationship of retention and reading efficiency to style of prose passage, to level of practice, and to memory ability. The "easy" style passage gave higher scores on the reading efficiency and recall measures than the "hard" style. The authors believe that the increased reading speed of the "easy" style passage affected its recall beneficially.

Wees and Line (1937), in an interesting study, found that if the amount of information (in the "man-in-the-street" sense of the word) in passages of prose is held constant, but with a note-form presentation in one case and an essay style presentation in the other, it will be the latter which will yield higher recall. They also experimented with another variation in style of presentation in which they endeavoured to show that if the main point towards which the passage is tending is indicated at the beginning and this point is then reached in an orderly fashion, retention is again enhanced as compared with a situation in which this is not the case. The difficulty with the latter finding is that the explanatory variable is a highly subjective one. Wees and Line offer no explanation for the former finding.

King and Cofer (1960b) have studied the influence of the adjective-verb quotient on the recall of

connected discourse. The adjective-verb quotient (AVQ) was first proposed by Boder, (King and Cofer, 1960b) and is a simple measure; a passage with 27 adjectives and 37 verbs would have an AVQ of 69. King and Cofer do not succeed in showing that the AVQ is a useful underlying variable. Indeed, some of their findings, especially the relationship between numbers of verbs and adjectives and length of recall, are ridiculously inane.

IV. 4.

THE CONTRIBUTIONS OF INTERFERENCE THEORY

Until lately, it seemed that interference theorists had nothing of value to offer to the understanding of the processes governing the recall of connected discourse. Until the publishing of Underwood's paper in 1957, it had been held that the recall of meaningful material was superior to that of disconnected, meaningless material. Furthermore, the scrutiny of results available at that time did not bear out the general expectation that interference theory would be applicable to any type of connected discourse.

The earliest work in this area was carried out by McGeoch and McKinney (1934 a and b), retroactive inhibition being studied in both cases. In the earlier study the material was poetry. The interpolated material was other poetry and nonsense material, with retention intervals of 15 minutes and 17 days. Both types of material gave equivalent but very small amounts of inhibition, the inhibition increasing with time. Similar results

were obtained with prose (1934b). McGeoch and McKinney were satisfied with the results on the whole because of their expectation that recall of meaningful material was superior to that of nonsense material.

Their results received some support from the work of Newman (1939). His material was 300 word stories, in which he was able to differentiate 12 items that were essential and 12 that were not essential to the plot. Recall was measured 8 hours after reading, which took place either in the morning or in the afternoon or at night. No control over day-time activities was exerted. The best overall recall was found after the night reading session, when interpolated activities were presumably at a minimum, thus giving general support for the suppositions of interference theory. But when the level of recall of the essential and non-essential items was examined separately, it was found that there was no differential fall in the level of retention of the essential items during day-time. Newman held that this was because the associative power of these items had greater intrinsic strength, that they were held together by the general structure of the story.

Hall (1955) used a completion test as his experimental material and an RI design. OL was 30 sentences, while IL was further sentences varying in two levels of similarity to the topic of the OL sentences. No RI was found.

Ausubel, Robbins, and Blake (1957) used ordinary school text-book materials, and an RI design.

Measurement of recall was by means of a recognition test and the passages were presented on cyclostyled sheets. No RI was found.

Slamecka and Ceraso (1960) criticised the above studies because they used the methods of group-testing, of whole presentation, recognition as a method of measuring recall, and because unlimited recall time was allowed. In general, this would lead to lack of control over the degree of reinforcement of the various verbal items and increase error variance.

Slamecka has made a number of studies which demonstrate that interference theory can be successfully applied to explain the forgetting of connected verbal materials. In the first, (Slamecka, 1959), where subjects were tested in groups, he showed that unaided written recall of a short passage of prose was a negative function of the degree of similarity of topic which an interfering passage bore to the original passage. Using the standard method of presentation of material in rote-learning experiments, he (Slamecka 1960a) showed that the degree of RI was a positive function of the degree of rated similarity between original and interpolated passage. The RI was transitory, as it is in nonsense-syllable experiments. A further experiment (Slamecka, 1960b), also using the serial anticipation method, examined the relationship between degree of IL and degree of OL when both are varied and three levels of each are used. Significant RI was found once more; recall varied directly with degree of OL and inversely with

degree of IL. Furthermore, a study of recall errors suggested a shift in the covert-overt error ratio: as recall rose, together with an increase in the number of interlist intrusions when degree of IL and degree of OL were approximately equivalent. The data on errors are the strongest indication that the findings of interference theorists can be taken over and used without change by the experimenter in this field.

In his latest study, Slamecka (1962) failed to find the classic relationship between number of interlist intrusions and degree of IL. As degree of IL rose, the ratio between this type of intrusion and omissions remained constant. But, earlier findings were not contradicted in that three-quarters of all errors were omissions. The ratio of intralist errors to interlist errors was about two to one. This led Slamecka to reassert a belief expressed earlier (Slamecka 1960b) that the form of interference in connected discourse is general.

Finally, we have a study on PI (Slamecka, 1961). It was found that relative PI increased with degree of PL and that it increased with time. PI vanished quickly during OL. The number of omissions increased as a function of increasing degree of PL and as a function of increasing time-interval between OL and RL.

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IV. 5.

METHODOLOGICAL CONSIDERATIONS

Webb and Schwartz (1959) have shown that the relative amount of error variance of recall measures

rises as a function of the amount of material that precedes testing. Recall was measured by questions about the stimulus material (stories). Questions were asked after each paragraph, after each story, after three stories, and after six stories. Variance, as a whole, rose in negatively accelerated fashion as a function of increasing amount of pre-test material, but error variance increased in a linear or negatively accelerated fashion.

Levitt (1956) has written an important paper on the use of the thematic unit or idea-group as a measure of retention. He points out that despite the wide use of this method of measuring the retention of connected discourse, no attempts have been made to define idea-groups empirically. This means that inter-experiment quantitative comparisons become difficult. The possible combinations of individual words to form thematic units, even when the number of words per unit are held constant, are very large. Since not every word in a passage has an equal chance of being recalled, different groupings could cause different estimates of extent of recall. Further, as the passage increases in length, the number of words per unit tends to rise, as an experimenter is disposed to break his passage up into larger and larger units. Levitt demonstrated that as variance rises, there is a corresponding tendency for mean recall score to rise as well. As an example of possible misinterpretations of results, he quotes Clark's study. The affective passage was significantly more variable than the "meteorological" one with respect to the number of words per unit, and it is possible that the greater variability enhanced the measured recall. The ranking

of subjects for recall is affected comparatively little by divergences in the size of unit.

A problem worth attacking is the degree of agreement between various measures of recall of connected discourse, but so far there have been only three studies (King, 1960; King and Schulz, 1960; King, 1961). King (1960) used seven different scoring techniques. There were: (a) scoring by number of thematic units retained, (b) a kind of "cloze" scoring (for the use of this technique see King and Cofer, 1960), (c) the number of sentences recalled, (d) the number of content words recalled (all articles, conjunctions, prepositions, etc., were eliminated), (e) the total number of words recalled, whether these words were correct or not, (f) the total number of words in recall that were identical with the original words, (g) a criterion based on scaled judgements. The experimental material consisted of narratives, including the "War of the Ghosts". In one study (King, 1960) there were one or two presentations of each stimulus story; in another (King and Schultz, 1960) there were three, four and five presentations.

The intercorrelations were high in both cases and a factor analysis yielded two clear orthogonal factors with negligible residual variance. The factors were identified as number of content words reproduced and the total number of words reproduced.

Deese, (1961a) holds that the situation described by King is easily comprehensible to those who mark essay-style examination questions, in which most examinees reproduce the words of the text-book either at length or briefly. This would account for King's two factors. However, there are enough examinees who give adequate recalls without using the words of the text-book to produce a stable third factor in a large sample. He goes on to say, "The point of King's work ... is that highly judgemental descriptions of recall can be reduced ... nicely to words and word counts. It appears that ... we are not missing something fundamental by the kinds of counting we do." (p. 29).

Finally, King (1961) showed that recall protocols could be effectively ranked without the aid of the original stimulus material.

IV. 6. CONCLUDING STATEMENT

When we take account of all the work that has been produced on the recall of connected discourse, it is evident that only the associationists have produced noteworthy work. An exception should perhaps be made in the case of the work on levelling-sharpening and in the case of the experiment by Adelson and Redmond (Ch. III, pp. 59 - 64), but it must be said that these results are made more meaningful when they are interpreted in terms of association theory.

EXPERIMENTAL

WORK

P R E L I M I N A R Y
S T A T E M E N T

The experiments to be reported here do not form a unified whole in the sense that one large-scale problem is attacked. On the other hand, they are not a series of disconnected studies that merely happen to deal with connected discourse. The Pilot Study is an attempt to study a possible source of individual differences in the recall of prose and two further experiments explore other possible causes of individual differences whose potential role became obvious in the course of analyzing the results. At the same time, the results of the Pilot Study led to the formulation of hypotheses to test a general problem - the relative roles of "form" or the coherent unity of a passage of prose as opposed to its "content" (the associative structure of the words expressing its meaning) in controlling recall. Such attempts culminated in two studies showing that the latter was the crucial variable. These two experiments illustrated the power of association theory, both in its capacity for yielding workable hypotheses and as a reservoir of good experimental designs.

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V.

P I L O T S T U D YAN ATTEMPTED STUDY OF INDIVIDUAL
DIFFERENCES IN THE RECALL OF
SHORT PROSE PASSAGES

V. 1.

I N T R O D U C T I O N

In order to find a suitable hypothesis to test, it was necessary to extrapolate from studies of learning in order to discover the relevant variables. In an experimental population in which the range of intelligence is wide, the correlation coefficient between IQ and measures of verbal learning may be as high as .60 to .70 (McGeoch and Irion, 1952). In populations more homogeneous with respect to IQ such high relationships cannot be expected, but the variability in recall scores remains considerable. Under such circumstances, it is natural to turn to an examination of possible personality variables.

The major variable chosen in this study was self-rationalization. A measure of this, the self-rationalization index (SRI), has recently been validated by Danziger (1963). Danziger postulates that the individual in whom the tendency towards self-rationalization is high treats his life as a form of enterprise, the success of which is evaluated against the criteria commonly used in our society to assess career success. Such

criteria are internalised by the individual so that his own attitudes and forms of thought show a high degree of consonance with the customary beliefs and expectations of his society. It is more important for the present study that such a state of affairs is said to involve "... the application of a strict, objective time scheme to one's personal life, for only in this way can one rationalize the successive activities which constitute the stages of one's career." (Danziger, p. 18).

In the field of memory, such attitudes should play an important role. The process of rationalization should extend to the individual's past. This should result in a relatively high degree of schematization so as to allow his memory system to operate in as efficient a manner as possible. He should thus show a tendency to incorporate relatively easily material which deals with generalized topics and which is more easily taken up by pre-existing schemata, while at the same time should show a tendency to reject material that deals with the specific. Finally, his generally cold and calculating attitude to life should lead to a lessened degree of interest in emotively rich material.

A preliminary attempt was also made to assess the influence of reading speed on recall. The only previous work on this topic is a study by Raymond (1955), who found that reading achievers were better than non-achievers on auditory span, than on visual-span tests of immediate memory. Achievers' scores on a test of related items were higher than their scores for unrelated items,

while they had higher span for digits/forward than for digits reversed. Poulton (1958) believes that high reading speed is an advantage only when the subject returns to selectively study material that has already been covered.

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V. 2. METHOD

V. 2. (1). Introduction The general aim of the experiment was to produce two prose passages of such a type that they would easily be incorporated into the memory schemata of individuals high in self-rationalization, and two of a type that would not so easily be incorporated. The two passages of the first type were called "abstract", the two of the second type "concrete". One "abstract" passage was a simple case history, written in a very bare, unemotional style, the other a strictly rational argument. One "concrete" passage was a lyrical description of a rural scene, the other an introspective description of a man's state of mind. The main hypothesis was that the correlations between SRI and recall would be positive and significant only in the case of the abstract passages.

The dependent variable was the recall scores of the various passages. It was not thought necessary in a study of this nature to take variations in degree of reinforcement into account. However, all the Ss had

the same opportunity to reach the same degree of reinforcement during the learning period.

V. 2. (ii) Subjects The Ss were 42 female university students taking the first course in Psychology at the University of Cape Town. They ranged in age from 17 to 21 years. The testing was carried out as part of the normal course of practicals in the department. The Ss were not paid for their co-operation.

V. 2. (iii) Prose Passages These were made up on the basis described above. The passages were not presented to the Ss in the way shown below. The strokes indicate the manner in which the passages were broken up for scoring purposes. The passages, which were cyclostyled and duplicated, were as follows:

ABSTRACT PASSAGES

Case History (called "Case" hereafter).

The patient VL was a male unmarried clerk, age 62./ In 1925 he suffered severe concussion/ following a motor accident./ He subsequently became alcoholic,/ his first treatment in a general hospital being in 1937./.

In 1941 he was again severely concussed/ in an air-raid./ Again, recovery was incomplete;/ movement of the left side of the body was impaired./ The patient continued to be alcoholic./ In 1952, examination showed/ that there was a severe loss of

memory for recent events/ combined with dis-orientation in space and time./ The patient was placed in an institution,/ where he died three years later./ On post-mortem,/ it was discovered that there was widespread brain-damage,/ most of which was probably due to alcoholic poisoning,/ but some to the accident reported above./

. . .

A Refutation of Malthus (called "Malthus" hereafter).

Malthus, from an examination/ of the data available to him,/ concluded that the rate of increase of population far exceeds that of food production,/ the former being geometric, the latter arithmetic./ The consequence of this is that,/ without the occurrence of wars and pestilences,/ mankind would rapidly outgrow its food supply/ and mass starvation would be inevitable./

A fallacy in his argument is the assumption that his data express an unchanging tendency./ He could not foretell/ the immense improvements in agricultural technology which have occurred./ Nor could he foresee the accelerating industrialization of underdeveloped countries,/ leading both to a drop in the birth-rate/ and to the availability of funds for the purchase of food from areas like North America/ which are faced with agricultural over-production./

. . .

CONCRETE PASSAGES

A Country Scene (called "Scene" hereafter).

Beyond and about us lay an exquisite man-made landscape./ It was a sequestered place,/ enclosed and embraced in a single, winding valley./ Our camp lay along one gentle slope;/ opposite us the ground led to the neighbourly horizon./ Below us flowed a stream,/ which had been dammed/ here to form three lakes,/ one no more than a wet slate among the reeds,/ but the others more spacious,/ reflecting the clouds and the mighty beeches at their margin./ The woods were all of oak and beech, the oak grey and bare,/ the beech slightly dusted with green by the breaking buds./ They made a simple, carefully designed pattern/ with the green glades and/ the wide green spaces,/ planned 150 years ago/ but seen now in its full maturity./

... ..

The Dreamer (called "Dreamer" hereafter)

This was one of his lucid, conscious moments./ Horror possessed him when there arose before him/ a clear idea of what human destiny was meant to be/ as compared with his own existence,/ when the problems of life wakened within him/ and whirled through his mind like frightened birds/ roused suddenly by a ray of sunlight in a slumbering ruin./ It grieved him to think that he was undeveloped,/ that his spiritual forces had stopped growing./ He bitterly envied those whose

lives were rich and full./ His timid mind recoiled when it grasped/ that many sides of his nature had never been awakened./ But then the period of consciousness would pass away/ and he would sink once more into sloth and indolence./ And, with time, the lucid intervals became fewer and fewer./

. . .

