

CHAPTER THREE

THE PRESENT STUDY, METHODOLOGICAL CONSIDERATIONS, POSTULATES AND DEFINITION OF TERMS

In the last decade educationists and researchers in India have also evinced interest in creativity. A large bulk of the published literature, however, deals with theoretical formulations. On the empirical side, the studies are all done by the R-technique. In terms of age-levels, most studies seem to be confined to children and adolescents. For example, M. K. Raina(1968) has studied cognition, personality and socio-economic correlates of creativity, involving 175 pupils of VIII, IX and X grades of Rajasthan as his subjects. The instruments used by him were the Hindi versions of the

EPPS, the Taylor's Manifest Anxiety Scale, the Jalota Test of Mental Ability, the Kuppuswami Socio-Economic Status Scale and the Minnesota Test of Creative Thinking. Raina has conducted a number of other studies, many of them related to the above one. Passi (1971) has conducted an exploratory correlational study of creativity as related to achievement and intelligence, involving students of the higher secondary stage of Punjab. The creativity instrument employed by him was the one constructed by himself. Paramesh (1969) has conducted a study having a wide coverage. His study was concerned with finding the relationship of creativity with extraversion, emotionality, body-image and values. Sarkar is pursuing a study of personality of creative and intelligent children at the Vishwa Bharati University, Shantiniketan. Many of the recently completed or ongoing research activities in creativity are knowledgeably either of the nature of test-construction or they are correlational studies using the R-technique.

Raychaudhuri has conducted a number of studies either alone or in collaboration with some others like Ganguly and Bhattacharya, and he has been the pioneer of creativity studies in India. His studies

commenced as early as in 1961 and his explorations have largely been in the area of personality structures of artists, notably musicians. Raychaudhuri and his collaborators alone seem to have been concerned with the study of creativity at the adult level.

This investigator also decided to conduct this study in the area of adult creativity. In order to keep it manageable enough, the study was chosen to concentrate upon certain personality dimensions of creative adults of India. For the fear that creative individuals might feel weary of taking long and rigorous tests which are generally employed in the R-methodology, the Q-technique was selected for obviating that difficulty.

Kerlinger (1964) has pointed out that "Q can be used to open up new areas, to test preliminary theories, to explore heuristic hunches The problem of creativity has been tackled up to now almost entirely with large N cross-sectional methods Complex areas, especially psychological areas where intensive study of the individual is required, do not always yield too readily to large N approaches. Q methods, adequately used, should be useful in laying some of the research foundations in these

areas".¹²⁸ Clearly, therefore, the approach has to be idiographic and not nomothetic.

Idiographic versus Nomothetic Approach

Underwood (1957) has indicated that there is no need for raising any controversy between the nomothetic approach and the idiographic approach. It is true that while the former relates to the process of discovering psychological relationships or phenomena by using groups of organisms, the latter approach is the process of determining many relationships in respect of one individual by means of intensive studies. In Underwood's words, "the idea is that we should discover the laws holding for the individual, not the laws holding for the group."¹²⁹ It has been pointed out that Ebbinghaus and Skinner have derived many generalizations in the areas of memory and learning respectively by means of idiographic analysis. Numerous examples can be cited to show how psychological phenomena have been studied with the help of both ^{the} approaches. Underwood emphasizes that there is actually no "issue other than the ever-present one in

128 Fred N. Kerlinger, Foundations of Behavioral Research. (New York: Holt, Rinehart and Winston, Inc., 1964), p. 597.

Note: Kerlinger has given herein the views of J. Guilford and F. Barron as indicated in his footnote.

129 B. J. Underwood, Psychological Research. (New York: Appleton-Century-Crofts, Inc., 1957), p. 88.

all kinds of research concerning the generalizability of results" ¹³⁰ in psychological studies. Underwood has mentioned : (i) the papers of Beck (1953) and Rosenzweig (1951) as "pro" idiograph papers, (ii) the paper of Seeman and Galanter (1952) as "anti" idiographic approach and (iii) the paper of du Mas (1955) as the "one which carefully analyzes what, each type of research can provide".

This investigation, or for that matter any investigation related to the area of "personality", would pose the problem of resolving the dilemma between idiographic versus nomothetic laws. McClelland (1963) observes that "one of the knottiest problems in the psychology of personality is the relationship between general laws ... laws which are established for groups of individuals, and their application to the individual person Most laws in psychology would seem to be nomothetic". ¹³¹

130 Ibid.

131 David C. McClelland, Personality, (New York: Holt, Rinehart and Winston, 1963), p.89.

However, Allport (1937) is a champion of idiographic laws and he emphatically puts it that the individuality of a person is observed or ignored in the search for nomothetic laws. Decrying the nomothetic approach Allport remarks :

The piling of law upon law does not in the slightest degree account for the pattern of individuality which each human being enfolds. The person who is a unique and never-repeated phenomenon evades the traditional scientific approach at every step. 132

McClelland, however, seeks to resolve the conflict by advancing the following proposal :

We need not conclude that we must have two different kinds of laws. We may need only to make an idiographic application of a nomothetic law or laws. 133

With respect to the roles of both idiographic and nomothetic approaches in the field of 'creativity research' Barron (1969) comments as follows :

Gordon Allport has accustomed us to think of the difficulties faced by personology as a whole by contrasting the idiographic and the nomothetic approaches to description: the former describes the individual in his unrepeatable, unexampled uniqueness, while the latter describes him relative to other human beings on hypothesized dimensions of personality.

132 Gordon W. Allport, Personality. (New York: Henry Holt and Company, 1937), pp. 4 and 5.

133 David C. McClelland, *op.cit.*, p. 90.

.... The fact is that this opposition is with us constantly in all our thinking and is indeed basic to the nature of perception and thought.

.....

The study of psychic creation ... requires an attention to both the idiographic and the nomothetic. 134

Testing for Creativity

As stated already in the introductory chapter, researchers have shown considerable interest in working in the area of creativity during the last two decades. A perusal of research literature, however, indicates that, by and large, researchers seem to have been concerned more with developing instruments for the identification and measurement of creativity in children as also with building testable generalizations and theories of what might constitute creativity. On close examination it appears pertinent that a comprehensive study of 'adult creativity' is indispensable, for the same might ultimately prove to be of immense value for all other kinds of studies in creativity. As a matter of fact exploration in the area of 'adult creativity' should be regarded as a basic study, capable of giving a lead in the right direction for further explorations

in the field of creativity in general. In other words, it could be said that one cannot conceivably hope to build an adequate foundation for exploration in the area of creativity, either of children or of adolescents, bypassing studies in the realm of 'adult creativity'. It is equally certain that any study of 'adult creativity' should involve an incisive study of the creative personalities who have established indisputable reputation in respect of their creative contribution in a given culture. In this context Stephenson (1953) reminds researchers in the following words :

It is helpful to keep our objectives clear: much that goes on in the name of the scientific study of personality has to do with the rather special exigencies of life, in a clinic, school, industry, or the armed forces. Sight has been lost of the wider interests in personality, such as are covered in biographies, novels, and the workaday world of religion, politics, acting, and the home. Who is there who is not interested, after all, in the personality of a queen Elizabeth, a Rita Hayworth, a MacArthur, a Nehru, a Gandhi, a De Gaulle, a Truman, or a Winston Churchill?¹³⁵

Stephenson has his own doubts about the capacity of an R-factorist or a learning theorist or a phenomenologist to explore the characteristics of such personalities in a worthwhile and penetrating way as the

