Memory or retention is an important aspect of human behaviour and cognition. It is an essential element of information-processing. Our knowledge of the world and its phenomena is represented in memory. The existence of memory or retention is essential for one's successful behaviour in the world. It is also an indicator of intellect. However, there are some exceptions in this regard. For example, Luria (1968) studied a man whom he called S over a span of many years. S appeared to remember volumes of information of a variety of sorts after only brief and apparently effortless examination. Moreover, he could recall this material at will no matter how much time had passed.

Memory may be discussed in terms of information processing, i.e., some kind of substance that may be put into memory, retrieved from memory and lost from memory, etc. This information-oriented way of looking at memory is relatively recent, having been used by theorists only since the 1950s (cf. Loftus & Loftus, 1976). The processes by which information gets into and out of memory are generally referred to as encoding, storage and retrieval, and are the three basic phases of information-processing done by a human observer. Encoding is the process of transforming physical stimulus energies impinging upon the senses of an observer into memory codes. The registration processes of
perception are necessarily involved in the memory process of encoding. Once an event is encoded, it is stored in memory in some systematic, organized network. The form of storage will depend upon the nature of the material to be remembered and the particular coding techniques employed by the individual. Coding techniques vary from simplistic rote repetition to sophisticated mnemonic strategies. Information stored in memory is not of much use unless it is accessible for recall. However, many experiences may be stored in memory even though they are not at the moment retrievable. These experiences are referred as the tip-of-the-tongue phenomenon. It occurs whenever a person attempts to recall a name or word and has the feeling that he knows it and is on the verge of producing it but, for the moment, cannot find it.

The Information-Processing Approach to Memory.

Over the last thirty years, several attempts have been made to describe what happens when people perceive and retain information from the external environment. Two different aspects of information-processing have been emphasized: structure and process. Those who emphasize structure have usually suggested that the nature of the information-processing system imposes limitations on the rate of the flow of information through it. It is assumed that there is a temporal sequence to the flow of information, which passes from modality-specific stores through a short-term store (S.T.S.) to a long-term
store (L.T.S.). On the other hand, those theorists stressing the importance of process have concentrated more on the richness and variety of encoding and processing strategies which can be applied to incoming information. While it is convenient to distinguish between process and structure, they undoubtedly interact and depend on one another in a variety of complex ways (Eysenck, M.W., 1977).

**Structural Theories**

The structural theories of information-processing have been advanced in one form or another by a number of psychologists (e.g. Broadbent, 1958; Glanzer, 1972; Waugh & Norman, 1965) and were described in their most complete form by Atkinson and Shiffrin (1968, 1971).

Information is processed over time. It is convenient to think of information as passing through several stages, each with its own characteristics. If information is to have any effect at all, it must be registered perceptually. That is to say, a person must see, hear, feel, or otherwise sense some energy change in the environment. To the extent that energy persists over time, processing can be done directly. But sometimes an event occurs and is gone before we have an opportunity to make a complete or thorough examination of it. Under those circumstances, we are forced to rely on memory. Thus, memory is an important component in human information-processing (Bourne, Jr., et al., 1986).
For ease of communication, memory may be conceptualized as consisting of three hypothetical stages: sensory memory, short-term memory and long-term memory (Bourne, Jr., et al., 1986).

**Buffer Model**

The "buffer" model as proposed by Atkinson and Shiffrin (1968, 1971) characterizes memory as having two dimensions. The first dimension contains the permanent or structural features of the model like the hardware of a computer. The second dimension contains "control processes", which are operations performed by subjects and under their control, much as the rehearsal and output order strategies.

On the basis of structural features, Atkinson and Shiffrin divide memory into three distinct components: the sensory registers, the short-term store (STS), and the long-term store (LTS). According to this model, information is processed by and held in the sensory registers and then entered into STS. The information remains temporarily in STS, with the length of stay being a function of control processes. While information resides in STS, other information associated with it in LTS may be activated and brought into STS to accompany it. Furthermore, during the period when information is held in STS, it may be copied or transferred into LTS.