V. 2. (iv) Presentation of the Material The method of group-testing, whole-presentation and unlimited recall time was used. The passages were issued to the Ss face-down. The Ss were required to read the passages, starting at a signal given by the experimenter. They were allowed one minute for each reading and were then asked to, "Reproduce the passage in any way you like".

Three such training sessions were given for each passage. Six experimental groups of 12 - 20 members each were used. The passages were presented in a partially counterbalanced order.

Delayed recalls were collected one and eight weeks later. At the end of the one-week period, Ss were simply asked to reproduce the passages they had learnt. At the end of the eight-week period the titles of the passages were written up on the blackboard in order to stimulate weak recalls.

V. 2. (v) Scoring Techniques Two methods of scoring the protocols were used. The first was a complicated word-count. The number of words of the original passage that were reproduced in the protocols and that appeared in the correct sequence were counted, each word being given a score of one. The same was done for words that effectively rendered the meaning of the original and whose order of recall was correct. Each of the words that was either an original word or an effective substitute for an original word but was displaced from its original position was given a score of a half. Any word that was clearly wrong was given a score of minus one. The total score was computed for each of the first immediate reproductions and for the delayed recalls.

The other scoring system was that of thematic units or idea groups (Levitt, 1956). Both scoring systems were applied by the experimenter, the reliability of the first being checked by using another rater.

V. 2. (vi) Self-Rationalization Index This was measured in the way described by Danziger, (1963).

V. 2. (vii) Reading Speed Scores were available for 13 Ss on both immediate recall and on reading speed, as measured by the University of Cape Town Reading Speed Test, (Grover, 1958). Unfortunately only a few of this group were present during delayed recall sessions.

V. 3. RESULTS

V. 3. (1) Reliability of the Recall Measures The inter-rater reliability of the word-count on a sample of 30 one-week recall protocols was .920. Reliabilities across the two systems of measuring recall were computed separately for the one-week recalls, all 42 protocols being used. r varied from .907 to .934.

The influence of the possible effects of proactive and retroactive inhibition were examined by setting out the one-week and eight-week recall scores and doing t tests on the scores within each passage. Since only one significant difference was found, it was concluded that the scores for each type of passage could justifiably be pooled.

V. 3. (11) Recall Data. The means and S.D.s of the recall scores for each type of passage are shown in Table 1.

T A B L E 1.

Means and S.D.s of the Recall Scores (in Percentages of Thematic Units Reproduced) for Each Passage.

<u>Passage</u>	<u>One-Week Recall</u>		<u>Eight-Week Recall</u>	
	<u>Mean</u>	<u>S.D.</u>	<u>Mean</u>	<u>S.D.</u>
Case	70	4.88	37	19.03
Scene	50	21.92	18	40.00
Dreamer	32	27.29	11	38.30
Malthus	35	27.51	11	37.56

The differences between the recall scores were explored by means of t tests. The results are shown in Table 2.

T A B L E 2.

Tests of Significance of the Differences Between the Mean Recall Scores of the Four Passages.

<u>Comparison</u>	<u>One-Week Recall</u>		<u>Eight-Week Recall</u>	
	<u>t</u>	<u>p</u>	<u>t</u>	<u>p</u>
Case and Scene	4.202	0.01	5.23	0.01
Case and Malthus	5.882	0.01	7.47	0.01
Case and Dream	6.463	0.01	7.34	0.01
Case and Malthus	2.007	0.05	2.79	0.01
Scene and Dream	2.426	0.05	2.65	0.05
Malthus and Dream	0.642	n.s.	0.781	n.s.

Case was the easiest passage to recall, followed by Scene, with the remaining passages tying for third place. The same pattern is found at both recall intervals.

V.3. (iii) Relationship Between SRI and Recall

Measures Not one of the correlations between SRI and the eight measures of recall came anywhere near to reaching significance. It was not even worthwhile adopting the inferior procedure of examining the differences between the recall scores of extreme scorers on the SRI. There is no point in presenting the detailed results.

V. 3. (iv) Relationship Between Reading Speed and Recall Measures Because the number of Ss for whom both reading speed and delayed recall scores were available was very small, only the relationship between reading speed and immediate recall could be examined. The results are shown in Table. 3.

T A B L E 3.

Product-Moment Correlation Coefficients Between First Immediate Recall Scores and Reading-Speed Scores.

<u>Passage</u>	<u>r</u>
Case	.535 °
Scene	.619 °
Malthus	.514 °
Dreamer	.211

° significant at the 0.05 level

V. 3. (v) Interrelationships Between the Recall Measures. The scores for the first immediate recall, for the one-week recall and for the eight-week recall were intercorrelated separately. The results are shown in Table 4. It will be observed that the recall scores of the passages failed to cluster in the manner predicted by the hypothesis.

T A B L E 4.

Intercorrelations of Recall
Scores within Type of Passage

<u>PRODUCT-MOMENT CORRELATION COEFFICIENTS</u>				
<u>Immediate Recall</u>				
	<u>Case</u>	<u>Scene</u>	<u>Malthus</u>	<u>Dreamer</u>
Case		.268	.668	.441
Scene			.356	.042
Malthus				.345
<u>One-Week Recall</u>				
	<u>Case</u>	<u>Scene</u>	<u>Malthus</u>	<u>Dreamer</u>
Case		.574	.621	.564
Scene			.377	.490
Malthus				.490
<u>Eight-Week Recall</u>				
	<u>Case</u>	<u>Scene</u>	<u>Malthus</u>	<u>Dreamer</u>
Case		.591	.368	.153
Scene			.453	.499
Malthus				.355

Correlation coefficients on each passage were also computed for first immediate vs. one-week recall scores, for first immediate vs. eight-week recalls, and for one-week vs. eight-week recalls. The mean correlation coefficient over all four passages was also computed for each recall interval. The results are shown in Table 5.

TABLE 5.

Product-Moment Correlation Coefficients Across
Passages and Between Recall Intervals.

<u>Passage</u>	<u>Immediate vs. One-week Recall.</u>	<u>Immediate vs. Eight-week Recall.</u>	<u>One-week vs. Eight-week Recall.</u>
Case	.470	.358	.566
Scene	.311	.031	.678
Malthus	.403	.024	.426
Dreamer	.421	.051	.444
\bar{X}_r	.401	.116	.528

The differences between two pairs of mean correlation coefficients were computed, using McNemar's (1962) method. These were, firstly, the difference between the mean correlation coefficient for immediate reproduction vs. one-week recall and the mean correlation coefficient for the one-week vs. eight-week recall. The second difference was that between the mean correlation coefficient for immediate reproduction vs. eight-week recall and the mean correlation coefficient for one- and eight-week recall. The t value for the first difference was .809, which was not significant. The t value for the second was 2.989 ($p < 0.01$). The conclusion to be drawn from this result is that although the recall processes operating at the immediate level are still operating at one week, they have ceased to operate at eight weeks. At the same time, it is noted that the

highest mean correlation coefficient, of the three given in Table 7, is that between one- and eight-week recall. Thus, it seems that it is not lapse of time alone that causes the fall in the size of the correlation coefficients.

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V. 4.

DISCUSSION

The most striking positive finding which emerged from this study was the marked difference in the ease of recall of the four passages. It is not possible to argue that this resulted from a methodological artefact. Levitt (1956) has shown that as the length of thematic units increases, there is a corresponding rise in the variability of the recall scores obtained by the use of this method. An examination of Table 1 and of the divisions into thematic units of the experimental passages shows that this finding was repeated here. But Levitt also found that as the length of the thematic unit increased, the mean recall score is likely to rise, whereas the opposite is true in the present case. The apparent association between "type of passage" and degree of recall stimulated all the experimental work which follows, and the broad issues which the finding raises will be discussed in the next section.

Finally, some evidence can be adduced, from the results, which points to a difference between the processes controlling immediate and more long-term memory. The first is that the correlation coefficients

for the one-week vs. the eight-week recalls are uniformly higher than the coefficients for immediate vs. the one- and eight-week recalls, the difference being striking in the latter case. Secondly, immediate recallability showed a marked relationship with reading speed. It seems likely, considering the low correlations between immediate and delayed recall, that reading speed is an unimportant factor in delayed recall. Thus, immediate memory might be influenced beneficially by the ability to take up material rapidly, whereas long-term retention might be more influenced by processes which consolidate the material.

V. 5.

SUMMARY

The results of an attempt to find a relationship between the recall of prose passages of differing types and a personality measure (the Self-Rationalization Index) are reported. No relationship was found. However, a good relationship between reading-speed and immediate recall was found, while there is some evidence that the processes governing immediate recall differ from those controlling later memory. The most significant finding, in the sense that it stimulated four of the experiments which follow, was the marked difference in ease of recall of the four passages used. A narrative was well retained, a complex description was recalled less well, while an argument and an introspective passage were retained equally badly.

V. 6.

PROLEGOMENA TO EXPERIMENTAL WORK

V. 6. (i) Introduction It has been pointed out, that not only did the expected relationship between SRI and recall scores not emerge but also, that the recall scores themselves did not fall into the expected clusters. Because of the large number of meaningless correlations, it was not possible to factor analyze the total inter-correlation matrix. It can be said that the function of the rest of the experiments performed was to discover the nature of potential variables. This entailed both framing hypotheses on the basis of the work reviewed in the Introduction and working out methods whereby these hypotheses could be tested.

V. 6. (ii) "Form" as a Relevant Variable The first possibility is that the essential feature controlling recall is the form of the passage rather than its subject matter. This assumption is based on the work of Bartlett (1932), who believed that what is retained by the S are not traces of the actual words of the passage but some general apprehension of its total nature. This entity forms a scaffolding around which later recall is created. Then, the hypothesis, as applied specifically to the results reported above, would be that some intrinsic feature of the narrative form renders it inherently more retainable; that this ease of retainability is a less marked feature of the descriptive form; and that it is lower still in the argumentative and introspective forms.

V. 6. (iii) "Familiarity" As a Relevant Variable

The other hypothesis is that the form of the material is of little account and that the crucial feature is the associative structure of its words. The re-interpretation of Bartlett's work by Deese (1961a) and the implications of the experiment by Underwood and Postman (1960) make this alternative attractive.

The attractiveness of the second hypothesis is increased by the disadvantages of the hypothesis regarding form. Firstly, it is obviously difficult to separate effectively the "form" of a passage from its "content". Secondly, it is evident that "form" alone cannot be the sole factor influencing recall, but that some scope must remain for the influence of variations in subject-matter. Thirdly, the first hypothesis gives no inkling as to what feature of "form" affects memory. Thus, it is possible to rank different "forms" for ease of recall only when their ease of recall has been observed. Finally, it seems justifiable to reduce the first hypothesis to the second. For example, in the case of "narrative form", one could say that material clothing this form is recalled easily, simply because the form is highly familiar.

When evidence for the second hypothesis is sought in the data presented above, none is, however, forthcoming. It would seem that the highest correlations should be between the passages whose recall is most nearly equivalent. But this was not the case.

Yet, this does not disprove the hypothesis. It does not follow that, because the degree of familiarity of the passage is the same in the population as a whole, there will be no variations in degree of familiarity from one subject to the next. The hypothesis cannot be demonstrated until some external measure of familiarity is devised.

V. 6. (iv). Failure to Find a Relationship Between Personality Factors and Recall. The reason for this failure can be made clear by accepting, on a provisional basis, the validity of the hypothesis regarding familiarity. Once degree of familiarity can be assessed, the extent of recall can be predicted, provided that the empirical basis for such predictions is available. Clearly, personality variables, which must have some control over attitudes directing the individual to have certain interests rather than others, must affect degree of familiarity. The question that now arises is why it is not possible to proceed directly from personality measures to recall measures.

The point can be made clear by referring to the present case. In the Introduction to the Pilot Study it was stated that the self-rationalizer assessed all his experience with reference to possible career success. It can therefore be predicted that he will be most familiar with verbal material relating to his chosen

goal. These goals will differ from one self-rationalizer to the next, so that this knowledge must be available to the experimenter before he can predict extent of recall.

The second reason for the failure of the experiment lies in what might be called the "projective fallacy". It was implicit in the designation of the two types of passage as "abstract" and "concrete" that the form or structure of the passages would directly mirror the structure of the minds of the Ss. It was thought that the self-rationalizer would incorporate the two "abstract" passages relatively easily, merely on the basis of certain general features that they had in common and which can be looked upon as attributes of their form. Both had no imagery; neither made any reference to specific individual human problems; the primary concern of both was accuracy, for the presentation of a series of events on the one hand and for logical exactitude on the other. Further reflection shows that it is naive to expect the mind of a "personality type" to display itself in this immediate fashion. The self-rationalizer may see himself and his world as schematized and abstract. It does not follow that he will automatically find it easier to incorporate all such material, nor that he will be unable to recall with relative ease material that is emotively rich. It is possible to envisage that a self-rationalizer who has made a career of English Literature, might well be highly

familiar with precisely this type of material. His attitudes would express themselves, not in lack of retentiveness of his chosen subject-matter but, in the quality of his appreciation of it, and his concern for personal success.

V. 6. (v) Preview of Experiments Experiments 1, 2 and 3 deal with "form" as a relevant variable. In Experiment 1, an hypothesis was framed to explain the relatively good recall of "A Country Scene". The hypothesis was of such a nature that it enabled a possible test of Bartlett's suppositions about recall types. An effort was made to treat "narrative form" and "argumentative form" as independent variables in Experiment 2. In Experiment 3, "form" was treated at a less fundamental level; that is, in terms of style of presentation.

Experiment 4 examines the role of the changer-condenser continuum of Gomulicki (1956b) as a possible source of individual differences in recall. Possibilities for examining the influences of individual differences in recall at a more fundamental level are opened in Experiment 5, where a scale of familiarity was devised and its relationship to the degree of recall was examined. The successful validation of the hypothesis, combined with data on sex differences, make it possible to profer suggestions about future work on this topic.

The sixth and last Experiment is a simple extension of Slamecka's work (see Ch. IV, pp. 80 - 81). The results can be related to the findings of Experiment 5 in that they can both be interpreted in terms of Association Theory.

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VI.

EXPERIMENT ONETHE RELATIONSHIP BETWEEN RATED STRENGTH
OF VISUAL IMAGE AND ABILITY TO RECALL A
PASSAGE OF CONNECTED DISCOURSE

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VI. 1.

INTRODUCTION

This experiment is the first which was designed to explore problems arising from a study of the results of the Pilot Study. The passage entitled "A Country Scene" is complex and yet its mean recall was relatively high. It was thought that one of the reasons for this finding might be that during the interval between learning and recall a visual image of the scene described in the passage arose in the minds of a significant proportion of the group of subjects and acted as a 'scaffolding' around which recall arranged itself. This hypothesis is derived from the ideas of Bartlett on Form (Ch. II, pp. 42 - 3). An attempt was also made to test some of Bartlett's speculations about the supposed difference between 'visualisers' and 'vocalisers' (Ch. II, p. 42 - 44). He claimed that the use of visualization, when predominant, leads to confusions of order in recall and favours the introduction of extraneous material, whereas the use of vocalization favoured the preservation of the correct order in re-

call and yet had no effect on the introduction of extraneous material. Here the rationale was simply that it was possible that a person who was able to form a strong visual image would presumably be a visualizer as defined by Bartlett.