135 W. Stephenson, The Study of Behavior: Q-Technique and Its Methodology. (Chicago: The University of Chicago Press, 1953), p. 288

biographers do. He emphasizes that, among other things, personality studies must be concerned with the characteristics of a concrete person and this, in turn, very much demands an idiographic approach. Agreeing with Allport (1937), Stephenson emphasizes the need for the studies of the uniqueness or the distinctive quality of such eminent personalities rather than merely compiling a list of all their numerous attributes. He says :

We now see clearly that this is not the same thing as an account of the vast assemblage of personal qualities that are such a person's capabilities, potentialities, and the like, for these have no better status than his bankbook, his motorcar, or his other worldly possessions. It is what he does with such possessions and dispositions, if anything, that might be of interest for a study of his personality. ¹³⁶

Pleading for taking up penetrating studies of such personalities, comparable to the incisiveness of psychoanalysis, Stephenson urges researchers to undertake studies "along lines of testable propositions and Q-methodology".¹³⁷ In Stephenson's scheme "much more can be learned about personality from a careful exploration of a few really interesting people, such

136 Ibid., pp. 288 and 289.

137 Ibid.

as a Kierkegaard, a Churchill, or an Einstein." 138 He holds the view that by no means the "theories of needs, drives, enduring egos, or the like are what the present occasion requires for the direct study of what it is that, in Cicero's words, raises the man above his peers." 139

Guilford (1971) also expresses a similar view with respect to testing for creativity. He points out that "creativity is an ambiguous word, but when it is used in the phrase 'testing for creativity' its meaning may be restricted to those qualities or traits of individuals that predispose them to produce novel ideas and novel effects." 140

In the last two decades researchers in the area of creativity have been progressing along various lines and, truly, many of them have attained a high standard of sophistication. For example, Guilford (1971) has pointed out that the age-old standard intelligence tests miss tapping those intellectual qualities which

138 Ibid., p. 290.

139 Ibid.

140 J.P. Guilford, "Creativity: Testing for Creativity", The Encyclopaedia of Education, (The Macmillan Company & The Free Press), Vol. II (1971), p. 557.

are intimately related to creativity. He has also identified such cognitive abilities as fluency, flexibility and elaboration which seem to characterize verbal creativity. Similarly, research in the area of non-verbal creativity from the psycho-physiological point of view has attained a high standard of sophistication. An instant example of this is the discovery of the dominance of hippocampal activity over the reticular one as an important, necessary and sufficient psycho-physiological characteristic to account for non-verbal creativity (See Anderson, infra p.117).

This investigator sees good reason to accept two broad categories or kinds of creativity, viz. (i) verbal and (ii) non-verbal, for the sake of convenience. However, it is beyond the capacity and scope of this investigator to pursue the study along the psycho-physiological lines. In this context, it may be of considerable significance to peruse the following remarks of Stephenson outlining a thesis of extreme mechanistic view such as the Soviet psychology :

A process of quantifiable kind may proceed upto a certain point, such as, for example, may concern chemical changes in a nerve. But a new "synthesis" is supposed to take over at that point, and a new quantitative principle results. What was chemical becomes electrical, with its own distinct quantitative laws. What was physical becomes physiological,

and what was physiological becomes mental. Each such qualitatively distinct system, as the Soviet psychologist would say, has its own laws, and the laws of phenomena at one level cannot be expressed in terms of laws at a lower level. Thus, reductionism of all science to physical operations is rejected.¹⁴¹ *

Stephenson (1953) has pointed out that, remarkably enough, American behaviourism is also returning to the same position which seeks to give adequate recognition to the self or the psyche. For these reasons this investigator is not inclined to concede a prior claim to the nomothetic approach in this investigation. Broad generalizations emerging out of the factor-analytic studies in this research would be indicated to point out such verifiable propositions as might indicate patterning of specific attributes within the two broad categories of creativity - verbal and non-verbal, or any sub-categories thereof as might be warranted. There would, therefore, be no attempt towards having any large-scale, normative sampling and exhaustive listing of all relevant and irrelevant attributes, capacities and potentialities of the creative persons studied.

141 W. Stephenson, op.cit., pp. 347 and 348.

* Note : An interesting discussion on reductionism is given in Underwood (1957).

The R-versus the Q- Technique

Guilford ¹⁴² (1936,1954) has indicated that if there is a matrix of scores showing columns for tests and rows for persons, the correlations in the R-technique would be between the columns whereas in the Q-technique they would be between the rows, or, in other words, between the persons. Guilford has recommended the use of the Q-technique as a matter of practical concern when the number of persons is small and the number of tests or variables is very large. In that case, inter-correlations between persons for the sake of identification of conspicuous combinations of common traits such as personality types or syndromes or common patterns of characteristics, is of special value, and he advocates the utility of the Q-technique for such a purpose. Travers (1958 and 1964) has pointed out that although Allport (1937) was the first to raise the necessity of discovering some method of studying the unique characteristics and orderliness of the behaviour of an individual in accordance with the idiographic laws, as against the nomothetic laws, he was not in a position to suggest a way out. Later, MacKinnon (1938)

142 J.P. Guilford, Psychometric Methods. (2nd ed: International Student Edition: Kogakusha Company Ltd., Tokyo, 1954) (McGraw Hill Book Company, Inc., 1936, 1954), pp. 529 and 530..

pushed this point raised by his teacher, Allport, further, but with little success. In 1953 William Stephenson published his book entitled "The Study of Behaviour: Q-Technique and Its Methodology" which adumbrated his methodological invention promising great utility for carrying out idiographic studies for testing psychological theories in such diverse areas as clinical, social, personality and self-psychology. Travers had indicated that Stephenson had proposed "to apply factor-analysis to the problem of categorizing individuals in groups of persons whose behaviour can be understood in terms of particular patterns of traits."¹⁴³ He calls this new technique "interesting and ingenious."¹⁴⁴

Comparing the R-, P- and Q-techniques Fruchter¹⁴⁵ (1954) has indicated that even though the R-technique which consists of "the correlation of a series of measures over a population of persons" is most frequently utilized in correlational studies, the other kinds of correlational techniques such as the P-technique

143 R.M.W. Travers, An Introduction to Educational Research (2nd ed.) (New York: The Macmillan Company, 1958 and 1964), pp. 46 and 47.

144 Ibid., p. 271.

145 Benjamin Fruchter, Introduction to Factor-Analysis, (New Delhi: Affiliated East-West Press Private Ltd., East-West Student Edition, 1967, Original 1954), pp. 176, 202-204.

(of Cattell) and the Q-technique (of Stephenson) could also be applied. He has pointed out that the " analysis of a matrix of Q-correlation coefficients has been variously referred to as inverted, inverse, or obverse factor analysis, since the roles of tests and persons are interchanged as compared with the more conventional R-technique." Fruchter has further pointed out that, as indicated by Cattell (1946 and 1952), there are six different ways of studying covariation in tests, persons and occasions and these six alternatives can be grouped in three pairs in such a way that each pair would consist of mutually trans-pose intercorrelational techniques (Fruchter, 1954). They are briefly outlined as below :

Pair I : O- and P- Techniques

(i) The O-technique: Comparatively a much less common technique in this pair, it consists of working out correlation of occasions for a series of tests for one individual. This technique is helpful in finding out whether different occasions or conditions systematically affect the performance of a person. As in the Q-technique (see below), this one also requires averaging over a series of tests. This technique is useful in identifying how the same individual behaves differently on different occasions.