The buffer, from which the model derives its name, is considered as a part of STS. The buffer is intimately concerned
with the subject strategy of rehearsal. If the subject employs a strategy different from one of repetition of the to-be-remembered items, then the buffer will not be the dominant part of STS. However, Atkinson and Shiffrin demonstrate that in many tasks the buffer plays an essential role. The buffer is a small capacity store holding a fixed number of items to be referred. As each new study item is presented, it may enter the buffer for rehearsal and if it does, one of the current inhabitants of the buffer will be removed, since the capacity of the buffer can not exceed a certain limit.

According to this model, every item at the encoding stage enters the subject's rehearsal buffer, which has a capacity left as a free parameter of the model, \( r \), a variable which is expected to depend on the specific subjects tested and the particular situation. One by one, the initial items fill up the compartments of the buffer, and thereafter each succeeding item removes from the buffer, a randomly chosen inhabitant. The model postulates further that information about an item is copied into LTS during the period of time that it remains in the buffer; infact, the amount of information transferred is a linear function of the amount of time the item spends in the buffer. Finally, the model includes the assumption that when the subjects scan through LTS during recall to find the items they wish to remember, they make precisely searches with replacement, and then they terminate their search. Thus, items with more information in LTS are more
likely to be found during the LTS scan.

Dual Process

One of the most important attributes of the buffer model is its postulation of two distinct memory stores, L.T.S. and S.T.S. Such a "dual process" notion has been widely, but not universally, accepted by memory theorists. The most impressive evidence supporting the distinction between STS and LTS comes from clinical evidence deriving from patients whose hippocampus area of the brain has been damaged. (cf. Bourne, Jr. et al., 1986). Such patients, like the patient HM studied by Milner (1967) and Wickelgren (1968) seem to have relatively normal verbal short-term memory process along with an almost complete inability to construct new verbal long-term memory representations. In terms of the buffer model, such patients cannot transfer information from STS to LTS.

The other evidence supporting the distinction between STS and LTS involves free recall tasks. The serial position curves in these tasks typically show a large recency effect, a small primacy effect, and a flat function in the middle. In such curves, the middle and primacy portions of the curve reflect retrieval from LTS, whereas the recency portion reflects largely retrieval from STS. Further, manipulations of list length and rates of presentation left the recency portions of the serial position curves intact but changed (decreased) the pre-recency portions significantly (Bourne,
Jr. et al., 1986; Glanzer & Cunitz, 1965). Another type of experimental evidence which suggests that there are two different memory stores involves the format in which information is represented in memory. Evidence shows that the short-term memory representation are based on phonemic codes, whereas those in the long-term memory involves semantic coding.

However, some subjects apparently suffering from damaged short-term memory are capable of placing data in L.T.S. and recalling them. Such patients can carry on normal conversations without displaying evidence of general memory defects. Baddeley (1976) wonders whether STS serves any function except keeping experimental psychologists occupied.

Atkinson and Shiffrin (1971) themselves allowed for the possibility that the separate boxes they sketched for STS and LTS might actually be part of the same structure. And in later separate writings, both the authors moved closer toward a position that STS may be a part of LTS (Atkinson et al., 1974; Shiffrin, 1975).

Levels of Processing

An important attack against the distinction between STS and LTS was initiated by Craik and Lockhart (1972), who also proposed an alternative conceptual framework in which memory phenomena can be understood. Craik and Lockhart raised three arguments against the dual process approach: arguments involving capacity, coding, and the time course of forgetting.
The first argument concerns the fixed limited capacity that most dual process models attribute to STS. The problem is that empirical estimates of the STS capacity vary considerably. Whereas measures of memory span vary between five and nine items (e.g. Miller, 1956), estimates of the buffer size by Atkinson and Shiffrin (1968) are much lower. The second argument concerns the coding distinction in STS, where originally it was thought that STS was restricted to phonemic coding. However, later evidence suggested that coding in STS is more flexible so that STS and LTS cannot be sharply distinguished on the basis of coding (cf. Bourne, Jr. et al., 1986). Finally, Craik and Lockhart argued that if the memory stores are distinguishable in terms of their forgetting functions, then it would seem crucial that the time courses of forgetting be invariant across different experimental paradigms. However, such invariance is not found; different methods of testing lead to different courses of forgetting.