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VI. 2. METHOD

VI. 2. (i) Subjects The Ss were male and female university students taking the first year Psychology course at the University of Cape Town. They ranged in age from 17 to 21 years. The n was 53 (23 male and 30 female.)

VI. 2. (ii) Rating Scale of Strength of Visual Image

The scale was a modification of that used by Galton (1883) and was as follows:

Did a visual image or "mental picture" of the scene described in the passage arise in your mind at any time? (Answer "yes" or "no")

If such an image did arise then rate on the following scale (put a tick next to the description which applies):

1. The whole scene is as clear as the real one with very bright colours

2. The whole scene is as clear as a real one. Colours are not very bright

3. The whole scene is fairly clear and well defined

4. Only certain parts of the scene are clear, but they are distinct

5. There is an image of the scene, but it is dim and confused

VI. 2. (iii) Presentation of the Experimental Material

Testing was in the group situation, with whole presentation and unlimited recall time. Ss were tested during normal practical sessions. The three groups tested numbered 15, 18, and 20. There were two experimental sessions for each group. In the first, a cyclostyled version of "A Country Scene" was presented. At the command of the experimenter, Ss were required to pick up the passage and read it as many times as they could in the time allotted (one minute, twenty seconds). They were then asked to make an immediate reproduction. The resultant protocols were called "immediate reproductions".

One week later the same Ss were presented with a two-page cyclostyled form. On the first page the instructions were:

"Reproduce the passage called "A Country Scene" which you learnt last week: Do not turn over until you have recalled as much of the passage as you possibly can."

The Ss performed this task in the space provided and on turning over found the instructions for the rating scale given above.

VI. 2. (iv) Measurement of Recall Scores Two measures were used. The first was that of "thematic units" or "idea groups" (Clark, 1940; Levitt, 1956). The second, called "correct words" was simply the number of words of the original which also appeared in the protocols.

VI. 2. (v) Derivation of Assimilation Score. This score was derived simply by counting the number of words assimilated. Words such as "pond", "dam", etc. are easily scored, each such assimilation receiving a score of one. Trees were commonly wrongly recalled (birch, fir, elm, etc.); sometimes conventional descriptions were added, e.g. the trunk of the birch might be said to be white and smooth (which would gain a score of three). Unusual assimilations were: "the stream divided into two" (a score of three); "As we crossed the last ridge" (scored three); and "we pitched our camp" (one). If the camp was said to be in the valley, a score of two was given.

VI. 2. (vi) Misplacements of Order The thematic unit system was used to derive this score. A thematic unit which was misplaced was given a score of one. Ss tend to rearrange the order of recall of prose to a very slight extent and misplaced material is easily located.

VI. 3.

RESULTS

There was no difference in the general ability of the three groups to recall "A Country Scene". When scores for delayed recall based on the thematic unit system were analysed F was 3.12, which, with d/f of 2 and 50 just fails to meet the 0.05 level of significance. There was also no difference in the recall ability of the males and females in the sample. The mean thematic unit score for the males was 4.04 and 5.43 for the females. t was 1.65, which is not significant. It was therefore justifiable to treat all 53 Ss as a single group.

VI. 3. (i) Reliability of the Imagery Scale About five months after the recall tests had been performed an altered form of the procedure described above was used with 39 of the original Ss. Testing was again carried out in the practical classes. This time Ss merely read "A Country Scene" for 1 minute, 10 seconds, without producing a recall and then immediately responded to the imagery scale. The product-moment correlation coefficient was .595, which is significant at well beyond the 0.01 level. It was therefore concluded that the scale was reasonably reliable.

VI. 3. (ii) Relationship between Recall and Strength of Image Since the expected relationship between strength of image and degree of recall was positive, the

scores derived from the scale of imagery were inverted. The mean and S.D. of the imagery scale were 3.66 and 1.10 respectively. The means and S.D.s of the recall scores are shown in Table 6, together with the product-moment correlation coefficients between the recall and imagery scores.

T A B L E 6

Means and S.D.s of the Recall Scores, with their
Product-Moment Correlation Coefficients with the
Imagery Scale

	<u>Immediate Reproductions</u>			<u>Delayed Recalls</u>		
	<u>Mean</u>	<u>S.D.</u>	<u>Correla- tion</u>	<u>Mean</u>	<u>S.D.</u>	<u>Correla- tion</u>
Thematic Units	7.95	3.29	+.251	4.88	3.20	+.414*
Correct Words	26.89	11.28	+.159	13.75	9.28	+.382*

* Significant at the 0.01 level

VI. 3. (iii) Relationship Between Degree of Visuali-
zation and Extent of Assimilation Extreme scores on
the imagery scale were separated as follows. Low
scorers^{were} defined as those who had scores of 5 or 6

($n = 11$) and high scorers as those with scores of 1 and 2 ($n = 10$). The mean assimilation scores of the two groups were then compared. The mean assimilation score of the high-scorers was 4.50, that of the low-scorers was 4.19. $t = 0.05$, so that it appears that Bartlett's hypothesis has not been substantiated.

VI. 3. (iv) Relationship Between Strength of Image and Number of Displacements During Recall It was not possible to test the hypothesis because only six Ss showed any displacements.

VI. 3. (v) Validity of the Imagery Scale An attempt was made to assess the validity of the imagery scale at the same time as its reliability was being tested. It was considered that, because of the context in which the scale was first administered, Ss might have used it not merely as a means of rating strength of image but also as a means of rating the adequacy of their own recall. Because recalls were not demanded at the second administration, no such tendency would be present there. Thus, if the scale measured strength of image and nothing else, the correlation between imagery and recall scores should not show a significant drop. When imagery scores obtained on the second occasion were correlated with the recall scores obtained on the first occasion, r for imagery vs. delayed recall was .156, while for imagery vs. immediate reproduction r was .067.

VI. 4.

DISCUSSION

Despite the fact that a small but significant correlation was found between imagery and recall scores on the first occasion that the main hypothesis was put to the test, the marked fall in the coefficient when the reliability of the scale was tested casts doubt on the general applicability of the finding. On the other hand, in both cases the size of the coefficient was greater when delayed recall scores were used, which is in line with the supposition given in the Introduction; that is, that the "form" of the passage would take some time to develop.

It therefore seems reasonable to explain the result in terms of the inadequacy of the scale. Inadequacies are obvious, even if the low reliability is not taken into account. The most striking defect of the scale is that one reference point (no image at all) was not placed in conjunction with other statements referring to strength of image. Secondly, it is probable that Ss were not offered a sufficient range of statements at the low end of the scale, which would result in crowding of judgements around statements 4 and 5, with consequent poor differentiation.

Even so, the marked drop in the correlation coefficient remains a problem. After all, there is no intrinsic reason, apart from that suggested (use of the scale to rate efficacy of recall), why the coefficient should not be higher on the second occasion rather than the first. If the scale measures nothing but strength

of image the shrinkage in the size of the sample should not affect the issue. The only suggestion that can be made is that when the reliability was tested the Ss were not given the same length of time to allow the image of the scene to develop. But they already had considerable acquaintance with the passage, so it might be thought that the image would be sufficiently strong.

Furthermore, the failure to confirm Bartlett's hypotheses regarding the supposed characteristics of visualisers and vocalisers was not final. It should be noted that these hypotheses were made in a section of his work dealing with the recall of visual figures, which do not have the tight intrinsic structure possessed by connected discourse. That this is the case is shown by the fact that only six Ss showed misplacements in the order of recall. It can be argued that the concept of assimilation used here differs from that which Bartlett had in mind. It is probable that those among the present group of Ss who showed any tendency to assimilate external material were prevented from doing so by the nature of the material. Of course, had a longer passage been used and had it been reinforced to a lower degree, more assimilations and misplacements might have been observed.

In undertaking further work, a source of ambiguity will have to be taken into account. Even if a reliable scale of imagery showing significant correlations with recall is constructed, it will not necessarily follow that the causal factor is the production of some sort of mental scaffolding created out of representations

of the scene described. Instead, it is possible that those Ss with good mental imagery might simply be forming a 'picture' of the words on the page, and such an ability need not necessarily be related to ability to form a scaffolding of the former type. Attempts were made to estimate the relative importance of the latter factor in the present study. Firstly, it was suggested that the mental picture of the scene itself might take time to develop, so that the correlations between imagery and immediate recall scores would be insignificant. Such a result was obtained, but it is still possible that development might be a characteristic of the image of words. So, correlations between imagery scores and recalls of a non-descriptive passage were obtained for a part of the sample. Unfortunately, by chance, a portion of the sample which showed poor correlations between imagery and recall was selected, so that it was possible to infer only that the imagery scale was unstable. Further work will be undertaken, since the results seem to be sufficiently interesting to warrant replication.

. . .

VI. 5.

SUMMARY

The results of an attempt to find a relationship between the recall of a passage of descriptive prose and the scores on a scale of visual imagery are

reported. The hypothesis was that those who were able to form such an image relatively well would achieve better recall than those who formed the image relatively badly. At the same time, it was suggested that those who formed a good image would be "visualizers", as defined by Bartlett, and those who failed to form such a good image would be "vocalizers". Bartlett's suggestions regarding assimilation tendencies and tendencies to alter the order of recall as related to the visualizer-vocalizer dimension were also examined. Although a positive and significant correlation was found between recall and strength of image, it was impossible to demonstrate the validity of the hypothesis fully. It proved to be impossible to put the other hypotheses to the test.

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VII.

EXPERIMENT TWO

THE RELATIONSHIP BETWEEN THE NARRATIVE
AND ARGUMENTATIVE FORMS OF PRESENTATION
OF IDENTICAL SUBJECT MATTER AND THEIR
DEGREE OF RECALL

VII. 1.

INTRODUCTION

In this experiment, form, as defined by Bartlett, is manipulated in a different fashion from the way that it was done in Experiment 1. In the Pilot Study, a marked difference was found between the general level of recall of a narrative ("Case History") and an argument ("A Refutation of Malthus"). The suggestion to be explored here is that Ss may have had more difficulty with the latter passage because the type of "scaffolding" provided by a logical structure is inherently more difficult to create, so that later recall suffers. No attempt was made to search for possible individual differences with respect to the ease with which such a postulated structure might be set up since it was necessary to see first of all if any evidence could be found for the presence of such a structure.

VII. 2. METHOD

VII. 2. (i) Introduction An attempt was made to set the same material in a narrative framework in one case and in logical form in the second. The hypothesis was then that recall of the first passage would be significantly greater than that of the second.

VII. 2. (ii) Subjects The Ss were male and female university students taking the first course in Psychology at the University of Cape Town. They ranged in age from 17 to 21 years. The narrative passage was given to two groups of 16 and 18, the argument to two groups of 21 and 12.

VII. 2. (iii) Preparation of the Experimental Material The argumentative passage was written by the experimenter, who then gave it to a senior student who prepared the narrative form. (The writer is indebted to Mrs. Joan Ross for her assistance in this matter). The two passages are shown below. The strokes indicate the divisions of the thematic unit scoring system used (see below) and did not appear in the passages that were actually presented.

(NARRATIVE)DARWIN'S THEORY OF EVOLUTION

/When Darwin was studying in Edinburgh in 1825,/ people believed that all the organic species seen on earth/ had existed in the same form since time began./

But two experiences made him question this./

/In 1831, he sailed on the "Beagle"/ as a naturalist for the expedition,/ and during this trip he observed that where certain species were becoming extinct/ i.e. losing the struggle for existence,/ they were always related to another flourishing species./

/On his return in 1836/ Darwin visited a friend/ who ran a studfarm in Kent./ While inspecting the carefully bred yearlings,/ an idea struck him./ If man can select desirable variations of a certain species/ and encourage them to accumulate to produce an improved form,/ surely this could occur naturally./

But to create an evolutionary theory/ he needed a link/ for the notions of struggle for existence and selection./ Then one day in 1838/ he picked up an essay by Malthus./ Malthus claimed that human population was increasing/ faster than its food supply./ He also said that a species increases/ to the limit of its means of subsistence./ Excitedly Darwin generalised this/ to all species./ Once a species has increased sufficiently/ its members must be competing/ for insufficient food./ If all organic species had remained unchanged/ all their members should be in such competition./ But such competition is not universal./ Could the answer not be/ that forms able to use/ a type of food different from that/ in short supply/ could arise naturally?/ Darwin reread two of

the entries in his notebook./ "Where a species is becoming extinct/ a related species is increasing in numbers"/ and "Animal breeding shows that/ the characteristics of a species can change", he had written./ Now it became evident to him that/ Nature uses competition for food supply/ to test out variants of species/ and allows only the desirable variants to survive./ So he concluded that organic species are/ in a continual state of change/ in order to adapt to a constantly changing environment./ The theory of evolution was born./

(305 words)

(ARGUMENTATIVE)

DARWIN'S THEORY OF EVOLUTION

/The position that Darwin had to combat was/ that all the organic species seen on earth/ had always existed since time began/ in the same form that we see them now./

/Two lines of evidence/ made this position seem unlikely./ Firstly, certain species were becoming extinct,/ i.e. they were losing the struggle for existence./ Where this process could be observed/ it was seen that such declining forms/ were always losing ground/ to a related species./ Secondly, the facts of animal breeding/ should be taken into

account./ Man can select desirable variations/
of a certain species and encourage them to accumu-
late/ so as to produce an improved form./ Surely
this process could occur naturally./

/In order to create an evolutionary theory./
the notions of struggle for existence and of selection/
had to be linked./ Another thinker, Malthus,/ had
already stated that/ human population was increasing/
at a faster rate than its food supply./ He also
maintained that any species increases/ up to the limit
of its means of subsistence./ Darwin generalised
Malthus' observations to all species./ Once a cer-
tain species has increased sufficiently in numbers/
all members of it must be competing/ for an insuffi-
cient supply of food./ If organic species had re-
mained unchanged/ then all members of every species/
should be involved in such a competition./ But ob-
servation shows that such competition is not universal./
The way out of the dilemma was/ to assume that forms
which could make use/ of a type of food different from
that/ which was in short supply/ could arise naturally./
Animal breeding showed/ that the characteristics of a
species could change./ Where a species was becoming
extinct/ a related species was increasing in numbers./
Thus it is evident that/ Nature makes use of competition
for food supply/ to test our variants of species/ and
allows only the desirable variants to survive./ Thus,
organic species are/ in a continual state of change/ in
order to adapt to a constantly changing environment./

(328 words)

VII. 2. (iv) Presentation of the Material The

material was presented during the course of normal practical classes. The method of group testing with whole presentation and unlimited recall time was used. The passages were cyclostyled and presented face-down to Ss. At a signal from the experimenter, Ss picked up the passages and read them as many times as they could in the time allotted (3 minutes, 30 seconds). Recalls were collected immediately and at the end of a week. Because of a public holiday, only 28 Ss were available for the delayed recall session. Ss were asked to indicate whether they had ever read any material relating to the topics dealt with in the passages.

VII. 2. (v) Method of Measuring Recall Two methods were used. The first was that of thematic units or idea-groups (Clark, 1940; Levitt, 1956). The second method was to count the number of words in the original that also appeared in the protocols. This measure was called "correct words".

VII. 3. RESULTS

An analysis of variance was performed on the immediate recall scores. F , with d.f. 3 and 63, was less than 1. The only conclusion that could be drawn from this was that the four groups did not

differ significantly in recall skills.

Next, four groups for each type of passage were made up by differentiating those who had reported having read something on the topic of evolution from those who had not. Separate t tests were then performed for each type of passage. The results are shown below in Table 7.