(ii) The P-technique: Used first by Burt, Cattell and Rhymer (1947), this technique involves the correlation of a group of tests over a series of occasions administered to one person. It is helpful in determining whether any of the tests of a battery covary in time if its administration is repeated on the same individual. Likewise, it is useful in confirming the findings reached by the R-technique. This technique is useful in personality studies where dynamic variables, such as the personality traits, which fluctuate over time are involved.

Pair II : Q-and R-Techniques

(i) The Q-technique : This technique indicates how a sample of persons covary over a series of 'tests' administered under the same conditions of instruction. In this case, however, the term 'test' would mean differently as indicated by Stephenson (1953). The type of measurement utilized in this technique is called ipsative (i.e. relative to the self) as contrasted with normative(i.e. relative to the group). Rank scores are ipsative measures. No matter who ranks a set of K objects, the means and standard deviations must always be the same" (R.Cattell, "Psychological Measurement : Normative, Ipsative, Interactive," Psychological Review LI (1944), 292-303).

" Q is unique ... in systematically using a procedure that sacrifices level and scatter. All individuals have the same general mean and the same general standard deviation. When sets of scores have these two characteristics they are called ipsative scores, in contrast to normative scores which are the usual scores derived from tests and scales." 146 The characteristics and properties of this technique will be discussed in greater detail later on in this chapter.

(ii) The R-technique : It is the most commonly used technique of working out correlation of tests administered to a sample of persons on a single occasion or under the same condition. Fruchter (1954) believes that the transpose of this technique is the Q-technique, Stephenson (1953), however, holds a different view.

Pair III : S-and T-Techniques

(i) The S-technique : According to Fruchter the " S- technique consists of determining the extent to which two or more individuals vary together over a series of occasions or trials on one task Traits which vary in the individual on different trials or occasions, as in learning studies or in different social situations would be most appropriate for this type of analysis also ".

(ii) The T-technique : Again, according to Fruchter, this technique is the transpose of the S-technique and it may be useful in determining the "occasion" factors which covary over a number of persons on one test such as in the test-retest (reliability) situation. This technique may be helpful in identifying situational factors that affect performance on a test on repetition.

However, Eysenck (1970, p. 398, footnote) has pointed out that the nomenclature has become extremely confusing because of the same letter being used for quite different procedures by different writers. "It is credible", writes Varma (1965), "that a hypothetical factor among several persons may be found and may represent a sort of personality that is central to the persons correlated. Q-technique is of interest to psychologists in the field of personality and clinical work..."¹⁴⁷ Similarly, describing the Q-sort of the Q-technique as a kind of relative ranking technique, Helmstadter (1966) writes eloquently about the utility of this technique and its promising future in the computer age in the following words :

When properly carried out, the Q-sort would seem to be one of the best approaches devised

147 Manmohan Varma, An Introduction to Educational and Psychological Research. (Bombay: Asia Publishing House, 1965), p. 124.

to obtain a comprehensive description of one individual. Because this technique does require considerable effort in the original scale preparation as well as raters who will give careful consideration to a long list of behaviours for each person to be rated, the Q-sort has not yet received the popularity it deserves. However, with modern computers, a Q-sort deck can be "distilled" in such a way that a great deal can now be accomplished with a relatively small number of items. Thus, it is possible that the Q-sort will become one of the most widely used ways of rating persons in school or on the job, as well as in research situations... 148

Describing briefly the basic style of the Q-technique Phillips (1971) observes that the " Q-technique is subject to the same kinds of assumptions or theory as (the) traditional factor analysis."149 He further points out that despite some controversy over its status, Stephenson, who is the originator of the Q-technique, holds the view that the traditional factor analysis and the Q-technique differ in important ways " in psychological, logical, and methodological principles."150 Even though Stephenson himself has meticulously shown the differences between the Q-sort and the Q-technique in his book, The Study of Behavior:

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- 148 G.C.Helmstadter, Principles of Psychological Measurement. (London:Methuen & Co.Ltd.,1966),p.190.
- 149 Bernard S. Phillips, Social Research:Strategy and Tactics,(2nd ed.) (New York: The Macmillan Company, 1971), p. 213.
- 150 Ibid., p. 214.

Q-Technique and Its Methodology, Fox¹⁵¹(1969) uses these terms interchangeably and highlights the advantages of the Q-sort as a sophisticated ranking procedure, useful in educational research for "ordering concepts". Towards the concluding part of her stimulating article entitled "Toward a Workable Psychology of Individuality", Leona E. Taylor¹⁵²(1959) describes the Q-sort method as "perhaps the best known" of the new methods developed by psychologists in the recent years for the assessment of the unique ways "individuals organize their experiences", which, she feels, is that something which describes the uniqueness of each individual personality.

Thus, many authorities have written in favour of the Q-technique and its methodology invented by

151 David J. Fox, The Research Process in Education, (New York: Holt, Rinehart and Winston, Inc., 1969), pp. 602-605.

152 Note: This is reflected in her article appearing in M.T. Mednick and S.A. Mednick (eds.), Research in Personality, (New York: Holt, Rinehart and Winston, Inc. 1963), pp. 22-31, reprinted from the American Psychologist, Vol. 14, 1959.

Stephenson,¹⁵³ and it is also found that many studies have been conducted and are still being conducted along those lines. It may be pertinent to see what actually motivated Stephenson to invent the new technique at a time when the normative method, i.e. the R-technique very much ruled the day in behavioural research. In 1935 he wrote an article under the caption "Correlating Persons instead of Tests" in which he advocated the need for a better methodology than the factor analytic technique which might be more flexible and suitable for conducting studies in the complex area of human behaviour. He quotes his own words as follows:

Large populations of persons, however, are required in experiments that are made on these factors... and as a consequence the quality of the testing suffers. The size of

153 Note: Godfrey Thomson (1960) has given the following footnote to his chapter entitled 'Reversing the Roles' in his book The Factorial Analysis of Human Ability (5th ed., p. 249) :

* The first explicit reference to correlations between persons in connexion with factor technique seem to have been made independently and almost simultaneously by Thomson (1935, July) and Stephenson (1935, August).... But such correlations had actually been used much earlier by Burt and by Thomson, and almost certainly by others. See Burt and Davies, 'Journ. Exper. Pedag.', 1912, 1, 251".

This fact has been mentioned by Stephenson (1953, p.8) also.

the population sets a limit on the tests that can be applied Experimental work is slowed down, almost to the point of being burdensome. A research student may spend two years isolating a single factor. All one's controls and hypotheses have to be sandwiched into the one experiment, to be performed on one and the same group of persons. One cannot perform an experiment today and use its results for another tomorrow.... In short, the present-day technique lacks the pliability that the energetic experimentalist wants at his command. It is a device for massive field work and not... for rapid and subtle experimentation.¹⁵⁴

Not many studies appear to have been conducted in India with the help of the Q-technique. Some work has, however, been done in the University of Mysore utilizing this methodology as mentioned in the Directory of Indian Behavioural Science Research compiled and edited by Pareek. Fuster in Bombay and Pratibha Deo in Chandigarh have used this technique in the sixties. In the Centre of Advanced Studies in Education at Baroda no study seems to have been submitted thus far utilizing this technique. It, therefore, seems necessary to give here the important characteristics and properties of this technique, comparing, wherever necessary, with the R-technique. While furnishing below the basic tenets of the technique, this investigator has frequently consulted the source book The Study of Behaviour (1953) written by Stephenson who is the originator of the

154 W. Stephenson, op.cit., pp.8 and 9. The article had appeared in "Character and Personality", Vol. IV, Sept., 1935.

Q-technique and its methodology.