As an alternative to dual-process notion, Craik and Lockhart proposed the notion 'level of processing'. Basically, they suggested that stimuli may be processed in different ways and to different extents and the level of analysis determines the rate of forgetting. For stimuli that are analysed only at a superficial level such as that involving visual or phonemic attributes, the memory traces are transient, whereas for stimuli that are analysed at more deep, meaningful levels the traces are more permanent. The depth at which an item is processed is a function of the nature of the stimulus and the specific requirements of the task. Craik and Lockhart view
the different levels not as distinct stages but rather as a continuum of analysis. Further, they postulated a limited-capacity central processor which may be used to maintain information at one level of analysis. The capacity of the process is a function of the particular level at which it is operating, thereby accounting for the variation in the estimates for STS capacity. As soon as an item leaves the central processor, it will be lost at the rate determined by its level of processing, (slower rates for deeper levels), thereby accounting for the variation in forgetting rates. The central processor may work to keep information at one level of analysis which is known as Type I processing or maintenance rehearsal. Alternatively, it may work toward deeper analysis of the information, which is called Type II processing or elaborative rehearsal. In other words, Craik and Lockhart postulate two distinct types of rehearsal processes, not just the single process included in the buffer model.

Craik and Lockhart's (1972) levels of processing model conceptualizes memory as a hierarchy of processing levels through which new information is processed. At the initial level the physical or sensory features are analysed. The stimulus is then processed at progressively deeper levels of analysis such as pattern recognition and finally at the semantic and associative levels. The model embodies that the memory is a byproduct of perceptual analysis. The typical finding in this regard is that free-recall is the greatest
for semantically processed words, intermediate for the phonetically encoded words and the poorest for the physically encoded words (Craik and Tulving, 1975). This pattern of results occurred in memory experiments with many different tasks and stimuli. However, opposite results have occurred in some studies. The problem with the model is that the subjects when required to engage in phonemic processing may engage not only in phonemic processing but also in semantic processing.

Thus the model of levels of processing is revised which states that retention depends not on the depth of encoding but on the elaborateness or the spread of encoding (Craik and Tulving, 1975). The elaborateness of encoding refers to the extent to which items are related to or organised with other items. This definition of elaborateness emphasizes the relationship between different items. Elaborateness also refers to the extent to which an individual item is analysed regardless of the level at which the processing occurs. The more attributes we encode, the more elaborate our memory representation is. Whereas the first definition emphasized between-item elaboration, this definition stresses within-item elaboration. These definitions point out that the information can be elaborated in at least two ways, both of which occur by adding information to internal representation. One reason behind the emphasis on elaborateness is that the elaborateness of processing affects retention apart from the levels of processing. The elaborateness concept is also preferred because it avoids the notion of fixed sequences of processing
(Craik and Tulving, 1975). Many investigators believe that elaborate processing makes items distinctive or discriminable from other items and the increased distinctiveness aids retrieval (Eysenck, M., 1979; Jacoby and Craik, 1979).

**Personality**

Personality is a fundamental concept in Psychology and no experimental or applied psychological research can flourish which does not incorporate concepts related to personality. Psychology always deals with individuals and they behave differently in identical situations.