T A B L E 7.

Means, S.D.s, and t values for the Recalls
(Measured in Correct Words) of Readers and
Non-Readers

	<u>Argument</u>		<u>Narrative</u>	
	<u>Readers</u>	<u>Non-Readers</u>	<u>Readers</u>	<u>Non-Readers</u>
Mean	41.4	30.38	50.00	53.89
S.D.	20.39	13.42	17.44	20.23
n	7	26	15	19
	$t = 1.62$ (n.s.)		$t = 0.58$ (n.s.)	

It is apparent that previous acquaintance with the subject matter of the passages is not a significant source of variance.

Finally, a t test was performed on the delayed recall scores. The results were as follows (Table 8):-

T A B L E 8.

Mean, S.D. and t Value for the Delayed
Recall Scores (in Thematic Units) of the
two Passages

	<u>Argument</u>	<u>Narrative</u>
Mean	4.25	6.67
S.D.	3.11	1.75

$$t = 1.46 \quad (0.2 > p > 0.1)$$

It is therefore apparent that the hypothesis was not substantiated.

VII. 4. DISCUSSION

Very little discussion is required, although possible methodological reasons for a failure to support the hypothesis should be sought. The first is that the narrative passage is slightly longer than the argument. However, it is apparent from an examination of the recall scores obtained that this difference is so slight that an attempt to strictly equalize for

length would not materially improve the position. Secondly, it is possible that chance differences in general recall ability may have affected the results - the Ss to whom the narrative was presented may have had poorer memories than the Ss to whom the argument was presented. But this does not seem to have been the case.

Most important, it can easily be argued that the hypothesis was not substantiated simply because the "narrative" passage was not a narrative. The best answer to that criticism is to say that if a greater attempt had been made to make the passage more of a narrative its content would have differed considerably from that of the argument, so that it would no longer be possible to test the hypothesis. In fact, it seems that this is an hypothesis which cannot be tested. To abstract the "form" from the "content" is an impossibility. The only way to show that the hypothesis is without foundation is to demonstrate that "content" is the crucial variable in recall, that is, that the course of verbal recall is governed by the associative structure of the words making up passages of prose.

VII. 5.

SUMMARY

A further attempt was made to test Bartlett's hypotheses with regard to form as a determining

variable of the recall of prose. This time, an effort was made to abstract the variable while keeping content (an account of the development of Darwin's theory of evolution) constant. Two "forms" were extracted (argumentative and narrative) and two passages specially written to exhibit them. No difference in recall was found.

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VIII.

EXPERIMENT THREETHE RELATIONSHIP BETWEEN THE FORM OF
PRESENTATION OF A PASSAGE OF PROSE
AND ITS DEGREE OF RECALL

. . .

VIII. 1.

INTRODUCTION

In this experiment, the variable "form" is defined in a sense different from that used by Bartlett. Here, it is form of presentation which is manipulated. Such a definition implies that it is only the purely verbal, or associative, structure of the passage which is changed.

The experiment is a simple replication of Wees and Line's (1937) work, using different material and university students as subjects. It seemed worthwhile to perform this work for two reasons. Firstly, the finding reported above has significance in the field of education. Material is often presented in a terse, abbreviated form with sub-headings in the belief that

it is more easily learnt in this way. This assumption is certainly true, but it does not follow that recall is thereby rendered easier. Secondly, it was thought that it would be interesting to see how a different experimental population would behave in this situation.

VIII. 2. METHOD

VIII. 2. (i) Preparation of the Experimental Material

The topic of Palaeolithic Cave Art was chosen because it was felt that it would be equally unfamiliar to the majority of subjects. The two passages read as follows:-

NOTE-FORM PRESENTATION SHOWING THEMATIC
UNIT DIVISIONS USED FOR SCORING (See
Section "Method of Measuring Recall"
below)

EUROPEAN PALAEOLOGIC CAVE ART

1. LOCALITY

Found chiefly in the limestone caves/ of
Southern France/ and Northern Spain./

2. HUMAN TYPES RESPONSIBLE

These were definitely not neanderthal man, who was extinct at the time the paintings were made. The men responsible resembled physically human types existing at present.

3. CONTENT OF THE ART

The art consists of figures painted, engraved or carved in low relief on the walls of caves and rock shelters often far from the light.

Subject Matter:

1. Human figures - tended to prevail in earlier times.
2. Animals - tended to prevail in later times and to be better executed.
3. Geometrical designs and abstract figures.

Style:

- (a) Lack of attempts to show perspective and to show groups of humans or animals.
- (b) Lack of urge for pure decoration.
- (c) Often by great vigour and artistic maturity.
- (d) By two main trends:
 - (i) schematic - this especially applies to the human figures.
 - (ii) a type of hyper-realism. This applies to animals. The essential features of a species are vividly presented.

4. DATING.

A. The art was made in the Upper Palaeolithic period, 10,000 to 20,000 years ago.

B. Evidence for Dating:

1. Superimposition of figures/ - purely relative method. Newer paintings overlie the older./
 2. Attempts to use style and technique./
All such arguments probably false./
 - (i) scrawls and designs did not necessarily precede figurative realism./ Possible that more mature artists exploited possibilities offered by rock texture.
 - (ii) It is probable that poor perspective and lack of colour harmony/ are not primitive traits./ The latter is probably due to the awkward situation of the art,/ the former is probably related to the intention of the artist/ and to the fact that he was not painting from life./
 3. Monochrome and bichrome figures earlier,/ polychrome figures later.
5. PURPOSE OF PALAEOLITHIC ART. This may be :-
1. Magical power of the figures/ - connected with Palaeolithic man's beliefs and superstitions./
 2. A sheer delight in artistic expression./
Probable that these two purposes are not exclusive - / 1 may have been the primary purpose,/ but 2 may have increased in importance as techniques improved.
- Palaeolithic art is very important,/ not only because it is the earliest art,/ but also for the information about the

people living at that time which we gain from it./

(352 words)

(NORMAL-FORM OF PRESENTATION THEMATIC UNIT SYSTEM NOT SHOWN.)

EUROPEAN PALAEOOLITHIC CAVE ART

This form of art is found principally in the limestone caverns of Southern France and Northern Spain.

The human types responsible for it were definitely not neanderthal man, who was extinct at the time the paintings were made but men who physically resembled human types existing at present.

The art consists of figures painted, engraved or carved in low relief on the walls of caves and rock shelters. It is often deep in the caverns.

The subject-matter is of three types. Firstly, there are human figures. His fellow man seemed to interest the older Palaeolithic artists more than animals, which, however, appear to have become the subject of more absorbing interest as the art progressed. Finally, we have geometrical designs and abstract figures.

The paintings all show a number of characteristics. In none do we find attempts to render perspective and only very seldom are there representations of groups of figures. There is no sign of an urge to use art as a decorative medium, even though many of the paintings are characterized by great vigour and artistic maturity. Some of the art is of a schematised nature. This often applies to the human figures as well as to the geometrical designs. The rest displays a type of hyper-realism in which the essential features of a species of animal are presented.

The art was produced in the upper Palaeolithic period between ten and twenty thousand years ago. Most of the art cannot be dated more exactly than that, although there are a few lines of evidence on which one can rely. Firstly, in sites where there are many paintings, newer paintings will overlies older ones, but this enables one to date paintings only relatively. Some attempts have been made to date paintings on the basis of style and technique, but all the arguments which have been led are probably false. For example, it is not certain that scrawls and designs preceded the phase of figurative realism. Indeed, it seems certain that the later Palaeolithic artists became increasingly aware of the possibilities offered them by the texture of the rock and exploited this artistic opportunity. Again, lack of

perspective and poor colour harmony are not necessarily primitive traits when one considers the probable intention of the artist (see below), the poor light in which he was working and the fact that he chose to work in a place where the living model was not before his eyes.

However, we can have some assurance in maintaining that human figures are generally older than animal and that monochrome and bichrome paintings tend to precede polychrome.

The purpose of the art is uncertain. It is probable that the primary purpose was magical - to evoke the animals on whom early man depended for his food. It is, however, possible that as techniques improved the art was indulged in for its own sake.

Palaeolithic art is important not only because it is the earliest known form of man's artistic expression, and not merely because it tells us something about the life of the men who created it, but also for its great intrinsic value.

(518 words)

VIII. 2. (ii) Subjects The Ss were university students taking the first course in Psychology at the University of CapeTown. They ranged in age from 17 to 21, the majority being females.

VIII. 2. (iii) Presentation of the Material The passages were cyclostyled and presented in the group situation. The selection of a group for the learning of a particular passage was arbitrary. The experimenter (who was always the writer) presented the passages face-down. At a signal the Ss were required to pick up the passages and learn them, nine minutes being allowed for this. Ss were allowed to learn the passages in any way they wished, rough paper being issued to them on which to write notes should they desire to do so. All notes were collected at the end of the training session. Ss were asked to report if they had any previous knowledge of the topic, and all those who reported that they had were rejected. Ss were informed that recall of the passages would be tested later. Recalls, for which unlimited time was allowed, were collected two weeks later. The instructions were simply to reproduce the passage which had been presented for training.

VIII. 2. (iv). Method of Measuring Recall Two methods were used. The first was the method of thematic units or idea-groups (Levitt, 1956). Clearly, the number of thematic units in each passage was the same. The second method involved the counting of the total number of words that could be considered correct, whether the form of the original wording was preserved or not. This measure was called "total words".

VIII. 3. RESULTS

The experiment was carried out in two stages. In the first stage, the two passages were presented to two groups of female subjects and the difference between the recall scores analyzed by using a *t* test. The results are shown in Table 9.

TABLE 9.

Means, S.D.s and Significance of Differences between Means (t values) of the Recall Scores of the Experimental Passages.

<u>TYPE OF SCORE</u>	<u>TYPE OF PASSAGE</u>					
	<u>Note-Form</u>			<u>Normal-Form</u>		
	<u>Mean</u>	<u>n</u>	<u>S.D.</u>	<u>Mean</u>	<u>n</u>	<u>S.D.</u>
Thematic Units	6.13	16	4.54	9.77	13	4.97
	$t = 2.132 \quad (p = 0.05)$					
Total Words	46.44	16	46.47	83.23	13	45.41
	$t = 2.187 \quad (p = 0.05)$					

It will be noted that both forms of scoring give substantially the same result. Furthermore, the relationship between the sets of scores obtained by the two methods is high. For the recall scores of the normal form of presentation the product-moment correlation coefficient was .919, and for the note-form it was .940.

A possible interpretation of the results shown in Table 9 is that, by chance, the mean recall ability of the Ss who had been exposed to the note-form of passage was superior to the recall ability of those who had been exposed to the normal-form. It was possible to test this hypothesis because some of the Ss in both groups had been used in an experiment involving passages of different types from those used in the present experiment. The recall scores for these passages were taken and divided into two groups - one group of scores for Ss who had also been exposed to the note-form of passage, the other group for Ss who had been exposed to the normal-form. No significant differences could be found. It thus seemed justifiable to conclude that the differences found are a function of form of presentation of the passage.

The notes which had been made by Ss in the experimental sessions were collected and scrutinized to see if any information could be gleaned from them. It was observed that in no case had a précis been made in which the order of presentation of the material in the

original passage was changed. The recall protocols were then examined and a number of such displacements observed. There seemed to be more of such displacements in the case of Ss who had been subjected to the normal-form than in the case of Ss who had been subjected to the note-form. But the sample of displacements was too small for adequate statistical analysis. It therefore seemed justifiable to extend the study to see if the results reported in Table 9 could be replicated and if further evidence for a relationship between displacements of order and type of passage could be found.

Therefore, two groups of 12 and 14 Ss each were subjected to the normal-form and a further group of 10 to the note-form of the passage. (The writer's intention was to perform a simple analysis of variance on the recall scores of all five groups and to demonstrate that form of passage was the sole source for the presence of significant differences. But it was obvious from inspecting the data that this result would not be achieved.) To remove the possible effect of a sex difference, the mean recall scores of all available females were compared by means of a t test. The results are shown in Table 10.

T A B L E 1 0.

Means, S.D.s, and Significance of difference between Means (t value) of the Recall Scores (in Thematic Units) of Female Ss Exposed to the Note- and Normal- Forms of the Experimental Passages.

	<u>TYPE OF PASSAGE</u>	
	<u>Note-Form</u>	<u>Normal-Form</u>
n	26	39
Mean	7.81	8.28
S.D.	5.54	4.47

$$t = 0.37$$

The protocols of the total sample were examined for displacements. A displacement was defined as a thematic unit which was not placed by S at its original position in recall. The number of such displacements was recorded for the note-form and the normal-form separately and a chi-squared analysis performed. The results are shown in Table 11.

TABLE 11.Number of Displacements in Recall

	<u>NUMBER OF DISPLACEMENTS</u>		
	<u>0</u>	<u>1 and 2</u>	<u>3 or more</u>
Note type passage	15	2	2
Normal passage	16	18	5

Chi-squared = 8.18 (p = 0.02)

It therefore seems to follow that more rearrangement of the material occurred during the retention interval in the case of those Ss who were exposed to the normal-form of the passage than in those who were exposed to the note-form.

VIII. 4. DISCUSSION

Despite the fact that the mean recall scores of those required to memorize the normal-form of the passage was significantly higher than the mean recall score of those subjected to the note-form on the

first occasion when an attempt was made to test the hypothesis, it seems evident that a difference of this size could be expected only rarely. However, it is still justifiable to consider whether or not Wees and Line's original finding has been upheld, that is, whether or not a normal-form of presentation yields superior recall. The writer feels that Wees and Line's finding would be disproved only if the mean recall scores of the groups required to memorize the note-form had been greater than that of the groups required to memorize the normal-form. But this was not the case even on the second occasion when the hypothesis was tested. Considering the large difference in length between the two forms, it is surprising that the recall of the normal-form was always greater.

A further finding indicating a genuine difference between the two forms of presentation was that relating to the greater alteration in the order of recall of the material of the normal-form. This suggests that this form of presentation allows the S greater opportunity to change it to a form that has greater consonance with memory traces that are already present. Clearly, such a conclusion is merely tentative, at this stage.

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VIII. 5. SUMMARY

This study concerns an attempt to demonstrate that the recall of a terse, note-form presentation of a passage of prose was superior to that of a passage identical in content but set out in conventional form. The latter passage was considerably longer than the former. The results seemed to suggest that the recall of the longer passage was superior. It was also found that there was a greater tendency for Ss to change the order of recall of the longer passage, suggesting that they found it easier to incorporate this type of material into their memory systems.

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IX.

EXPERIMENT FOURTHE RELATIONSHIP BETWEEN 'CHANGE
TENDENCY' AND EXAMINATION RESULTS
IN UNIVERSITY STUDENTS

* * *

IX. 1.

INTRODUCTION

This study is simply an extension of the suppositions of Gomulicki (1956a) and Paul (1959) regarding the possible influence of change-omission tendencies on recall. (see Ch. III, pp. 56 - 59). In addition, there are some findings by King (1960) which appear to be relevant to the issues raised there. King performed a factor analysis on a matrix resulting from intercorrelating the recall scores of two prose passages scored in a number of different ways. Two factors were extracted, which were identified as the number of content words reproduced and the total number of words reproduced. King also reported that as length of passage rose, the first factor became the more important source of variation. This tendency should be

at its maximum in the examination situation, since very lengthy prose passages are being recalled. Further, it seems justifiable to argue that it is the individuals who are called condensers by Gomulicki who should be at an advantage when it is important to produce the exact content of passages in order to achieve a reasonable recall score. The changer should have the advantage when the passage is shorter since he will tend to produce a version of the passage that is equivalent in length to the original but will, because of the relative ease of recall, contain many words that are in fact correct.