The Chief Characteristics and Properties
of the Q-Methodology

It is well known that the basic postulate of the R-technique is the individual difference, and all generalizing and theorizing in respect of behaviour must depend upon that basic assumption. The operations of the R-technique require the studies to be conducted on a large number of cases or individuals so that the conclusions arrived at by the utilization of factor analysis might be held to be safely generalizable in respect of the universe from which the sample is drawn. The measurement strategy in the R-technique requires quantification and definition of the norms of the attributes which concern the investigator. Again, in the name of scientific inquiry a heavy premium is placed upon what might be called objectivity, and this necessitates observation of the behaviour in term of overt, rather than covert (or subjective) reactions which characterize the attributes under study. It disregards the internal self of the individual on the ground that the inner experience, being not available for scientific study, is specific to the individual, incapable of yielding any generalizable -

scientific theory. Such scientific theorizing depends upon numerous tests and scales under the assumption that every individual possesses the psychological attributes of some measure which would readily be identifiable by means of the traditional factor-analytic technique. The factors extracted by this procedure derive their scientific sanction on the ground of "communality" observable amongst a number of tests, and again, on this basis their invariance is inferred.

Decrying the aforesaid procedure Stephenson holds that this tendency has unnecessarily plagued investigations in the name of scientific inquiry. He holds that it would be a lop-sided assumption to conceptualize human behaviour merely in terms of what might be overt, observable (to others) response; on the contrary, the term "behaviour" should be inclusive of the inner experiences of the individual also, for they constitute as much of his total self as the so-called external "objective" behaviour. Joining issues with introspective psychology, the Q-methodology does not distinguish between "what is subjective, such as thinking, and what is observable to others, such as playing golf." Stephenson asserts the thesis that for

scientific purposes, "dreaming is as much behaviour as is jumping a stile or dashing a hundred yards. All is a matter of interacting with this or that situation. Inner experience and behaviour are thus alike. Both are matters for objective, operational, definition and study."¹⁵⁵ The "reductionism" or the "elementalism" which conceives "man as a mass of characteristics" is unacceptable to both Ward (1933)¹⁵⁶ and Stephenson.

It is realized that in the R-technique factors or their combinations are concerned with "communality" only whereas in the Q-technique that part, which is regarded in the R-technique as "specificity" ~~which~~ and discarded, is of utmost concern. It is, however, recognized even by the R-factorists that it is perhaps this "specificity" which accounts for the uniqueness of a person's personality. Stephenson (1953) holds that "it is theoretically possible for a person to be so unique that no other person can be found to correlate with him; in this case all the variance will be specificity."¹⁵⁷

155 Ibid., p. 4

156 J. Ward, Psychological Principles. (Cambridge: University Press, 1933), quoted in ibid., p. 12.

157 W. Stephenson, op.cit., p. 284.

The "Modus Operandi"

Essentially, Q-methodology requires ranking of the forced-choice type using either statements or objects instead of tests.

In respect of the size of the sample in Q-Methodology Wittenborn (1961) has commented as follows:

Goodling and Guthrie (1956) point out that the sample of items for Q-sort should be selected in such a way as to provide maximum intersubject variability and minimum intra-subject variability. The question of intra-subject variability is one aspect of reliability question, and this has been directly attacked by some investigations.¹⁵⁸

In the above context Wittenborn has cited the study conducted by Hilden (1958) in which correlations for 20 random sets of 50 statements each drawn from a universe of 1,575 statements were compared with the correlations for the parent population. In that study¹⁵⁸ "no reliable differences were found". It has been commented by the reviewer that "from this one might infer that when using items such as these, a sample of 50 statements may be sufficient for Q-sort purposes"¹⁵⁹.

The ranking of a sample of 70-150 items is

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- 158 J.R.Wittenborn, 'Contributions and Current Status of Q-Methodology', Psychological Bulletin, Vol. 58 (No.2, 1961) p. 140.
- 159 Ibid.

recommended. The operation consists of having such a sample of items (say, statements) from a larger pool. Those statements would then be printed separately in as many cards of size 2" x 4" or 3" x 5". These statements might be grouped together in separate sets under separate conditions of instructions. Since in the Q-technique "significant factors" or "effects" are anticipated, the distribution, though expected to be symmetrical, is not expected to be a normal probability curve. The practice is to obtain a somewhat platykurtic distribution (Stephenson, 1953, p.59). For this reason, the statements are required to be ranked into 10 or more categories. The subject (or operator) is allowed to inspect all the items of each set first and to form a "general impression" about the statements. Then he puts each card into its "appropriate" stack or rank according to his own best judgment. The piles obtained thereupon are known as the Q-sort.

Q-sorts have been attempted by investigators in both free and forced choice styles. On the issue of free Vs forced choice Q-sorts Wittenborn has cited some studies and finally concluded as follows :

The issue of forced vs unforced sorts has been discussed in numerous contexts, and no final agreement seems to have been reached. For example, Jones (1956) points out that there

is no one preferred distribution, and Block (1956) believes, on the basis of his comparisons, that the forced sort method is equal or superior to free sorts. 160

Stephenson has pointed out that the Q-Methodology is essentially "postulatory-dependency methodology rather than hypothetico-deductive". The Q-technique utilizes the Fisher's methodology for variance analysis and structuring of the samples of items, and the centroid method of factor analysis is considered suitable for testing prepositions in this technique.

The originator of the technique has pointed out that its use is not merely restricted to test a theory relating to one single individual or operator; he claims that "this applies no less if we employ a few persons X, Y, Z, ..., for the purpose of defining psychological types. Factors for a few persons, like those of a single one, may have considerable invariance attributable to them." 161 For this reason this investigator has chosen this technique for exploring whether there are certain common psychological attributes of creative persons. So far this investigator has not

160 Ibid.

161 W. Stephenson, op.cit., p. 6.

come across any study of creativity undertaken in India in the area of adult creativity using the Q-technique.* Thus far, no study whatsoever utilizing this methodology has been undertaken in the Centre of Advanced Study in Education, Baroda. Hence the curiosity.

In order to clarify the statistical status of the Q-technique, it might, perhaps, be considered pertinent to reproduce here the chart and the table given at pages 58 and 32 of Stephenson's book The Study of Behaviour.

The Table :

<u>R-Technique Postulates</u>	:	<u>Q-Technique Postulates</u>
1. The <u>populations</u> are groups of persons.		1. The <u>populations</u> are groups of statements or the like.
2. Each <u>variate</u> has reference to an attribute or characteristic of all such persons.		2. Each <u>variate</u> has reference to an operation of a single person upon all the statements in one interactional setting.
3. These variates do not interact-operations are according to the rule of the <u>single variable</u>		3. The variates may interact in the one interactional setting.

* Note: The Directory of Behavioural Sciences Research in India (1925-65) mentions two studies employing Q-method. A study of self-concept of teachers (Pratibha Deo and B.S.Hunda, 1967) using the Q-technique has also come to the notice of this investigator. None of them is related to creativity.