It is often said that the concept of personality types requires a categorical distinction, such that a person is either one type or another, and cannot be the mixture of two. This presents a clear contrast with the concept of traits which are taken to be continuous. A person can have more or less of any trait. Jung in his book 'Psychological Types' (1921) used the type concept suggesting that introversion and extraversion were the two principal types of personality. Eysenck (1947) suggested that introversion-extraversion is a continuous dimension and corresponds to Wundt's 'changeability'. Jung has suggested that different kinds of neurotic illness are found in introverts and extraverts (psychasthenia and hysteria, respectively). Eysenck took up this point and inferred from it that since there are neurotics at both ends of introversion-extraversion, neuroticism must be a second dimension orthogonal
to introversion and extraversion. Using the same logic he drew Kretschmer's idea that there are psychotics at both ends of the normal spectrum and argued that the schizophrenics are introverts while manic-depressives are extraverts. Since the test which discriminates normals from abnormals does not discriminate normals from psychotics, he suggested that there must be a third dimension of psychoticism (Eysenck and Eysenck, J.B.G., 1968). Eysenck refers to these dimensions as personality dimensions. These are therefore contrasted with traits but in rather a different way from the category versus continuum contrast outlined above (cf. Lamb, 1986).

Eysenck in fact regards types as second-order factors obtained from factor analysis. He proposes that the personality is hierarchically organized. At the bottom there are specific responses to specific stimuli. At the next level, there are habitual responses. Above are the traits, such as sociability and impulsiveness. The evidence for their existence comes from the observed intercorrelation between different kinds of habitual responses. At the highest level are the types (i.e. the three dimensions), the evidence for their existence coming from observed intercorrelations between traits. He regards such a 'type' approach to personality as superior to the trait approach of Cattell because of its greater simplicity, reliability and theoretical basis in physiology and genetics (cf. Eysenck and Eysenck, M.W., 1985; Lamb, 1986).

Eysenck's theory of Personality:

On the basis of factor analysis, Eysenck concluded
that overall there are three major types of concepts: Extraversion/introversion, neuroticism and psychoticism. He outlined the concepts of introversion-extraversion (E) and neuroticism (N) in 1944 paper. Those who were high on neuroticism were characterized by 'badly organized personality, abnormality before illness, little energy, narrow interests.' Those who were at the extravert end of the E dimension showed symptoms of hysteria and sex 'anomales'. Those at the introverts dimension showed depression, obsession and apathy.

In 'Dimensions of Personality' (1947), he proposed that these dimensions were sufficient to define all personality variations. He claimed that Cattell's second-order factors from the 16 - 2F, invia/exvia and anxiety are the same as E and N. Eysenck and Eysenck, S.B.G. (1969) factored together items from scale devised by Cattell, Guilford and Eysenck himself (The E.P.I.). Six hundred males' and six hundred females' scores were factor-analysed separately as expected; too large, third-order factors (E and N) accounted for most of the variance in both groups. This suggested that the other personality scales do show the same interrelated items as the E.P.I. The analysis, however, was loaded somewhat in Eysenck's favour. In a later paper Eysenck (1972), however, showed that in Cattell's own data the second-order factors, exvia-envia and anxiety account for almost all the variance implying that Cattell's 16 primary dimensions are really only measuring E and N. Later Eysenck added the third factor in these dimensions
which was labeled as psychoticism (Eysenck and Eysenck, S.B.G., 1976).

Eysenck used causative as well as description analysis of his personality dimensions. Eysenck and Eysenck, S.B.G. (1975) described the dimensions of extraversion-introversion as measured by E.P.Q as follows: "High E scores are indicative of extraversion. High E scoring individuals tend to be outgoing, impulsive and uninhibited, having many social contacts and frequently taking part in group activities".

The typical extravert is "sociable, likes parties, has many friends, needs to have people to talk to and does not like reading or studying by himself. He craves excitement, takes chances, often sticks his neck out, acts on the spur of the moment, and is generally an impulsive individual. He is fond of practical jokes, always has a ready answer and generally likes change. He is carefree, easy going, optimistic and likes to 'laugh and be merry'. He prefers to keep moving and doing things, tends to be aggressive and loses his temper quickly; altogether his feelings are not kept under tight control and he is not always a reliable person" (Eysenck and Eysenck, S.B.G., 1964, 1975).