The present study was undertaken because it seemed worthwhile to follow up these suppositions. It seemed reasonable to suppose that Gomulicki's verbatim tendency was a perfectly adequate measure of change tendency. A changer could simply be defined as someone with a low verbatim tendency, a condenser as someone with a high verbatim tendency. "High" and "low" could be defined in terms of criterion scores as circumstances permitted. The purpose of the study was two-fold. Firstly, to determine whether or not change tendency is primarily a function of the psychological structure of the individual or if it is a function of the type of passage used. Secondly, an attempt was made to discover a possible relationship with success in examinations.

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IX. 2. METHOD

IX. 2. (i) Subjects The Ss were male and female university students taking the first course in Psychology at the University of Cape Town. They ranged in age from 17 to 21 years. They were divided into three groups on the basis of the types of prose passage they had to learn. Group 1 consisted of 39 male and female Ss, Group 2 of 38 females, and Group 3 of 48 females.

IX. 2. (ii) Experimental Material Group 1 were required to learn and recall two passages of prose differing both in nature and in length. The first was "A Country Scene" (see Pilot Study), the second a 328-word presentation of the evidence upon which Darwin based his theory of evolution (see Experiment 2). Group 2 were the Ss of the Pilot Study. Group 3 were required to learn and recall three 250-word passages, two of which were similar in nature to the passage from "Oblomov" and the other to the argument presented to Group 1.

IX. 2. (iii) Collection of the Recall Protocols The method of group testing, with whole presentation and unlimited recall time was used. Ss were tested in groups of 15 to 20, and were asked to reproduce the passages in any way they liked. Any tendency towards change tendency was thus given maximum expression.

Details of the administration differed from group to group. Group 1 was allowed 1 minute 10 seconds to read the short passage and 3 minutes 30 seconds to read the longer one. Recall was demanded immediately after this reading. There was a two-week interval between the two sessions. In the case of Groups 2 and 3 further training sessions followed the first, but the resultant protocols were not used in the present experiment. Group 2 was allowed one minute to read each passage before making a recall, all four passages being presented at one sitting. This training session was followed by a recall session at the end of one week. Group 3 were allowed to read each passage through at their own rate. There was a one-week period between the presentation of each passage.

IX. 2. (iv) Derivation of the Scores Used It was considered that change tendency would be at its highest after the first reading of the passage, since with subsequent readings familiarity with the actual words of the passage would make their recall unavoidable. Change scores were therefore measured on protocols derived from immediate recall. Because of the drawbacks of Gomulicki's system, the measure of change tendency was verbatim tendency, which was measured for each passage separately. In cases where the change scores of a particular group were being compared with another set of scores, the mean change score for each subject over all passages used was calculated and constituted the change scores in this

instance. An S with high verbatim tendency is a condenser, and S with low verbatim tendency a changer.

The measure of success in examinations was an overall one. Since detailed examination results of the Ss were unavailable, an "examination score" was derived as follows. Only those students who had written three examinations in the year during which testing took place were used. A score of 0 was assigned to a failure in a particular subject, 1 to a third class, 2 to a second class and 3 to a first class. Total scores for each S were obtained by summing across the three scores.

Recall scores were obtained by using the method of idea-groups or thematic units (Levitt, 1956).

IX. 3.

RESULTS

In Group 1, the two sets of change scores derived from the two passages were correlated. The results are shown in Table 12. It appears that change tendency does have some consistency.

T A B L E 12.

Means and S.D.'s of Change Scores for
the Passages Learnt by Group 1, with
the Product-Moment Correlation
Coefficient Between the Two Sets of
Scores

	<u>SHORT PASSAGE</u>	<u>LONG PASSAGE</u>
Mean Change Score	37.77	26.59
S.D.	16.01	12.56

$$r = + .455 \quad (p < 0.01)$$

An attempt was then made to test the second hypothesis. In Group 2, change scores were correlated with examination scores. The mean and S.D. of the change score were 52.84 and 13.39 respectively. The product-moment correlation coefficient was + .289, which was not significant ($p = 0.08$). In Group 3, the mean change score was 26.17 (S.D. 13.98), and the corresponding $r = - .167$.

It was thought that the small coefficients obtained might be due to the restricted range of the

examination scores. A correlation was therefore performed between change scores and the results of the Psychology 1 examination (for which percentages obtained were available) in Group 3. $r = - .040$, which effectively disposed of the hypothesis.

When a scatter diagram was made for a possible correlation between examination score and change tendency in Group 1, it was observed that those with extreme change scores had better results than those towards the middle of the change score distribution. It was therefore thought that it might be possible that those with a definite recall strategy might perform more effectively than those with a more variable one. To test this hypothesis, the change score was split at the 25th and 75th centiles and an analysis of variance performed on the resultant three sets of examination scores. $F = 2.39$, which with d.f. 2 and 35, was not significant.

Finally, in Group 2 only, the difference between the mean one-week recall scores of changers and condensers was examined for each passage separately. A condenser was defined as a person whose mean change score for the four passages exceeded the median (51.5), a condenser as someone whose mean change score fell below the median. The results are shown in Table 13. None of the differences was significant.

T A B L E 13.

Means and Standard Deviations of Recall Scores
(in Thematic Units) for Changers and Condensers
in Group 2.

<u>PASSAGE</u>	<u>CHANGERS</u>		<u>CONDENSERS</u>	
	<u>Mean</u>	<u>S.D.</u>	<u>Mean</u>	<u>S.D.</u>
1	10.48	3.43	10.62	5.21
2	15.78	3.23	15.41	1.76
3	8.78	5.54	9.90	5.63
4	6.39	3.73	5.29	3.87

The only other result to which it is necessary to draw attention is the finding that as the length of passage rose, change scores fell. In other words, the shorter the passage, the more of it the Ss could remember verbatim.

IX. 4.

DISCUSSION

It seems necessary to say merely that only the first hypothesis received any support from this

study, and that this support was very limited. However, it can be seen from the results that in some cases, an enlargement of the sample might have yielded significant results, while at the same time certain contradictions in the findings are apparent. An attempt should be made to resolve these contradictions in case any attempt is made to carry this work further.

The most striking contradictions are, firstly, the reversal of the sign of the correlation coefficient between change scores and Examination Scores when the length of the prose passage was doubled, and, secondly, the fact that the sign was negative when the longer passage was used. It will be recalled that the expectation, derived from King's work, was that as length of passage was raised the relationship would become increasingly positive. The length of passage from which change scores is derived cannot affect the issue. The range of change scores is not affected by the type of passage used, as can be seen from examining the S.D.s of the various sets of change scores. Moreover, the range of change scores should affect only the size of the coefficient, not its sign.

It seems that the only way to resolve the contradictions is to invoke the fact that degree of reinforcement is at its highest degree of equivalence in the situation when short passages are being used. A short passage of prose is relatively easy to recall,

merely because it is short. Material on which a student is being examined is relatively easy to recall because it is highly familiar to the student. Evidently, a single reading of the longer passages used did not raise their degree of reinforcement to the required degree of equivalence even though more time was allowed.

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IX. 5.

SUMMARY

Gomulicki (1956a) and Paul (1959) proposed that change tendency is a source of individual differences in the recall of connected discourse. Previous work has shown that Ss differ markedly in the extent to which they reproduce the original words of a passage of prose which has to be recalled. This tendency is called change tendency. Those who have a strong tendency to reproduce the original words of the passage are called "condensers", those who show a preference for giving a version of the passage in their own words are called "changers". The present study attempted to examine the reality of the proposed typology and to see if any relationship between change tendency and ability to recall in different situations could be found. A slight

consistency between change tendencies as measured on prose passages of different types was found but there appeared to be no relationship between change tendency and degree of recall.

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X.

EXPERIMENT FIVETHE RELATIONSHIP BETWEEN RATED
DEGREE OF FAMILIARITY WITH IN-
DIVIDUAL SENTENCES AND EXTENT
OF RECALL OF CONNECTED DISCOURSE

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X. 1.

INTRODUCTION

The results of Experiment 2 indicated that it was probably impossible to manipulate the variable "form"; while the results of Experiment 1 indicated possible ambiguities in the concept. It was therefore decided to take up the second broad concept suggested in the Discussion of the Pilot Study and to attempt to manipulate the variable familiarity. It should be noted that no attempt was made to assess possible individual differences, since it was necessary to discover whether or not the variable was an important one.

The next step was to see how the findings concerning the differential recall of different types of passages could be related to the variable of familiarity. If the theoretical issues outlined in Ch. I. are ignored, it

would be simple to affirm that the differences observed are the result of the operation of familiarity - the more familiar the material, the easier it is to recall. Theoretical considerations apart, other difficulties in establishing the relationship are formidable. To deal with familiarity only, if the material to be ranked were made too molar, contradictions would emerge directly. Thus, if we were to say that narratives are, in general, more familiar than descriptions and were then asked to place a narrative passage by Proust and a description of a picnic from a magazine on our familiarity-scale, our quandary would be obvious. At the same time, the difference in degree of familiarity is quite plain. To use degree of familiarity of individual words would be to use too molecular a measure, since it seems doubtful that unfamiliar passages are necessarily made up of unfamiliar words. Further, it seems that words do not differ enough in familiarity to produce a range great enough to produce significant correlations (Underwood and Schulz, 1960)

X. 2. METHOD

X. 2. (i) Introduction The unit that was finally used was the sentence, largely because it was the only

one left. Previous work has shown that raters can effectively assess the relative extent of occurrence of letters (Attneave, 1953), of words (Howes, 1954) and of bigrams and trigrams (Underwood and Schulz, 1960). The general technique used in this study was to select sentences from passages of prose used in other studies and obtain familiarity ratings for them. The rated values were then related to the recall scores of these sentences. Because of the very wide variety of possible sentences in the English language, the subjects were asked to treat each sentence as an example of a "type". That is, they were carrying out two processes - classifying and rating. Only the latter process was at work in the three studies mentioned above. A further difference was that there is no means of assessing the validity of the sentence-rating task as there is no simple means of assessing the extent to which subjects have in fact been exposed to particular types of sentence, whereas such measures are easily obtainable for letters, words and bi- and trigrams. It was considered that there was only one precaution that could be taken to ensure that the comparison was in fact one between familiarity and recall. This was to collect the two sets of scores from different groups of a comparable make-up. All the subjects for the comparison between familiarity and recall were female university students but those subjects from whom recall scores were obtained did not perform the rating task and vice versa.

X. 2. (ii) Subjects These were university students taking the first-year Psychology course at the

University of Cape Town. The age range was 17 to 21 years. Three broad groups of Ss were used - two for the collection of recall material and one for the collection of ratings. The numbers of Ss were 42, 48 and 73 respectively. Of the 73 Ss used for the collection of ratings, 57 were female and 16 male.

X. 2. (iii) Recall Material This was derived from five prose passages. Four of these were those used in the Pilot Study. The fifth, and longest passage (250 words), was taken from an English translation of "Swann's Way" by Proust. Proust's lengthy sentences were modified for the purpose.

X. 2. (iv) Procedure for Collecting Recall Material
The procedure for collecting protocols of the shorter passages has already been described. There were some differences in the procedure in collecting the protocols for the short and the long passages. Those Ss from whom protocols were collected from the longer passage were allowed to read the passage through once at their own rate, while the delayed recall was collected after two weeks.

X. 2. (v) Obtaining Recall Scores In this experiment, only 100 protocols, 20 from each passage, were used. In the case of the short passages, the method of drawing the sample of protocols was to use those resulting from a presentation early in the training.

sessions so as to equalize interference effects as far as possible. The criterion for correct recall was that either 50% or more of the original words of the sentence should be exactly reproduced or that 70% or more of the words should be reproduced in the form of synonyms. A score of one was given to each sentence which met the criterion. The possible range of scores for each sentence was therefore 0 - 20.

X. 2. (vi) Make-Up of the Familiarity Rating Scale

This scale consisted of 94 sentences which fell into two classes - "filler material" and "experimental material". The purpose of the former was to present each subject with a wide enough range of material to facilitate accurate rating. In order to get a rough idea of the preferred reading material of the subjects a small group of first-year students was required to write a list of the magazines and newspapers that they customarily read and of the novels and non-fiction that they had read in the preceding six months. They were also asked how often they read the newspaper. The experimenter then went to the local public library and to the largest local bookshop (which also sells current magazines) and located all the magazines and as many of the novels as possible. Sentences were selected by opening a publication at random and writing out the sentence which first attracted attention, all dialogue being excluded. Names of well-known personages and literary characters were altered.

This procedure resulted in the production of a large pool of items. From these a weighted list of 73 was drawn for final inclusion in the scale. 32 were from novels, and of these 8 were from the "James Bond" series because of its very high popularity; 30 were from magazines; and 11 were from newspapers. This probably underweights newspaper material in terms of relative amount of time spent reading it, but any attempt to give it its due weight would probably have led to repetitiveness of item type.

The experimental material consisted of 21 items, 12 of which were from the short prose passages, 5 from the longer passage, and 4 were new items drawn from philosophical and descriptive works. The 17 items for which recall scores were available are given in the section on Results.

The order of presentation of the items in the scale was randomised, and the material was cyclo-styled together with the instructions.

X. 2. (vii) Administration of the Scale The scale was administered to 74 Ss, one of whom had to be rejected for failure to comply with the instructions. The list of items was prefaced by the following instructions, which are a modification of those used by Underwood and Schulz (1960) in a trigram rating task:-

On the following pages are about 100 sentences.

They are representative of the type of sentences you would expect to see in a wide variety of written material - newspaper, periodicals, novels, etc. After each sentence is a blank. Your task is to rate how often you have come into contact with a sentence which resembles each of those listed here. That is, you are to read a sentence and decide how often you have seen sentences which express similar ideas and have a very similar grammatical structure.

Your ratings will be made along a nine-point rating scale. This scale may be visualised as follows:

<u>Very infrequently</u>			<u>Average</u>			<u>Very often</u>		
1	2	3	4	5	6	7	8	9

Please note that the sentences of a type that you have experienced most frequently are to be given high numbers, those least frequently experienced, low numbers.

Your judgement of how often you have experienced a sentence is to be made relative to how often you have experienced the other sentences in the list. To carry out your ratings, proceed as follows. First, look carefully at the first sentence in

order to get a "feeling" of how often you have experienced it. Then look at the second, then the third, and so on for approximately the first ten sentences. Then skip around over the following pages examining approximately ten more sentences. The reason for this is that it will give you an idea of which sentences you have rarely, if ever, experienced.

After you are confident that you know how to "anchor" the rating scale, go back to the first item on the list and assign it a number which you think represents its location on the nine-point scale. Use only whole numbers; do not assign fractional or decimal values. If you think the first sentence relative to the others, has been experienced quite frequently, you might assign it an 8 or 9. If you think that you have rarely seen the sentence, you would give it a 1 or 2. You will also probably find sentences which you will judge to have been experienced with about average frequency relative to others and you would assign a middle number - 4, 5 or 6.

Do not spend much time on any one sentence; your first reaction is the one we want.

Remember, those sentences you have experienced very frequently are to be assigned high numbers,

those infrequently, low numbers. The scale is reproduced on each of the pages that follow so that you can refer to it and thus avoid reversing your scale numbers. After you have completed your ratings, check back to make sure you have not omitted any.