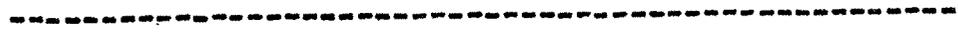
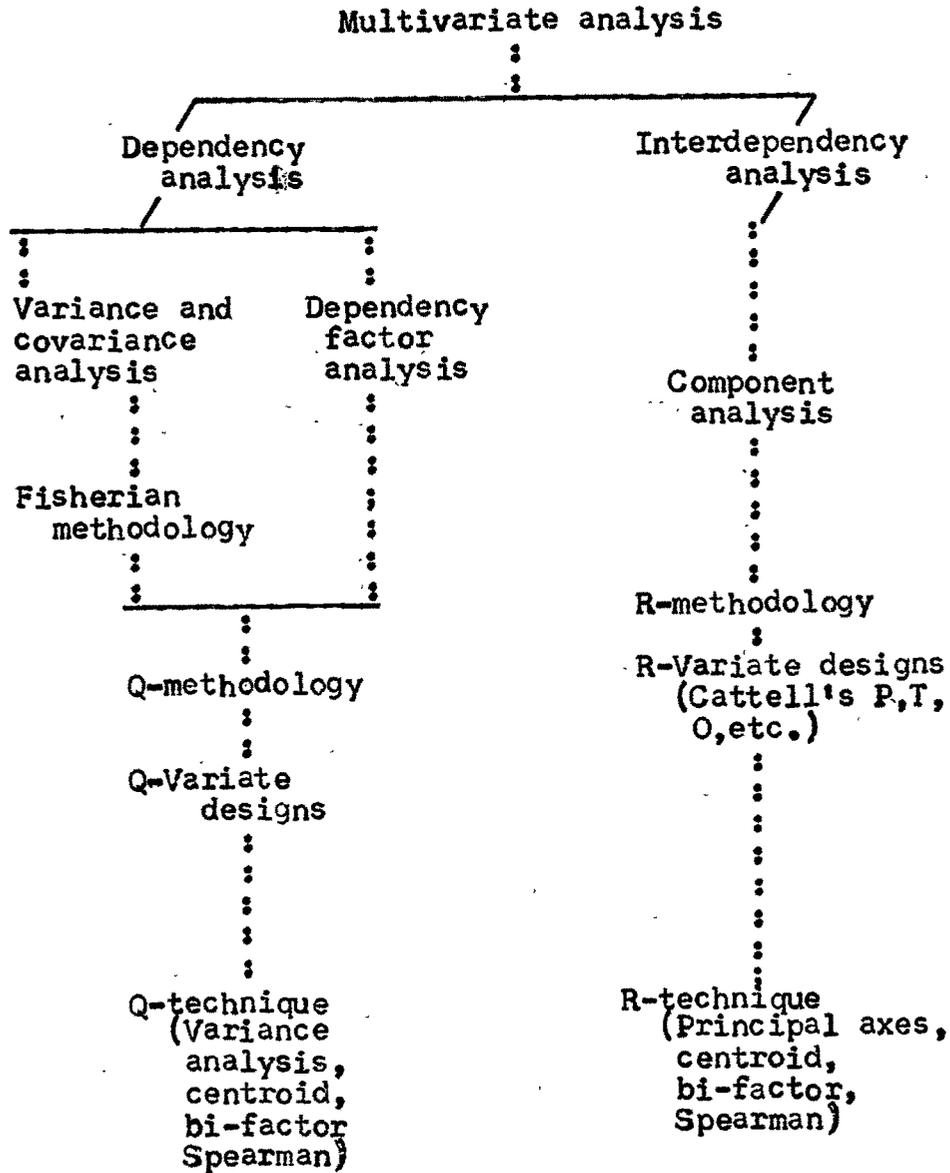
R-Technique Postulates

4. The transitory postulate (namely, if $x \rightarrow y$, $y \rightarrow z$, then $x \rightarrow z$) proceeds in terms of individual differences.
5. Scores are reduced to standard scores with respect to each variable, for the sample of persons concerned.
6. These scores are approximately normally distributed with respect to the sample of persons.
7. All the important information for each array is contained in its variation (no information is lost in throwing away the variate means).
8. The concern is with interdependency analysis.

Q-Technique Postulates

4. The transitory postulate has reference to intra-individual differences (such as "significance").
5. Scores are reduced to standard scores with respect to each person-array.
6. Scores are approximately normally distributed with respect to the person-array.
7. All the important information for each array is contained in its variation (no information is lost in throwing away the variate means).
8. The statements of a sample may interact.
9. The concern is with dependency analysis.

The Chart



Writing about the utility of factorial methods in personality research Guilford (1954) has pointed out that " the methods could also be fruitfully used to discover underlying dimensions of temperament,

interest, and attitudes - in fact, dimensions underlying any aspect of personality, including morphological and physiological traits. The extension of factorial methods to variations known as the Q-technique and the P-technique has offered promising tools for the understanding of personality structure in individuals." 162

Eysenck (1960) has expressed certain doubts about the claims made by Stephenson with regard to the special advantages of the Q-technique. He writes:

In summarizing Stephenson's contribution, we must note that all the studies reported by him are merely illustrative, and that until a large scale, properly planned and executed experiment is reported, it must be very difficult to assess his claims objectively. In the studies reported, however, there are certain features, both in the experimental design and the statistical treatment, which throw very great doubt on the results.¹⁶³

After discussing at some length the relative merits of the R-technique (or the T-Technique) and the Q-technique (or the P-technique) in the same

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- 162 J.P.Guilford in Foreword to Benjamin Fruchter, Introduction to Factor Analysis. (Princeton: D.Van Nostrand Company, Inc., 1954), pp.vii and viii.
- 163 H.J.Eysenck, "The Analysis of Correlations between Persons" in The Structure of Human Personality (London : Methuen & Co., Ltd., 1960, 2nd Ed.), p. 404.

chapter, Eysenck concludes as follows :

We may say, therefore, that if the process of correlating persons has any major and novel significance in the field of personality study, it must lie in the fact that it gives rise to factors which could not have been discovered in any other way, i.e. general factors describing overall similarities between people's reactions.¹⁶⁴

On a perusal of the Sixth Mental Measurement Yearbook reviews it appears evident that Edwards (1965), Lykken (1965) and Exner Jr. (1963) have written eloquently about the contribution of Jack Block for constructing the California Q-set used in the Berkeley studies on creativity. These authorities have generally favoured the Q-technique as a research device. While Allen Edwards' comments are rather specific in nature about the CQ-set, Lykken's observations contain a good deal of discussion relating to the properties and merits of the Q-technique in general also. For example, he makes the following comment while dealing with the nomothetic-ideographic issue in the following words :

One line of argument can be adumbrated by noting that if individuality is in part a result of (learned) structural uniqueness,

as evidenced by idiosyncratic behaviour patterning (i.e. unique traits) or idiosyncratic systems of S-R relationships, then - to the extent that the behaviours one wants to predict are mediated by such unique aspects of structure - to that extent will any nomothetic assessment be found wanting. One means of answering this essentially empirical question is, of course, by exploring the limits of the nomothetic approach with the most sophisticated techniques available, among which the Q-set method has to be included." 165

Commenting upon the capacity of the CQ-set to "encapsulate the essence" of the subject in the set of mere 100 items, Lykken has argued strongly in favour of the Q-sort items and their validity in general in the following words :

An important point to keep in mind here is that a descriptive dimension, property, or trait need not be the explicit subject of a specific Q-item in order for it to be expresseable via the Q-sort as a whole; many attributes can be communicated by means of the configuration of pairs or groups of item placements Perhaps one should continue the analogy drawn earlier between the global, nomothetic personality description attempted by the Q-sort and the similarly global representation commonly read into protocols of personality tests like the MMPI. Modern psychometric practice considers responses to questionnaire items to be bits of behaviour, the meaning of which devolves from the empirical item correlations. It is considered naive to