The typical introvert, as the other hand, is "a quiet retiring sort of person, introspective, fond of books rather than people; he is reserved and distant except to intimate friends. He tends to plan ahead, 'looks before and leaps"
and distrusts the impulse of the moment. He does not like excitement, takes matters of everyday life with proper seriousness and likes a well ordered mode of life. He keeps his feeling under control, seldom behaves in an aggressive manner and does not lose his temper easily. He is reliable, somewhat pessimistic and places great value on ethical standards" (Eysenck and Eysenck, S.B.G., 1964, 1975).

Eysenck and Eysenck (1975) described that high N scorers are neurotics while low N scorers are emotionally stable.

A person having a higher score on neuroticism is-"an anxious, worrying individual, moody and frequently depressed. He is likely to sleep badly and to suffer from various psychosomatic disorders. He is overly emotional, reacting too strongly to all sorts of stimuli, and finds it difficult to get back on an even keel after each emotionally arousing experience. His strong emotional reactions interfere with his proper adjustment, making him react in irrational, sometimes rigid, ways." (Eysenck and Eysenck, S.B.G., 1975).

A stable individual, on the other hand-"tends to respond emotionality only slowly and generally weakly, and to return to baseline quickly after emotional arousal; he is usually calm, even-tempered, controlled and unworried". (Eysenck and Eysenck, S.B.G., 1975).

The third dimension in Eysenck's personality theory is
psychoticism. "High P scorers on psychoticism scale are ego-centric, aggressive, impersonal, cold, lacking in empathy, impulsive, lacking in concern for others, and generally unconcerned about the rights and the welfare of the other people. On the other hand, a possible concern of their general oddity, they are always original and creative, provided they have reasonable intelligence, background and the like" (Eysenck and Eysenck, S. B. G., 1975). The opposite end of the psychoticism dimension has been referred some times to as "superego".

Eysenck also provides causative explanations of his personality dimensions. According to him, individual differences in extraversion-introversion are due to inherited differences in the functioning of the nervous system. He states that individuals in whom excitatory potential is generated slowly and in whom excitatory potential is relatively weak, are thereby predisposed to develop extraverted patterns of behaviour. Individuals in whom excitatory potential is generated quickly are thereby predisposed to develop introverted patterns of behaviour. Similarly individuals in whom reactive inhibition is developed quickly and is of a strong nature and dissipates slowly, are predisposed to develop extraverted patterns of behaviour. Conversely, individuals in whom reactive inhibition dissipates quickly are thereby predisposed to introverted patterns of behaviour (Eysenck, 1957).

Eysenck in his book "The Biological Basis of Personality" (1967) correlates extraversion-introversion to the amount of
arousal in the cortex which is mediated by the reticular formation. The theory states that people in whom the arousal level is relatively low in the resting state will tend to behave in an extraverted fashion, whereas people in whom arousal level in the resting state is relatively high will behave in an introverted manner. He states that the main activity of the cortex is the inhibition of the lower centers so that the more aroused the cortex is the stronger the inhibitory function it plays (cf. Eysenck, 1982; Eysenck and Eysenck, M.W., 1985).

Regarding the causative side of the dimension of neuroticism Eysenck points out that it is an inherited psychological disposition closely linked with the autonomic nervous system which governs a person's emotional reactivity and may predispose him to the development of neurotic disorders under suitable circumstances (Eysenck, 1967; 1982; Eysenck and Eysenck, M.W., 1985).

According to Eysenck, a causal theory for psychoticism is rather more difficult to find. However, the fact that males invariably score much higher on P than females as a group; that criminals and psychopaths (with high p scores) tend to be male rather than female and that before menopause women fall prey to psychotic illness, particularly schizophrenia, less readily than males suggests that perhaps psychoticism is related to "maleness", i.e., to excretion of certain types of androgens. High p scorers, like psychotics show a lack of certain serotonin metabolites like SHIAA, and the presence of certain leucocyte antigens such as HLA-B27 (Eysenck, 1982).