X. 3. RESULTS

Familiarity ratings for each sentence were obtained by summing across the raters and taking the mean, male and female raters separately. The ratings for the 21 experimental items are shown below (Table 14). It will be observed that the pattern of results broadly fits the expectations outlined above. That is, sentences from the narratives have the highest ratings, those from the descriptive passages have intermediate ratings, while sentences from introspective passages and sentences expressing logical arguments have the lowest ratings.

T A B L E 1 4.

Mean Familiarity Ratings of the Experimental Items

<u>NARRATIVE ITEMS :-</u>	<u>FAMILIARITY RATING</u>	
	<u>Males</u>	<u>Females</u>
32. He suffered severe concussion following a motor accident	6.31	7.81

NARRATIVE ITEMS :-FAMILIARITY RATING

	<u>Males</u>	<u>Females</u>
53. Examination showed that there was a severe loss of memory for recent events combined with disorientation in space and time	4.94	4.98
76. The patient was placed in an institution where he died three years later	5.06	6.60

DESCRIPTIVE ITEMS :-

12. Trees and reflections of trees, house and reflection of house, together with gleaming water below and bright sky above, formed a unitary whole	4.56	5.58
59. As we came over the rise we suddenly saw the house, gleaming splendid in a sudden burst of sunlight	5.06	6.54
62. The vines were wreathed over the cottage fronts, tossing their young tendrils up into the blue sky of spring and, in autumn, festooning the balconies with a fresco of purple	4.76	6.29

ITEMS FROM PASSAGE EXPRESSINGFAMILIARITY RATINGARGUMENT :-

	<u>Males</u>	<u>Females</u>
25. He could not have foretold the immense improvements in agricultural technology which have occurred	4.69	5.16
38. This led to the availability of funds for the purchase of food from areas like North America which are faced with agricultural over-development	5.25	5.77
55. The consequence of this is that, without the occurrence of wars and pestilences, mankind would rapidly outgrow its food supply and mass starvation would be inevitable	6.44	6.35
75. A fallacy in his argument is the assumption that his data express an unchanging tendency	4.81	4.51

ITEMS EXPRESSING LOGICAL STATEMENTS:-

14. He is tempted to make assumptions which are accidentally true of the particular figure he is taking as an illustration, but do not follow from his axioms	3.63	3.47
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ITEMS EXPRESSING LOGICAL STATEMENTS:- FAMILIARITY RATING

	<u>Males</u>	<u>Females</u>
86. And this means that it is a fictitious problem, since all general problems are at least theoretically capable of being solved	4.50	5.11
92. If a sentence makes no statement at all, there is obviously no sense in asking whether what it says is true or false	4.56	4.04

ITEMS FROM THE INTROSPECTIVE PASSAGE:-

40. It grieved him to think that he was undeveloped, that his spiritual forces had stopped growing	4.13	4.00
48. His timid mind recoiled when it grasped that many sides of his nature had never been wakened	3.81	4.84
88. But then the period of consciousness would pass away and he would sink into sloth and indolence	4.69	5.33

SENTENCES FROM THE PROUST PASSAGE:-

8. And this melody, which was Jacque's love, had multiplied, and had become closely interwoven with all his habits.	3.19	3.77
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SENTENCES FROM THE PROUST PASSAGE:-FAMILIARITY RATING

	<u>Males</u>	<u>Females</u>
18. For instance, the very moderate liking, amounting almost to dislike, which in the days before he was in love, he had felt for Odette's expressive features, her faded complexion, returned on certain days	3.31	4.95
63. It was a thing which one repeatedly calls in question, in order to make oneself probe further into it, in the fear that the question will find no answer, that the substance will escape our grasp - the mystery of personality	4.31	4.72
90. And certainly those feelings were perfectly genuine	4.94	6.00
93. But his love extended a long way beyond the province of physical desire	4.06	5.89

Before correlating recall scores with the ratings obtained, an attempt was made to assess the reliability of the familiarity scale. The values obtained from the 57 female raters were intercorrelated.

The mean correlation coefficient was very low ($r = +.238$, $p = 0.02$). The correlation coefficients ranged from $-.264$ to $+.553$. Of the 1,596 coefficients, 709 lay at the 1% level of significance or better.

When the recall values of the 12 items from the short passages were correlated with the relevant familiarity ratings, the product-moment correlation coefficient for females was $+.840$ ($p < 0.01$). When all 17 recall items were used, the value fell to $.602$ ($p < 0.01$).

Using female ratings only, a final attempt was made to assess the effect of inter-rater reliability. From the total correlation matrix, a sample of 21 raters was selected by inspection. These provided coefficients of such a size that all but 10 were at the 1% level of significance or better, those 10 all being beyond the 5% level. The correlation coefficient for the 12 sentences from the short passages was then re-computed, using only these 21 familiarity values, and found to be 0.812 ($p < 0.01$).

The scale has good overall reliability. This is shown by the fact that the correlation of the male and female ratings on the 21 experimental items was $+.749$ ($p < 0.01$). For all 94 items, the male and female ratings correlated surprisingly highly; $r = .588$ ($p < .001$). Large differences were shown only on the items shown in Table 15, and the reasons for such differences are obvious.

T A B L E 15.

Items on which Males and Females give
Markedly Different Ratings

<u>ITEM</u>	<u>FAMILIARITY RATING</u>	
	<u>Males</u>	<u>Females</u>
17. Everyone in fact knows that the ambience of a room adds to the enjoyment of the food you eat there - how often is this true of a good restaurant	3.88	5.19
31. The time has passed when the handbag was famed as that final touch, now its potential includes what goes on inside	2.38	4.14
36. The pretty look is blantly feminine - a delicious compound of the romantic and demure baby doll	3.56	5.89
37. She met fashion designer Pierre Balmain here on Thursday and was believed to have ordered her wedding dress	3.63	6.53
45. She was pretty and she smiled as she put her hand on his pulse	3.94	5.77
50. This 5,000,000 dollar Palo Alto, California, resort has a Roman air - the ballroom is called the Circus Maximus	2.75	4.54

ITEMFAMILIARITY RATING

	<u>Males</u>	<u>Females</u>
56. But I discovered that it was possible to produce appetising, delicious meals which would not add an ounce of fat but would, in fact, melt it away.	3.56	6.25
60. For over an hour we sat in our car in the Kruger National Park, watching a scene that seemed to have come alive from a painting	4.37	6.47
62. The vines were wreathed over the cottage fronts, tossing their young tendrils up into the blue sky of spring, and, in autumn, festooning the balconies with a fresco of purple	4.76	6.29
64. Town girls should clear their faces twice a day with a minimum of three applications of cleanser, milk or cream	2.81	5.88
65. Unwilling to return to her own circle with her indignation flaming on her forehead, she walked toward the end of the ballroom	3.69	5.65
66. As she talked her cheeks had reddened, yet she concealed her embarrassment with her easy manner of speaking	3.81	6.05

<u>ITEM</u>	<u>FAMILIARITY RATING</u>	
	<u>Males</u>	<u>Females</u>
77. Join side and sleeve seams	1.94	6.68
79. At school and college she conducted herself with an unusual degree of personal discipline	3.63	5.84
84. As fashion breaks into print this spring, the girl or woman who sews has, more than ever, the edge on her non-sewing sisters	2.44	6.33
85. We slur and mumble, we drop letter sounds and whole syllables	4.06	6.75
93. His love extended a long way beyond the province of physical desire.	4.06	5.89

The only other variable whose possible influence on recall could be assessed in this experiment was sentence length. The role of this factor is not important, since sentence length and recall for the 12 items from the short passages correlated - .425, while the corresponding r for sentence length and familiarity was - .247.

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X. 4.

DISCUSSION

The results show that there is a fairly strong relationship between rated degree of familiarity and extent of recall. The relationship is far from perfect, but this is probably due, to a large extent, to imperfections in the method. The most important source of uncontrolled variance must have lain in the fact that the ratings and the recall scores were drawn from different subjects. It is difficult to see how to correct for this methodological necessity and at the same time avoid the criticism that one is inducing the required relationship. Secondly, the method of collecting recall protocols is open to criticism in that it increases error variance. Finally, no attempt was made to allow for possible serial position effects in selecting sentences for inclusion in the scale.

The fact that the inclusion of items from the longer passage caused a decline in the strength of the relationship requires special discussion. The reasons for this appear to be three-fold. Firstly, an inspection of the protocols resulting from the third immediate recall showed that many of the Ss had failed to reach the criterion of perfect recall. This must have enhanced individual differences in delayed recall. Secondly, Ss were allowed to read at their own rate; the effect on eventual recall must have been again to increase individual differences in recall due to variations in degree of reinforcement during learning. Thirdly, we have the fact that the delay period was two weeks in this case.

Variations in rater reliability do not seem to have been an important source of error variance. The use of "reliable" ratings did not produce a significant change in the degree of the relationship between familiarity and recall.

Next, it is necessary to deal with the possible criticism that the familiarity scale is simply another means of measuring recall. In rating the sentences for degree of familiarity the subjects must have used their memory for material of the relevant type. But this can only mean that, in their opinion, they have experienced it frequently in the past. Now, this is all that the familiarity scale is assessing. It does not measure ability to recall, general intelligence, or degree of motivation. The familiarity variable is probably contaminated with a factor of interest in certain types of material rather than others. However, it seems likely that this interest factor must enhance recall through the medium of general familiarity with the preferred material and that it is not set in motion directly through the reading of a prose passage of a previously unfamiliar type.

Lastly, theoretical issues must be taken up. It seems that the relationship between familiarity and recall is rather different in this instance from that which obtains in serial lists of unconnected words (Postman, 1961a; Underwood and Postman, 1960). In

the former case the S has to unlearn his previous associations in order to learn those imposed by the experimenter. With time, the old associations reassert themselves and depress later recall. This situation may be found only in prose material of a low degree of familiarity. Such material can be looked upon as occupying a position on the total continuum of meaningfulness close to that occupied by lists of unconnected words. In most cases, the words of the sentence are probably perfectly familiar to the S; it is their juxtaposition which is new to him. When the degree of familiarity with the sentence is high it is probable that the associations between the words are so familiar it is as though the S is performing an additional trial on a serial list. Or perhaps an analogy should be sought in the processes of free recall of unconnected words, where strong inter-list associations boost total recall (Deese, 1959a).

It also seems that the second hypothesis suggested in the Discussion of the Pilot Study has been validated. The sentences of the familiarity scale were rated as individual units, completely out of context. Yet the relationship between familiarity and recall was very strong. Hence it follows that "form" or "total structure", the apprehension by the subject of the passage as a unity of some kind, cannot be an important causative factor in recall. Almost the only

factor which directly influences recall is the degree of familiarity with the units (sentences in this case) forming the whole. And it is certainly not possible to argue that the factor of "form" should operate at the level of the sentence; the sole factor here must be simple associations between words.

It is also possible that the results of this experiment enable us to offer an explanation of the results of Experiment 4. The short, terse sentences of the note-form of presentation are less common than the normal sentences, and this relative rarity might have influenced the relatively poor recall.

These conclusions must remain speculative until further work can be done. The relationship between familiarity and recall is far from perfect. Yet it is difficult to see how it can be substantially improved by a simple extension of the present method. Attention has already been drawn to deficiencies in the method of collecting recalls. These are easily rectifiable. Problems relating to the measurement of familiarity are more intractable. Individual differences in the familiarity ratings, though they might be reduced by the use of different scaling techniques were considerable.

X. 5.

SUMMARY

An attempt was made to assess the strength of the relationship between rated degree of familiarity for connected discourse and the extent of recall of such material. The experimental material consisted of sentences selected from prose material, recall protocols of which were available. These sentences, together with a larger number of sentences drawn from a wider range of reading matter (novels, magazines and newspapers), were inserted into a 94-item scale in which subjects were required to rate each sentence for degree of familiarity on a 9-point scale. Positive and significant correlation coefficients between degree of familiarity and measures of recall were found.

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XI.

EXPERIMENT SIXRETROACTIVE INHIBITION OF A
PASSAGE OF DESCRIPTIVE PROSE

XI. 1.

INTRODUCTION

It was decided to undertake a small study in which the standard methodology employed by Slamecka was used (see Ch. IV, pp. 80 - 81). A decision was made to employ descriptive passages in the present study because it was felt that, to be at the required level of difficulty, a narrative would have to be long. At the same time, the results of Experiment 1 had suggested that it was possible to find passages that were both short enough for use with a memory drum and yet which would have a firm intrinsic structure. No specific hypotheses were framed, but it was felt that RI would be obtained and that the form of interference would be generalised response competition.

XI. 2. METHOD

XI. 2. (i) Subjects The Ss were 20 male undergraduate students with a mean age of 20 who volunteered for the experiment and who were paid R1. Each S took part in one session; the nature of the session was determined by whether the S concerned was in the control or experimental group.

XI. 2. (ii) Material Seven passages were chosen from the writings of D.H. Lawrence; the criterion for selection was that they describe some 'natural' scene. Eight lecturers at the University of Cape Town (six from the English department and two from the Psychology department) made judgements as to the 'similarity' of the passages. They were told to take passage No. 1 as the standard and then rate the others as 'almost identical', 'very similar', 'similar' or 'slightly different'. They were also told to bear in mind that all the passages were of 'descriptive prose' and hence 'to use other types of passage as an implicit standard'. Their ratings are shown in Table 16.

T A B L E 16.

Mean Similarity Ratings of Judges

<u>PASSAGE</u>	2	3	4	5	6	7
<u>MEAN RATING</u>	3.00	3.00	2.88	2.75	2.88	3.63

Rating Scale : 1 - "Almost identical"
 2 - "Very similar"
 3 - "Similar"
 4 - "Slightly different"

The judges did not place any one passage as significantly more 'similar' than the others, and so the ratings were not of great benefit.

It was decided to choose passage Five for use in the experiment together with passage One. This decision was based, firstly on the fact that the mean rating for passage Five was the lowest, and secondly on the fact that, on inspection of the words comprising the passages, these two appeared to be the most similar. The two passages were then slightly modified so that each consisted of two sentences comprising a total of twenty-nine words.

To determine the difficulty of the passage, each of nine Ss, comprising both undergraduates and lecturers, took part in two sessions, with a twenty-four hour period between sessions. At each session Ss had to learn one passage to a criterion of one perfect anticipation trial. The passages were presented in a counter-balanced order so as to offset any possible practice or interference effects, and on the memory drum used in the actual experiment. The learning conditions were also the same as those for the Ss in the actual experiment.

The mean trials to criterion for the passages were as follows: passage One, 7.78; passage Two, 3.00. The levels of difficulty for the passages were therefore not significantly different ($t = .243$; $d.f. = 16$; $p = .9$). A correlation coefficient for the number of trials taken on the two passages by each of the

nine Ss was calculated. This showed that there was a strong relationship between the speed of learning of the passages among the preliminary Ss. $r = .74$ ($p = 0.01$).

The passages are produced below:

Original Passage:

The west over the land was a clear gush of light up from the departed sun. The east was a tall concave of rose-coloured clouds a marvellous high arch.

Interpolated Passage:

Often at the end of the day the sky opened. Then stately clouds hung over the horizon infinitely far away glowing through the yellow distance with an amber lustre.

When the passages were typed on to the paper used on the memory drum, the full stops were replaced by double asterisks.