165 David T. Lykken, (as reviewer of the California Q-set), in Oscar Krisen Buros (ed.), Personality Tests and Reviews, (New Jersey: The Gryphon Press, 1970) 6:72, p. 978.

criticize (or to interpret) an MMPI item on the basis of its content. It may be that a similar attitude should govern one's evaluation of a Q-set. Clearly, in both cases, every resource of logic, theory, prior experience, and clinical intuition should be utilized in generating the original item pool and formulating the rules of procedure in the "context of discovery" phase of test or Q-set construction. But the ultimate evaluation of the end product must hang upon an empirical assessment of the instrument's properties and capacities. 166

Similarly, Exner Jr. (1963), has, in his review of Block's manual of the CQ-set, candidly pointed out that " several of the frequently voiced criticisms of the Q-sort technique are dealt with in adequate depth and sufficient clarity to have even the most negativistic reader somewhat impressed." 167

Turning back to Guilford once again we repeat the following comment :

The extension of factorial methods to variations known as the Q-technique and the P-Technique has offered promising tools for the understanding of personality structure in individuals. This has appealed to some clinical psychologists who seek a more rigorous way of approaching general principles of personality which keep close to the study of individuals. 168

166 Ibid., pp. 978 and 979.

167 John E. Exner, Jr. quoted in *ibid.*, p. 979.

168 J.P. Guilford in B. Fruchter, Introduction to Factor Analysis, op.cit., Foreword, p. viii.

Guilford claims that " the (factorial)
methods could also be fruitfully used to discover...
dimensions underlying any aspect of personality..."¹⁶⁹

These views, based on critical examinations,
seem sufficient to dispel the doubts raised by Eysenck.
It is evident that consensus of experts has generally
tilted in favour of the Q-technique as a useful research
device.

In the concluding remarks of his article entitled
" Contributions and Current Status of Q-methodology"
Wittenborn (1961) has emphasized the novel aspect of
Q-Methodology, particularly for the psychometrical and
psychoanalytical studies. He has further pointed out
the indications that " this methodological emphasis can
contribute to a broad study of personality and numerous
related social problems".¹⁷⁰ He has ended his article
with the remark that " the growing acceptance of this
methodological emphasis again reminds us that
psychologists require flexible methods for their
researches and will not wait for any orthodoxy".¹⁷¹

169 Ibid., pp. vii and viii.

170 J. R. Wittenborn, op.cit., p. 141.

171 Ibid.

Thus, many authorities have advocated the utility of the Q-technique in personality studies. It has also been suggested that this technique is eminently suitable for studying the creative personalities. Therefore, with a view to pursuing idiographic studies and verifying certain postulates relating to creativity it was decided to adopt the Q-technique and its methodology for the present investigation. It is also hoped that this study might give a lead to similar studies to be undertaken in India with the help of the Q-technique which has hardly been employed thus far in the field of creativity research in this country.

Summarizing, it can be said that the Q-technique was selected for this investigation for the following reasons, viz.

- i) Its forced-choice characteristic was considered suitable for administration of the Q to the sample of creative persons who are to act as their own judges in respect of the chosen statements.
- ii) Eminent authorities such as Guilford (1954), Stephenson (1953) and Kerlinger (1964) have recommended the Q as a very suitable tool for exploration in the area of intensive personality studies, particularly creativity studies.

- iii) No such studies employing the Q-technique have as yet been carried out in India in the field of creativity in general and 'adult creativity' in particular. It is believed that this investigation might contribute to theory - building and test-construction even in respect of adolescents' and children's creativity which, in turn, might have their own educational implications.
- iv) It is an interesting technique for both the investigator and the operators (testees).
- v) It is not very time-consuming and, therefore, manageable with the creative persons who might find it difficult to spare longer time to take too laborious and lengthy tests.
- vi) The administration of the Q-tests does not require too very rigorous and ritualistic controls. It is relatively facile.

The Theory and the Postulates

It has been said earlier (see para 2, p. 173, supra) that the Q-methodology is essentially a postulatory-dependency technique, rather than hypothetico-deductive. It was, therefore, considered essential to state an a priori theory of creativity. This would then

facilitate formulation of postulates around that theory.

With regard to the building of a theory vis-a-vis the construction of an operational definition of creativity, this investigator assumes that, like intelligence, the concept of creativity is also relative and embedded in a culture. It, however, does not mean that an act which is regarded as creative in a particular culture might not be accepted to be creative in another. It is construed that it depends, and the chances are both ways. The second thing is that creativity of a culture can be judged by its manifest products only because, with the present state of our knowledge, it may not be possible or convenient to seek evidences of creativity in covert behaviour. The third thing that this investigator believes is that in view of the accepted position that creativity, like intelligence is developmental in nature, it is plausible to consider first what constitutes 'adult creativity'. It is from such consideration alone that a workable concept of children's creativity or of adolescents' creativity could be hypothesized which might be helpful in the construction of appropriate tests or tools for the measurement of creativity of the youngsters.

The foregoing paragraph reflects the bias which this investigator has in respect of theory. Kerlinger

(1964) is being quoted below to justify the position that any investigator often has to start with some bias in respect of his theory :

The scientifically unformed person often has the idea that the scientist is a highly objective individual who gathers data without preconceived ideas. Poincare long ago pointed out how wrong this idea is. He said: " It is often said that experiments should be made without preconceived ideas. That is impossible. Not only would it make every experiment fruitless, but even if we wished to do so, it could not be done." 172

In view of the foregoing considerations the following operational definition of creativity was formulated for the purposes of the present investigation:

Creativity may be defined as the manifestation of uncommon talent in terms of novel and original products (whether ideas or effects) commending high professional estimate of their worth.

So far as the process is concerned, it is assumed that that should be regarded inferential. Because of its complexity, it is perhaps neither feasible nor convenient to make a precise judgement, even by experts, in respect of a creative process and to predict equally efficiently that it might ultimately

lead to a creative product. Operationally speaking, all the several acts which are potentially creative and are involved in producing a creative product are difficult to identify and parcel out. It was, therefore, regarded convenient to place reliance upon unusual products, whether ideas or effects, as evidences of creativity. This definition would not change from culture to culture, nor would it be found necessary to alter it if, instead of considering adults' creativity, one is interested in considering children's creativity or adolescents' creativity.

At this stage, it seems desirable to consider how the foregoing operational definition was constructed. The discussion of the same is, therefore, given below :

- i) Raychaudhuri (1965) has pointed out that "traditionally creative activity has been viewed as the manifestation of some inherent capacity/ability of the individual. The manifestation generally takes the form of novel, original and unique artistic or scientific-logical work." (see p. 30, supra).

Similarly," Guilford approaches the problem of defining creativity as a product of a personality behavior :

' Creative personality is then a matter of those patterns or traits that are characteristic of creative persons. A creative pattern is manifest in creative behaviour patterns, which includes such activities as inventing, designing, contriving, composing, and planning. People who exhibit these types of behaviour to a marked degree are recognized as being creative'. 173

Thus, both Guilford and Raychaudhuri consider creativity to be some kind of behavioural manifestation.

ii) Writing on the 'Theories of Problem Solving', Bourne, Ekstrand and Dominowski (1971) have pointed out that "Mednick defines creative behavior as behavior that is uncommon and relevant, which is virtually identical to Maltzman's definition of original behavior. For Mednick, original behavior is simply uncommon, while Maltzman views creative

173 J.P. Guilford, "Creativity", American Psychologist, V (1950), 444, quoted in microfiche No. ED 024181 of U.S. Dept. of Health, Education & Welfare (Ypsilanti, Michigan, Eastern Michigan University, 1968), paper of S.C. Zambito, "A Comparison of Groups Vs. Individual Production of Non-verbal Creativity".

behavior as uncommon, relevant and valued by society." 174

Thus, both Mednick and Maltzman consider creative behaviour as uncommon behaviour.

iii) The term talent has been defined as "unusual ability, especially in one of the fields of creative arts." (Philip L. Harriman's Handbook of Psychological Terms).

"Talent is covert; only when expressed it may become creativity". (Rollin May in Harold Anderson, 1959, p. 60).

iv) Guilford (1971) writes that "creativity is an ambiguous word, but when it is used in the phrase 'testing for creativity' its meaning may be restricted to those qualities or traits of individuals that predispose them to produce novel ideas and novel effects". (The Encyclopaedia of Education, Vol.2,1971).

174 Lyle E. Bourne, Jr., Bruce R. Ekstrand and Roger L. Dominowski, The Psychology of Thinking. (Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1971), p. 72.

Similarly, Stein (Taylor, 1964, p. 6) regards a process to be creative "when it results in a novel work that is accepted as tenable or useful or satisfying by a group at some point in time".

Thus, for operational purposes, it seems proper to seek evidences of creativity in the products which may be either novel ideas or novel effects.

- v) In his paper 'A Theory of Non-verbal Creativity' Anderson (1968) writes :
- " Originality is usually defined as some measure of the Statistical uncommonness of responses, while creativity refers to a high professional estimate of the worth of these responses (Maltzman, 1960)." 175

This justifies the use of the phrase 'high professional estimate of the worth' in respect of creative products in the operational definition of creativity that has been chosen by this investigator. (Underline mine from (i) to (v)).

175 Charles C. Anderson in Microfiche No. ED 025814:
'A Theory of Non-verbal Creativity', op.cit.

Postulates

1. Every creative field has its own characteristic dimension-pattern.
2. In general, creative persons are introverts.
3. Specifically speaking, the creative persons
 - i) are curious to know new things ;
 - ii) are more feeling and intuitive type ;
 - iii) are aesthetic in taste ;
 - iv) believe in supernatural powers ;
 - v) have feeling of superiority ;
 - vi) have mysterious experiences ;
 - vii) are irritable.
4. Creative persons of the verbal category are distinguishable from those of the non-verbal category in respect of patterns of personality characteristics.
5. Creative persons of the verbal category have similar personality patterns among themselves.
6. Creative persons of the non-verbal category have similar personality patterns among themselves.

Idiographic and Nomothetic Laws :

According to the classification of Wilhelm Windelband (1904) the term idiographic pertains to laws which are particular to the individual case, while nomothetic formulations are laws of general validity.

(After Windelband Wilhelm. Geschichte und Naturwissenschaft, 3rd ed., Strassburg : J.H. Ed. Heitz, 1904 as quoted in Heinz L. Ansbacher and Rowena R. Ansbacher (eds.), The Individual Psychology of Alfred Adler, (New York: Basic Books, Inc., 1956), p. 10.

Déjà vu :

Deja vu is a term ascribed to the feeling of having had the same experience once before, or of having once been in the same place before, which usually occurs in times of stress, fatigue or physical illness. This phenomenon, Freud noted, "corresponds to the recollection of an unconscious fantasy."

(After Ludwig Eidelberg, (ed. in-chief), Encyclopaedia of Psychoanalysis, (New York: The Free Press, 1968).

Jamais vu :

Opposite to déjà vu experience, it is ascribed to the feeling of unfamiliarity for familiar things or experiences.

Insomnia :

Insomnia is a symptom neurosis, the prolonged inability to obtain sleep. (Encyclopedia of Psycho-analysis, 1968).

Hallucinations:

Hallucinations are sensations or perceptions attributed to the sense organs which are erroneously experienced as if they were caused by external objects

Freud recognized that hallucinations, as with all mental events, have a meaningful emotional content. They represent archaic ideas and memories which emerge from the unconscious and are transformed into visual, auditory, gustatory, tactile, or olfactory sensations. (Encyclopaedia of Psychoanalysis, 1968).

Creativity :

The operational definition constructed by this investigator for purposes of nomination of highly creative persons by experts in the respective areas is as follows :

Creativity may be defined as the manifestation of uncommon talent in terms of novel and original products (whether ideas or effects) commanding high professional estimate of their worth.

Adult :

For the purposes of this investigation the term 'adult' would mean any person above the age 20.

Hallucinogenic drugs (Also called Hallucinogens):

Certain ingredients, whether naturally occurring or synthetically produced, when ingested, have the property of inducing an altered state of consciousness. Examples of such drugs are the peyote cactus, psilocybin, LSD-25, mescaline and scopolamine (a mixture of glucose and chlorine).

Somnambulism :

Walking, and carrying out other complex activities while asleep. (Drever's ' A Dictionary of Psychology, revised ed., 1964).

Psychedelic State:

Psychedelic state is a state of heightened emotion and suspended consciousness -- a sort of quasi-mystical state of the mind such as might be produced by ingestion of hallucinogens or by prolonged rhythmic shouting, singing, drum-beating or dancing.

Synesthesia :

Synesthesia is the phenomenon "in which patterns of association usually confined to a single sense modality may cross over to others: music is 'heard' as coloured light, for example.(Barron, 1969, p. 151).

Incubation:

Incubation is the second stage of creative thinking according to Wallas. It is comparable to the latency period (of Freud)- a period of overtly inert but covertly that of (internal) maturation.(cf. " arrest reaction due to hippocampal activation in C. Anderson, Chap.II,

p. 119, supra). Similar to Thurstone's (1952) non-verbal, prefocal thinking stage (Also Hutchinson, 1949).

Mood:

Mood is a generic term denoting general feeling tone which is a resultant of the specific feeling tones associated with the specific motivational systems operating at any one time. (Bonsfield, W.A. (1950) quoted in B.J. Underwood, Psychological Research (New York: Appleton Century-Crofts, Inc., 1957), p. 55.

Androgyny:

Androgyny is the tendency of the body, esp. of the male, to approach in form that of the opposite sex. (Warren's Dictionary of Psychology, 1934).

Gynandry:

Tendency of the female body to approach in form that of the male. (Warren's Dictionary of Psychology, 1934).

Hebephrenia:

Hebephrenia is a type of psychosis, usually classified as a subgroup of schizophrenia, characterized by childish behaviour and mannerisms, and shallow, inappropriate, silly, labile, and unpredictable emotions. Delusions and hallucinations also may be present. (Encyclopedia of Psychoanalysis, 1968).

Dimension:

The desire for scales analogous to those for size, temperature, and reaction time led

psychologists to postulate that personality has dimensions or traits. A trait is a tendency to react in a defined way in response to a defined class of stimuli...; nearly all the adjectives which apply to people are descriptive of traits: happy, conventional, stubborn, and so on. Traits are elusive in scientific analysis, however, and are defined and measured only at the risk of some ambiguity.

.....

A trait is a composite of many specific behaviours. (Lee J. Cronbach, Essentials of Psychological Testing, (2nd ed.) (Jointly published by Harper & Row, New York and John Weatherhill, Inc., Tokyo, 1964), pp. 499 and 500).

Operator:

The subject or the testee who 'operates' the Q-sort; the person being tested by the Q-technique.

Serendipity:

Serendipity is the phenomenon of making of discoveries by "accident". This refers to chance discovery as of Columbus or Pasteur. The term "serendipity" was originally proposed by Horace Walpole (Stein and Heinze, 1960, pp. 14 and 76).