In addition to the experimental passages, a brief warm-up passage was produced. Its chief purpose was to habituate the Ss to the conventions of the experiment. This passage was not taken from any book source; the sixteen words comprising it were chosen from the Thorndike-Lorge Word Book (1944) and consisted entirely of A.A. words i.e. those that occur 100 times or more per million words. The passage was -

Warm-up Passage:

The boys and girls ran outside. There they played on the grass until it got dark.

The memory drum used was specially designed and constructed for the experiment. It was driven by an induction motor with a centrifugal governor which operated a shaft to which was attached a gear system of the Geneva-stop type. The timing (i.e. the period for which each unit is exposed) could be varied continuously from a two to a three second interval. The drum was spring-loaded so that the drive could be disengaged and the drum adjusted to any position by hand (thus facilitating inter-trial rotation without switching off the motor). The outer casing which covered the drum itself had two slots, 10 mm. apart, and each measuring 50 mm. x 5 mm. The slots were adjacent to one another and placed at such a level that the S could view the words while sitting comfortably. The drum itself was large enough to accommodate fifty units (syllables, words).

XI. 2. (iii) Design and Procedure According to the usual RI paradigm the Ss were divided into two groups of ten, one the control group, the other the experimental group. On entering the experimental room each S was given preliminary instructions (see p. 181. XI. 2. (iv)). After this introduction to the general method of serial anticipation, the experimental session began with two trials of introductory activity. Further instructions were then given and the OL passage presented. The words were presented at a 3 - second rate with a 6 - second inter-trial interval. After OL to one perfect anticipation trial the procedure differed according to the group concerned.

(a) Experimental group: in the 30 - seconds period between OL and IL further instructions were given. Then the IL passage was presented and learned to the criterion of one trial of perfect anticipation. The time that elapsed between IL and relearning was again 30 seconds and again relevant instructions were given. Relearning was to one perfect trial.

(b) Control group: on the basis of the preliminary work it was decided to have a rest period between OL and relearning of 13 minutes, 48 seconds, which is equivalent to eight trials of IL and one minute for instructions for IL and for relearning. This period of 13 minutes, 48 seconds was divided up as follows: After instructions for the filler task had been given (30 seconds), 10 minutes were spent on the actual task, for which the Gottschaldt Figures Test was used. 54 seconds were then spent on instructions for the warm-up task and thereafter 1 minute, 54 seconds on two trials of warm-up i.e. on the introductory passage. Thereafter 30 seconds were devoted to instructions for relearning which followed to a criterion of one perfect anticipation trial.

XI. 2. (iv) Instructions :

Introductory : "This is an experiment designed to measure your ability at learning and memorising a number of sentences. The words making up these sentences will appear one at a time in the window of this memory drum. Now it is your task to learn to anticipate each of these words before it appears in the window. Obviously on the first presentation of the words you will not be able to

anticipate any of them; instead I want you to concentrate on these words, one by one as they appear. Then when the second trial begins, as indicated by this symbol 000 (the signal for the start of every trial), you must try to anticipate aloud the first word, and then the second and so on. You will also see two asterisks after some of the words and this is our convention for a full stop.

Always try to anticipate as many words as possible on each trial. Don't concentrate on a few words on one trial and a few others on the next. Instead study each word for the time that it is exposed. If it takes you a few trials to learn them all, or if you forget a word you previously anticipated correctly, then don't let this disrupt your learning; I can assure you this is very much the rule. Also never anticipate a word before the preceding one appears; in other words, don't get ahead of the drum. Furthermore, if you incorrectly anticipate a word but again think it will appear next, then call it out again. Are there any questions?

Now to get used to the procedure I will give you two trials on a simple passage. This is designed to get you used to the whole procedure so don't worry too much about the actual words but try to get into the rhythm of anticipating each word before it appears."

Prior to OL : "Now we will get on to the experiment proper. For the passage now appearing on the drum it is important that you be as accurate as possible. You will continue to anticipate the words until you anticipate all of them correctly in one trial. Remember you are being paid to give of your best."

Prior to Interpolated Task : Experimental group -
 "I now want you to learn another passage. All the same remarks apply and once again you will continue until you anticipate all the words correctly on one trial."
Control group -

For filler task : "I now want you to take that pencil and proceed with this test as instructed on the top of each page. Please be as quick but as accurate as possible and continue until I tell you to stop. You may ask any questions if you don't understand the instructions given."

For warm-up : "I am now going to present the first passage on the drum - the one that starts 'The boys' - and I want you to try to get back into the rhythm of anticipating each word before it appears. I will only give you two trials on this and once again don't worry too much about the actual words."

Prior to relearning : "I am now going to present the passage that was first in the actual experiment. Please try to anticipate as many of the words as

possible on the very first trial; this is very important. Again you will continue until you can repeat the passage exactly."

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XI. 3. RESULTS

XI. 3. (1) RI at Recall The main results for measuring RI are shown in Table 17 which records the number of incorrect responses for the Ss on the relearning trials.

TABLE 17.

Number of incorrect responses
per subject per relearning trial

<u>SUBJECT</u>	<u>Relearning Trials</u>							
	<u>CONTROL</u>				<u>EXPERIMENTAL</u>			
	1	2	3	4	1	2	3	4
1	1				3			
2	7	2	1	1	0			
3	5	2			7	1		
4	2	1			4			
5	1				4			
6	4	2	1		3	1		
7	3				8			
8	3				3	1	1	
9	0				9	3		
10	1				5			
	$\bar{X} = 2.7$				$\bar{X} = 5.1$			
	S.D. = 2.049				S.D. = 2.7			

When a one-tailed t test was performed, using the data on the first relearning trial (one-tailed since there is the alternative hypothesis $H_a : \bar{X}_c < \bar{X}_e$), it was found that the difference between the two means was statistically significant ($t = 2.123$, $df = 18$, $p = .025$). In other words the existence of statistically significant RI at recall was obtained. It was therefore concluded that RI at recall does operate in the recall of descriptive prose.

XI. 3. (ii) Dissipation of RI From the results in Table 17 it is obvious that the experimental group Ss did not require more relearning than the control group Ss to reach the necessary criterion. The mean number of trials to the criterion is 1.4 for the experimental group as opposed to 1.6 for the control group. It is thus apparent that RI dissipated at a remarkably fast rate and did not exist at all by the second trial of relearning.

XI. 3. (iii) Error analysis The analysis of the type of errors made in relearning has assumed a position of major importance in the interpretation of results obtained in RI and PI experiments. More specifically, it is largely on the basis of these errors that inferences are made about which mechanisms of interference have been operating. Hence an error analysis of great importance. In this experiment such an analysis can only be performed on errors made in the first relearning trial, since all Ss took so few trials to reach the criterion.

T A B L E 1 8.

Types of errors on first relearning trial

<u>EXPERIMENTAL</u>			
<u>Om.</u>	<u>Intra.</u>	<u>Extra.</u>	<u>Inter.</u>
28	15	4	4

<u>CONTROL</u>		
<u>Om.</u>	<u>Intra.</u>	<u>Extra.</u>
14	10	3

- Om. = omissions
- Inter. = interlist intrusions
- Intra. = intra-list intrusions
- Extra. = extra list intrusions

There are a number of important facts to be noted in the above table. In the first place there is the marked absence of inter-list intrusions in the errors of the experimental Ss, i.e. very few responses from the interpolated passage were given at recall. Thus, inter-list errors can account for very little of the difference in RI between the two groups. It is apparent that most of this difference is due to the large number of omissions in the experimental group as compared to the

other types of errors made by this group. This is clearly seen in the breakdown of the difference of twenty-four errors between the two groups - fourteen through omissions (58%), four through interlist intrusions (17%), five through intra-list intrusions (21%), and one through extra-list intrusions (4%).

XI. 3. (iv). Original learning It is important to check whether the two groups did not differ significantly in learning ability in the sense of speed of learning. Even though the Ss comprised a random sample, the possibility still exists that a difference in learning ability may occur by chance. It is known that fast learners also tend to be fast forgetters, (Postman and Riley, 1959), and thus if, by chance, the experimental group contained Ss who were faster learners than those in the control group, then the RI obtained could not be attributed solely to interference from II. Hence, if the conclusion that RI existed is to carry weight, it must be shown that the two groups did not in fact differ in learning ability where the number of trials to criterion in OL is taken as an index of learning ability. A comparison was therefore made of the mean number of trials required to reach the criterion by the control and experimental groups. The results are shown in Table 19.

T A B L E 1 9.Number of trials to criterion on OL

<u>SUBJECT</u>	<u>CONTROL</u>	<u>EXPERIMENTAL</u>
1	11	7
2	15	6
3	10	9
4	7	15
5	10	8
6	7	7
7	7	11
8	8	7
9	8	14
10	11	6

\bar{X} = 9.4	\bar{X} = 9.0
S.D. = 3.069	S.D. = 3.01

A two-tailed t test was performed. The two groups did not differ significantly in trials to criterion of OL and hence in learning ability. ($t = .061$, $df = 18$, $p = .9$). Thus, the RI obtained is due solely to the IL of the experimental group.

XI. 3. (v). Warm-up Effects A comparison was made of the number of trials taken by experimental Ss to reach OL and IL criteria. If there were significant warm-up

then the mean number of trials for OL will be significantly greater than the mean number of trials for IL.

T A B L E 2 0.

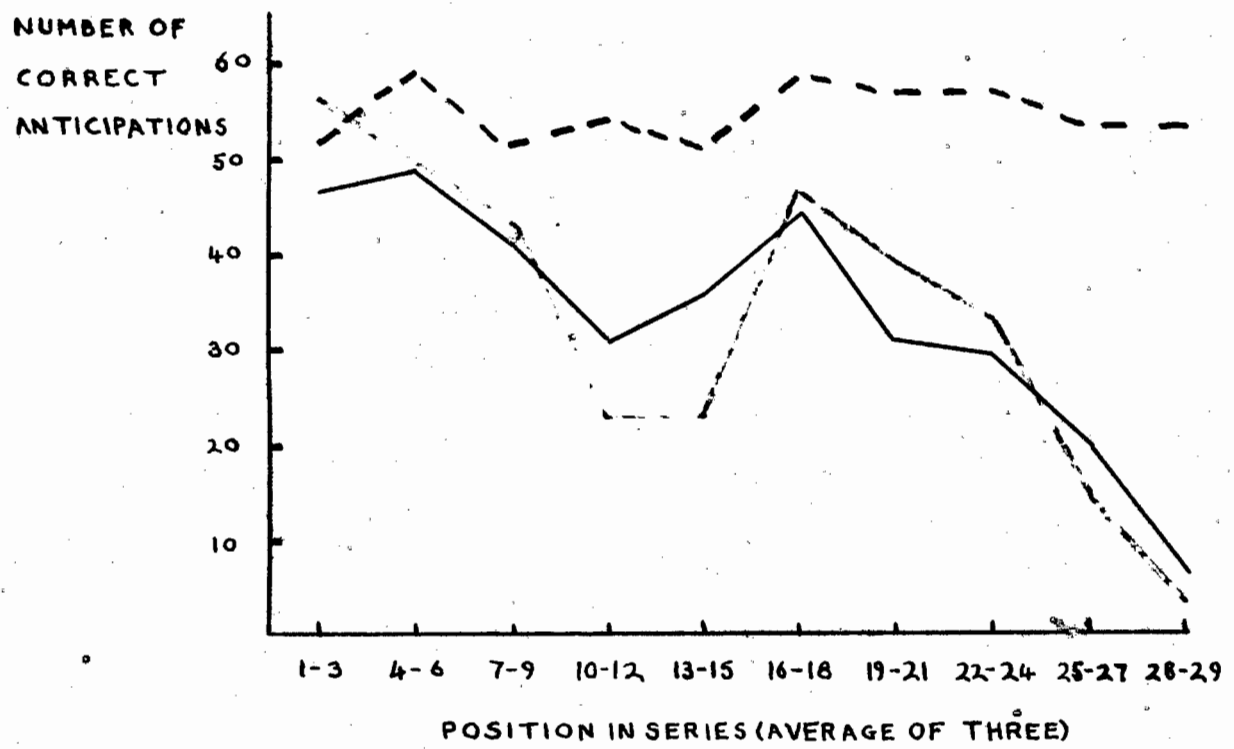
Number of trials to criterion
on OL and IL for experimental group.

SUBJECT	OL	IL
1	7	3
2	6	6
3	9	4
4	15	16
5	8	7
6	7	4
7	11	7
8	7	6
9	14	7
10	6	4
$\bar{X} = 9.0$		$\bar{X} = 6.4$
S.D. = 3.01		S.D. = 3.499

A two-tailed t test for matched groups was used because the scores for OL and IL are for the same Ss. There was a significant difference between the mean number of

FIGURE ONE

SERIAL POSITION CURVES



KEY:-
TRIAL TWO OF OL
TRIAL THREE OF OL
TRIAL ONE OF RL - - -

trials for OL and IL ($t = 3.344$, $df = 9$, $p < .005$).

XI. 3. (vi) Serial position curves As a result of the lack of information on the question of learning of connected discourse, as well as on the question of the retention of such material, it was decided to plot serial position curves for all twenty Ss on the second and third trials of OL. More specifically the aim was to see whether the learning of connected materials tends to follow the same pattern on the learning of unconnected materials i.e. bow-shaped serial position curves for acquisition. These curves are shown in Figure One.

It was only possible to plot a serial position curve for the experimental group on the first relearning trial, due to the rapid dissipation of RI. The specific aim here was to see whether the flat serial position curve, as obtained by Postman and Riley (1959) and interpreted as evidence for the operation of generalized response competition, would be obtained here. As Figure One shows there is no regular pattern at all. This cannot be interpreted for or against generalized response competition since the lack of errors prevented any significant pattern.

The curves for trial 2 and 3 of OL are typical of those found in the learning of passages of connected discourse, with a marked failure of anticipation at the end of the list (Deese and Kaufman, 1957). It is uncertain whether or not the slight bowing effect

towards the middle of the list is a function of the method of learning or of certain peculiarities of the list used.

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XI. 4.

DISCUSSION

As the results show, the rote retention of descriptive prose is susceptible to RI at recall, which is in line with Slamecka's finding with other types of material. The amount of RI was small and it dissipated at a rapid rate.

It would seem that these findings can be incorporated within the theories proposed on the basis of findings using conventional rote-learning materials. The concept of generalised response competition appears to be applicable here. It was on the basis of very similar findings that Newton and Wickens (1956) originally formulated the concept of a more general form of competition between lists. It was unfortunate that no definite serial position effects were obtained on OL, and that the level of recall was so high on RL, because Postman and Riley have reported that another distinguishing feature of this form of competition is that it pro-

duces a flattened serial position curve on the first trial of RL. The bowed form reappears on the second trial as a result of the reinstatement of the associative context of OL.

The second striking feature of the results was the marked improvement in the rate of learning of the second list under the experimental conditions and the absence of such improvement during the pre-experimental trials. This phenomenon cannot have been due to associative facilitation (Postman and Riley, 1959), since, had this been occurring, there would have been retroactive facilitation, not RI, at recall (Barnes and Underwood, 1959). Moreover, the concept of associative facilitation demands that there be an association between pairs of specific responses. It seems certain that this situation occurs very seldom in the case of connected discourse.