Synectics :

Devised by William J.J. Gordon for industrial inventors, it is a method of group thinking in which five to seven members drawn from various diverse disciplines participate in a number of sessions. One of them may be chosen

to act as a director or coordinator. The participants are selected to represent different backgrounds in terms of knowledge, experience and interest. This method might be useful in reaching unique, highly creative solutions to problems. Industries could possibly benefit from this method.

The word "synectics" means "the joining together of different and apparently irrelevant elements". (Tripathi, 1969; Barron, 1969). Synectics in operation depends heavily on two mechanisms: making the familiar strange, and making the strange familiar (cf. Deja vu and Jamais vu experiences).

Reticular formation:

The reticular formation consists of a diffuse collection of cells and fibers in the central core of the brain stem (Butter, 1969, p. 121).

The medulla contains afferent and efferent tracts as well as collection of cells. Many of these cells form nuclei from which cranial nerves emerge. Many of the nuclei are embedded in a large, diffuse mass of cells and interlacing fibers called the reticular formation. This structure receives its name from the many short fibres which form a dense network or reticulum. The reticular formation, which extends throughout the brain stem, is involved in the regulation of movements, and in the control of states of wakefulness and sleep. (ibid, p. 31).

Stimulation of the reticular structures in the brain stem not only produces arousal, it also affects the transmission and processing of sensory information, both at the cortex and in the lower sensory pathways. The reticular system may control alertness not only by changing cortical excitability but also by gating, or selecting, sensory information. The reticular system seems to be involved in selective attention. Through this process particular stimuli are at various times selected

for further perceptual coding. Cortical modulation of reticular activity is in the form of cortex suppressing the reticular activity, even though the cortex itself is excited by the reticular system. This suggests a feedback loop between the cortex and the reticular formation. Through this feedback loop, cortical mechanisms that mediate such complex processes as perception and thinking could modulate reticular activation. (ibid., pp. 126 and 127).

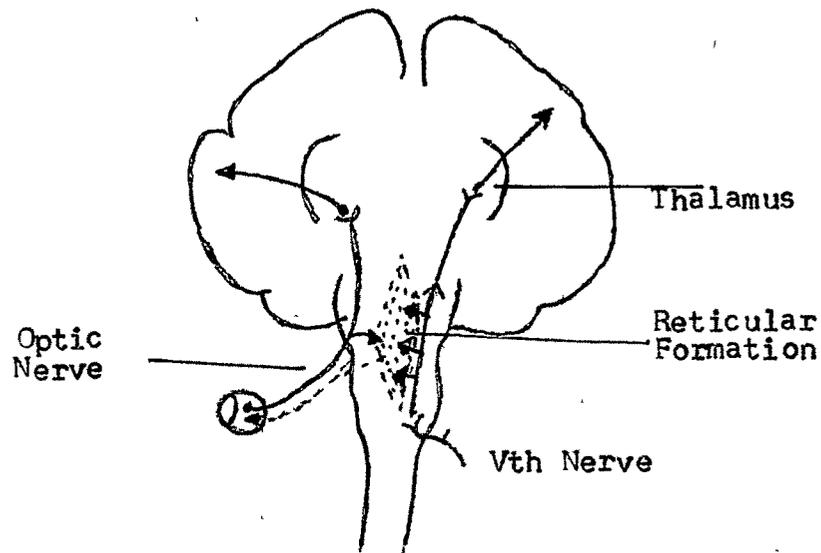


Fig. 1.

(After Butter :- Neuropsychology : The Study of Brain and Behaviour, page 125, 1969)

Limbic System :

In the medial portion of the cerebral hemispheres are found several structures which collectively are referred to as the limbic system. These limbic structures, consisting of nuclei and cortex, are interconnected with other portions of the cerebral hemispheres and with the thalamus and hypothalamus. Their functions are not well understood, but they seem to be involved in emotional behaviour and perhaps in learning. (ibid., p. 35).

The limbic system is involved in motivational processes. (ibid., p. 95).

It appears that the limbic system plays an important role in relating motivational and emotional responses to environmental events in other words, in the evaluative aspect of emotion. (ibid., p. 155).

Orienting response:

The orienting response[®] is another kind of response, other than the conditioned response. This response seems to play an important role in the learning process. Behaviorally, this response consists of orienting or investigatory movements to stimuli that are novel or that signal a biologically important event (such as food). The orienting response not only aids in focussing the organism's attention on the stimulus, it also prepares the organism for appropriate reactions to a potentially significant stimulus. A number of experimental findings suggest that the reticular formation of the brain stem and thalamus mediate the orienting response. (ibid., p.172).

Hippocampus :

Hippocampus is a part of the limbic system. It plays an important role in the control of the orienting response. Grastyan (1959) has inferred that the hippocampus modulates the orienting response in different phases of learning. According to this view the hippocampus actively suppresses the excitatory influences of the reticular formation, and so prevents the orienting response from occurring. Inactivation of the hippocampus releases the reticular formation from the inhibitory control and thus allows the orienting response to take place. (ibid., pp. 172 and 173).

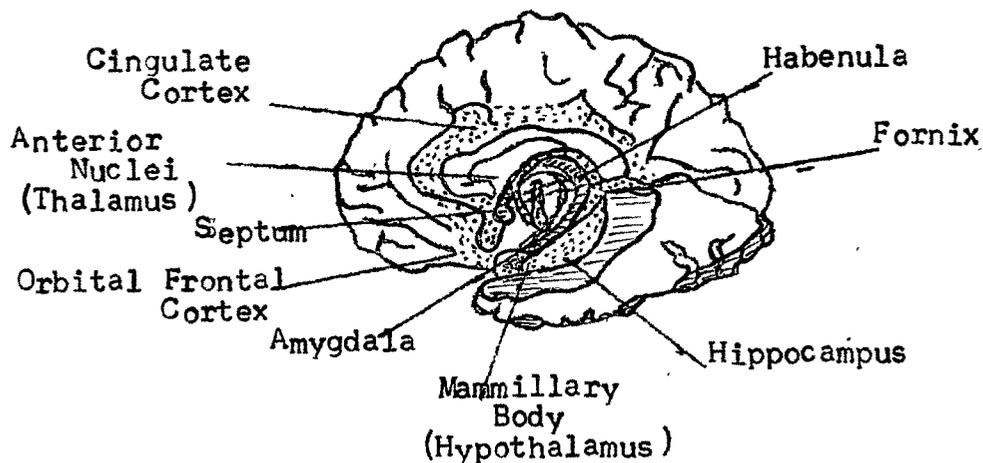


Fig. 2. (After Butter:
p.36,1969)

Interoceptive experiences :

They are experiences relating to visceral receptors. (Webster).

Proprioceptive experiences :

They are experiences relating to stimuli produced within the organism. (Webster).

Productivity :

It is shown by bringing forth many ideas and solutions. It emphasizes both quantity and contribution (Flanagan in Taylor and Barron, 1963, p. 92).

Research findings indicate that creativity and productivity do overlap to some degree, and yet they are distinguishable from each other insofar as productivity implies quantity whereas creativity implies high quality of a particular kind (After Taylor, 1964, p. 7).

Ingenuity :

It is shown by inventing or discovering a solution to a problem. The emphasis is on the existence of a problem and the demonstration of a quality of genius in solving it in an unusually neat, clever, or surprising way (Flanagan in Taylor and Barron 1963, P. 92).