It is probable that the factor at work was a warm-up or learning-how-to-learn process (Adams, 1961). There is some impressionistic evidence for this. When the trend towards fewer numbers of trials on IL was noted, the experimenter asked each S after the experiment whether he had found the second passage easier to learn, and, if so, why he had. Most Ss reported that the passage itself was not easier but that by the time the IL took place they were "in the rhythm

of learning". As one S put it, "I learned to deal with the tricks". The absence of such a phenomenon during the pre-experimental sessions could be explained by the loss of set which would occur during the 24-hour period between sessions.

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XI. 5

SUMMARY

It has not been possible until recently to demonstrate the existence of retroactive inhibition in the recall of passages of connected discourse. Now, the use of the standard techniques of rote verbal learning have reversed earlier findings. In this study, retroactive inhibition in the recall of a 29-word passage of descriptive prose is demonstrated. The inhibition dissipated very rapidly during relearning. Results are discussed in terms of standard interference theory.

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CONCLUSIONS

XII. C O N C L U S I O N S

XII. 1. REVIEW OF MAJOR EXPERIMENTAL WORK

XII. 1. A. FAMILIARITY AND RECALL

XII. 1. A. (i) Interference Theory and Familiarity

Although further work still has to be done, it can be said that the hypothesis with regard to familiarity and recall (Ch. V. 6. (iii)) was successfully validated in that it was shown that degree of familiarity with the individual sentences making up a passage of prose was the major determining factor in recall. The alternative hypothesis, that the form of a passage creates a unity around which recall develops, cannot be entirely rejected; but the only evidence found for its operation in the present series of experiments related to only one type of prose (descriptive) and to only a certain group of people (who may be Bartlett's visualisers).

In another sense, the discovery of a positive relationship between familiarity and recall creates more difficulties than it solves. Familiarity and meaningfulness have been equated for the purposes of Experiment 5; it has been pointed out (Ch. I. 2. A. (ii), p.24) that apparently the association theorist is forced to

postulate that the more meaningful the material, the less its degree of recall should be. Therefore, the theory should predict a negative relationship between familiarity ratings and recall. A way around the difficulty can be found by adapting the notions of unit-sequence and letter-sequence interference used by Underwood and Postman (Ch. I. 2. A. (ii) p. 25). It seems reasonable, when dealing with ordinary connected discourse, to make the word the minimal unit and to treat highly familiar aggregates of words (whether they be phrases, clauses, sentences, or groups of sentences) as units of a higher order. It should easily be possible to discover a series of units of increasing degrees of aggregation, and which are, at the same time, of increasing degrees of familiarity.

In material of a highly unfamiliar nature ("Finnegan's Wake" or the poetry of Ezra Pound, for example), the interference would be between the words of the passage. It is only when we reach the level of familiarity tapped by the scale used in Experiment 5 that interference would be set up between the higher order units. As the range of familiarity rises, so the size of such units increases. At low levels of familiarity, there should be interference between several parts of a sentence, until, at the highest levels of familiarity tapped by the scale used here, the sentence forms an entire unit and there are no interference effects between its parts. It is possible to predict that if recall of

larger units than the sentence were to be accurately measured, then interference effects between units that are highly familiar in themselves but which occur in unfamiliar conjunctions could be set up. Thus, when the full range of familiarity is tapped, a curvilinear relationship between familiarity and recall would ensue.

XII. 1. A. (ii) Familiarity and Individual Differences

The finding of a high correlation between the male and female ratings has important theoretical implications. The suggested manner in which personality variables influence recall was that the differing needs and interests of various personality types directed their attention to different aspects of the linguistic universe. Because of the differing needs and aspirations of males and females they can be treated, for the purpose of this discussion, as though they were personality types. When we look for such differences in the material used in the scale, however, very few are to be found, and no theoretical background at all was required to predict those that did occur. It follows that in the case of males and females large aspects of the linguistic universe have been experienced in common. If this is the case for them, then differences will be insignificant in the case of the best demarcated personality types.

This conclusion is based on results using mean ratings. An empirical feature of the scale was the instability of the individual ratings, leading to low inter-rater reliability. This instability must have four

major sources: an error factor; a factor due to genuinely differing degrees of familiarity with the various items of the scale; a factor causing a particular individual to utilize a particular segment of the rating scale by preference; and a factor which would cause some individuals to give a greater range of ratings than others. It has proved possible to identify the latter two factors in personality rating scales by using the standard analysis of variance techniques; (Guilford, 1954; Cronbach, 1955). The application of similar techniques might make it possible to identify individual differences in familiarity with greater accuracy.

XII. 1. A. (iii) Extension of the Range of Familiarity

When an attempt is made to extend the technique of measuring familiarity to larger populations, the range of familiarity of the material to be rated will have to be extended. It is probable that the present scale has approached the upper limit of middle class samples. If such scales were used on larger populations, the level of familiarity would have to be dropped in order to make effective discriminations. Bernstein (1959) has made a distinction between "public" and "formal" languages; the former is the form of the language habitually spoken by a particular person, characterized by general poverty of construction and vocabulary. The latter is a more exact form of the language, and may be written or spoken. As educational level rises, so aspects of the formal language enter the public language. Conversely, Hoggart (1958)

has indicated how impoverished is the written language with which the working class is acquainted. Work such as this will provide both suggestions for suitable material for inclusion in scales and possible extensions of the theoretical framework within which to discuss the results.

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XII. 1. B. INTERFERENCE THEORY AND CONNECTED DISCOURSE

XII. 1. B. (i) The Role of Specific Interference When the lists for Experiment 6 were scrutinized before being used in the learning sessions, it was hoped that evidence of interference between specific words would be found. In particular, the word "yellow" appeared at serial position 24 in one list and a very similar word ("rose-coloured") at the same serial position in the other. Since high interference should be a characteristic of such a position (Postman and Riley, 1959; Deese and Kaufman, 1957), it would be reasonable to suppose that the interference effects would spread to the neighbouring words. The fact that this expectation was not borne out can be considered an argument against the application of interference theory to the forgetting of connected discourse.

This is not necessarily an effective argument. First of all, individual differences in degree

of familiarity with various words have to be taken into account. Although such words may constitute a source of interference for some people, they may not for others. It is also possible that it is only words of very low degrees of occurrence that would cause observable interference. Secondly, it has been noted, both in the learning of the lists used in Experiment 6 and in the learning of lists used in an experiment at present in progress, that subjects tend to learn whole phrases very early in the series of learning trials, and that what has to be learnt is the position of such phrases in the correct sequence. The primary source of interference is therefore intralist. This leads to the suggestion that, because of the high level of familiarity with the various parts (phrases and clauses) of the list, the level of differentiation is high from the outset of learning. The learning of a new list would disrupt the bonds between the parts of the original list leading to confusion at recall, but there would be no interlist intrusions: omissions would be almost the only type of error. Because of the high degree of reinforcement of the total list, a result of its high familiarity, entire blocks of the list would not be omitted. Such large-scale omissions can be anticipated with the use of longer lists.

XII. 1. B. (ii) Associative Context and Warm-Up Decrement

Since generalized response competition is the primary source of interference in the forgetting of connected discourse, it follows that the concept of associative

context is of crucial importance. It will be recalled that it was said that various memory traces not specific to the list itself grow up and coalesce into a unity during learning. (Ch. I. B. (iii), p. 16). From what has been said about WUD (Ch. I. A. (i) pp. 1 - 2), it follows that the disruption of these bonds should be a source of interference. The force of the argument is increased when the very marked warm-up effect of the first list on the second in Experiment 6 is taken into account. This seems to imply the operation of some non-specific learning activity. On the other hand, it is probable that such an effect, could it be detected, would be of very short duration. It is likely that previous language habits would exert a powerful proactive effect and rapidly mask any WUD.

XII. 2.

OVERALL CONCLUSIONS

XII. 2. (1) The Limitations of Interference Theory

The methodology required for the demonstration of interference effects on recall imposes serious limitations on the generality of the results. Learning a list word by word is a highly unusual procedure and it seems justifiable to conclude that any results achieved are a function of the method rather than of the processes governing

recall. Cynics can point to concepts such as associative context and say that they are merely rationalizations designed to throw a cloak over ignorance as to the nature of these processes.

The only effective way to answer this criticism is to assert that any conclusion drawn from experiments employing the techniques of serial learning should be considered alongside conclusions drawn from other experiments based on association theory. The most important development in the field as a whole is the growth of our knowledge regarding linguistic norms. When such knowledge is used in conjunction with hypotheses derived from interference theory, interesting conclusions emerge. The best example of such work to date is the experiment by Underwood and Postman (1960).

XII. 2. (ii) Interfering Tendencies As a Source of Individual Differences. In Ch. III. pp. 68 - 70, it was suggested that a general susceptibility to interference might be a source of individual differences in recall. It was also pointed out that serious theoretical problems are raised. Such issues cannot be dealt with here. The hypothesis still requires empirical demonstration; it should not be too difficult to create designs to achieve this end. For example, data on individual differences in RI or PI could be gathered by the use of a standard paradigm. The same subjects could be obliged to learn and recall passages of prose under more strictly controlled conditions than

those used in the present series of experiments. The prose protocols could be scored in the manner suggested by Levitt (1956). Then, if interfering tendencies were important, a negative relationship between extent of interference and degree of recall should obtain. The use of this design would overcome objections to the use of the serial anticipation method.

In Ch. II (pp. 53 - 55), there was discussion concerning the theory that there are two types of memory, a memory for events and a memory for formal material. It was suggested that those who uphold this theory have not fully proved their point. The alternative hypothesis - that all forms of forgetting are caused by interference between discrete memory traces - could be put to the test. Again, the assumption would be that general tendencies to interference are developed to differential extents in a population chosen at random.

This proposal carries us outside the limits set down in the Foreword. Before undertaking work of this nature, a broader theoretical study of the nature of memory processes as a whole would have to be undertaken. One point immediately arises: when dealing with verbal material, we are treating stimuli that are not only already symbolized but which are set in an ordered matrix. Both symbols and the relationship between symbols are predetermined. It is usually held that the same is not true of events, where the person is reputedly freer to impose his own organization on his

memory traces. It cannot be denied that this is true. However, it does not follow that there is something different about the two types of memory trace. It is more reasonable, since the traces themselves cannot be observed, to say that both are the same. It also seems preferable to adopt the provisional hypothesis that inter-personal differences in mode of organization are due to the unavoidably large range of happenings to which different people are exposed.

It is admitted that the preceding arguments have an unsatisfactory quality. The recollection of personal experiences and rote recall are accompanied by different emotional experiences. A source of this dissimilarity immediately suggests itself. It is not unreasonable to assume that the items of a verbal list and the actual stimulus as recorded in the nervous system of the subject are almost identical. This cannot be true of the memory traces of events. The "objective" stimulus has to be coded in some way before memory traces can be set up. An important aspect of this coding must be the relationship between previous memory traces and the traces which are being created. Because of differing experiences, there are certainly wide individual differences in the take-up of the former traces.

Nevertheless, there could be situations which many people in a given culture have experienced in common.

The situation then becomes analagous to that found in verbal learning, where the recall of the stimuli is subject to interference from a pool of associations which vary little from subject to subject. It might be possible to obtain reliable familiarity ratings for a number of events. Once this were done, it would be possible to measure the recall of a scene, the memory traces of which had been exposed to proactive or retroactive effects from another, equally familiar, scene. It would be predicted that interference effects would be much less in the case of unfamiliar scenes, since recall could not be depressed by communal proactive effects.

XII. 2. (iii) Language Habits and Recall The suggestions about the use of analysis of variance techniques to uncover individual differences in familiarity immediately suggests that relationships between personality or motivational variables and recall might be revealed by a more stringent method. However, the work of Bernstein (1959) leads to further doubts about the possibility of success in this respect. He is largely concerned with class differences and with demonstrating how the impoverished speech habits of the lower classes makes it impossible to express subtlety of thought and feeling. One example of such a restriction will be given here. Bernstein points out that a limited range of conjunctions makes it difficult to express or understand completed thought. At the same time, a limited and rigid use of adverbs and adjectives makes appropriate qualifications difficult. This discussion is

of great interest in view of the finding reported in this study of the relatively low recall of matter expressing arguments and of the relatively low degree of rated familiarity with individual sentences taken at random from such material. It does not seem unreasonable to suggest that such deficiencies, though to a less marked degree, would be found to differential extents in university populations. The maintenance of poor language habits would then be the primary cause of forgetting. This statement is not equivalent to the statement that a certain set of needs and interests leads a person to a particular linguistic area. The aspirations of a particular person to express fine shades of meaning may be thwarted by his inadequate verbal equipment.

Such an analysis has further implications. The relationship between personality and motivational factors and recall is thrust back a further stage. We are obliged to say that there is a direct relationship between familiarity and recall, and between language habits and familiarity. Personality and motivation, then, must exert their influence on language habits. Now, it cannot be maintained that the possession of a particular personality structure causes the working classes to use a limited range of conjunctions, adjectives, and adverbs. There thus seems to be no reason to suggest that the possession of less gross deficiencies in this regard by a middle-class sample should be primarily a function

of personality variables. It is much more reasonable to scrutinize the past environment of the subjects to find the source of these defects, and only when unknown sources of variance have been discovered to turn to an examination of personality structure.

In all previous discussions of this topic, personality and motivational factors have been considered together. At that stage, the apparent confusion was justified. The only hypothesis that could legitimately be discussed was that needs and interests would direct a person to a certain area of the linguistic universe, either directly (in which case the independent variable would be called motivation) or through the mediation of a particular structure (his personality). It is now apparent that the factors of motivation and of personality must be considered separately. It is also apparent, on the basis of Bernstein's analysis of the language habits of the working-class, and the extension of this analysis to possible sources of individual differences in the middle classes, that dependent and independent variables are being confused. The manner in which a person comes to know himself and the ways in which he interacts with others are, to a very large extent, a function of his language habits: his personality structure is mainly a function of his predominant verbal associations. The extent to which this statement is acceptable will vary with the theoretical position of the person who reads it. A depth

psychologist would hold that sources of motivation become structured and exert a directive influence from an early age. A self theorist would say that personality changes throughout life, and would be more concerned with a scrutiny of the way in which this structure expresses itself than with a search for the reasons which caused the growth of the structure.

Nor can it be said that motivation should be consistently regarded as an independent variable. From the work of Bernstein (1959) and of Hoggart (1958), it can be inferred that, just as the language habits of the working-class place limits on subtlety of argument that can be comprehended, so these habits limit the range of emotions that can be expressed and understood. It follows that the range of needs and aspirations of which such people are aware is correspondingly limited. It can be predicted that differences of this nature would be found to a less marked extent in middle-class samples. It should also be found that deficiencies of this type could be overcome in the case of the middle-class person who is exposed to a richer environment, whereas, except in exceptional cases, a member of a less privileged group will remain unaware of broader possibilities. Techniques whereby scaled judgements of familiarity are obtained suggest themselves as^a useful means of observing changes of outlook.

Implications for interference theory are also evident. It is possible to unite the two suggested causes of individual differences (Ch. III. 4. pp. 68 - 71). The hypothesis can be made that, the more limited is the linguistic repertoire of a subject, the greater is the probability that interference will be set up. The position can be made plain by referring to the PI paradigm. If a subject has a limited number of verbal associations, his degree of PI of these will be high. If he is now obliged to learn material in which these associations form only a small proportion of the total number present, the unfamiliar associations will be extinguished during the interval between learning and recall. If the subject is given enough time, he can acquire the new associations; if, as in a University situation, he is constantly exposed to new associations, interference will increase. The analogy should not be forced too closely. It should be treated simply as one of the ways in which the findings of association theory can be incorporated into the broader field of psycholinguistics.

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