number, investigators in the field of measuring intelligence have had to re-assess their findings. Guilford for one has made an attempt to accommodate Piaget's observations in his own model. Hunt (1961) has elaborated on Piaget's theory within an information-processing and motivational framework and has suggested that in the assessment of intelligence more attention be paid to sampling behaviour for evidence of such organizational structures as schemata, operations and concepts (cf. Hunt, 1961, p. 344).

In an important article Hayes (1962) has put forward a "motivational-experiential" theory of intelligence, which has profound implications for a better understanding of human intelligence. He maintains that intelligence is nothing more than a collection of learned facts and skills and that individual differences in intelligence are due solely to experience producing drives (EPDs). These drives are inherited tendencies to engage in activities conducive to learning. Thus innate intellectual potential consists of EPDs rather than inherited intellectual capacities, as such.

Hayes differentiates EPDs from primary or biogenic drives and secondary drives i.e. derived from primary drives. Simply put, EPDs cause activity in the organism which leads to the organism being exposed to a greater number of situations where learning can occur and this in turn leads to wider experience. Hayes derives evidence from a wide range of fields to support his theory. He does not

indicate how many EPDs there are, nor does he maintain that intelligence is merely an average of all EPDs. He regards the relationships among them as being far more complex. Although these drives have not been measured directly it is likely that the preferences for different sense modalities would correspond with the relative strengths of the EPDs. Guilford's (1966) finding that some abilities have to be differentiated on the basis of sense modalities lends some support to Hayes's argument. Also, Guttman's (1965) suggestion that each mode of communication may define a different kind of intelligence, seems to tie-in with the concept of EPDs.

Problems such as I.Q. constancy, Mental Growth and Language Development may be seen in a different light if assessed from the point of view of EPDs. Some of these aspects will be taken up in a later chapter.

Bouchard (1968), in a review of current conceptions of intelligence, brings together the above theories as well as the work done in the field of information-processing theories, into a new conceptualization. He makes three important observations. He sees:
(i) a movement away from social and judgemental criteria for tests concerned with assessing theoretical conceptions of intelligence; and a greater emphasis on construct validity; (ii) a recognition that the problem of intelligence is a sub-problem associated with the more general problem of determining the structure of cognition

and thought; and (iii) an emphasis on process. His conclusion is that:

> "The general model that is emerging as a result of these changes resembles a dynamic information-processing system. It is seen as growing out of a constant environmental-organism interchange in which both heredity and environment are of 100-percent importance (Hebb, 1958) and in which neither is determinate (Hunt, 1961), but whose development is highly dependent on at least an adequate early environment (Bloom, 1964)" (p. 29).

Bouchard agrees that the task of bringing coherence into the study of intelligence by means of this model would be a long and arduous one. He feels, though, that the challenge is worth undertaking.

A stringent test of the theories and definitions which have been discussed would be to apply them in cross-cultural investigations in order to see whether their validity is upheld. An even more stringent test would be to apply them to non-Western, under-developed peoples. The findings which emerge from studies such as these are likely to give investigators new insights into the nature of intelligence.

CHAPTER II

AFRICAN INTELLIGENCE AND ITS ASSESSMENT

1. Introduction

Psychological research in Africa is relatively recent in origin. Prior to the second world war little of scientific value was published on the psychology of the indigenous inhabitants of the continent. Much of what was available came from the pens of travellers, missionaries, civil servants and anthropologists. Many of the written accounts were highly coloured by preconceived ideas and a firm belief in the inferiority of African peoples (cf. Carothers, 1953, p. 87). After the war scientific interest in the mental capacities of Africans quickened. This came about largely as a result of an expanding industry which required some means of assessing the occupational suitability of a technologically unsophisticated labour force. In the realm of education the demand for scientific measuring devices also grew. A number of investigations, conducted mainly in South Africa and the Belgian Congo, led to the construction of a number of cognitive tests (usually adapted from Western ones) and the field of research took on a distinct empirical bias. In later years, as Doob (1965) and Andor's (1966) literature surveys show, the focus of attention broadened to include the study of perception, motivation, attitudes and personality. Throughout the

development of psychology in Africa, however, the study of cognitive abilities, with all its attendant problems has occupied a position of central importance.

Since the early work of Biesheuvel (1952a,1954) and Ombredane (1952), in which the performance of illiterate and semi-literate Africans on cognitive tests was studied, most investigations in recent times have been confined to the study of school-going subjects. In the last decade, extensive surveys have been carried out in which either locally constructed or specially adapted paper-and-pencil tests have been applied to literate subjects in west, central and east Africa (cf. Schwarz, 1961, 1963; Irvine et al, 1964 and Silvey, 1964). In all these studies the subjects had a reasonable understanding of English which simplified the administration of tests greatly. Similarly, in francophone Africa, psychologists have worked mainly with literate schoolchildren and have been able to administer their tests in French. (Much of this work is discussed by Faverge and Falmagne, 1962). In contrast, the investigation of the mental abilities of illiterate and semi-literate Africans has sharply declined during the same period. In South Africa where most of the pioneering work on such groups was carried out, research has been largely of an applied kind. Well-established tests such as the General Adaptability Battery (Biesheuvel,1952a) and the Form Series Test (Grant, 1955) have been installed in numerous industrial firms. Basic research in the nature of the mental

abilities of illiterates and semi-literates, on the other hand, has declined alarmingly. It may be argued that this situation is the natural outcome of an upsurge of education in Africa which has led to an overall increase in the level of schooling. This is true only to a limited extent. The fact remains that the majority of Africans are either illiterate or semi-literate.

The objectives of psychological research in Africa were set down clearly by Biesheuvel (1958) when he wrote:

> "It is to provide a means of testing the general validity of psychological hypotheses concerning human behaviour. Western culture, within which scientific psychology originated, has inevitably served as a reference for the formulation of these hypotheses. As a result psychological laws may lack universality. For example, are human abilities uniquely defined by such factors as Spearman's g or Thurstone's primaries, or are these concepts merely artifacts of the kind of intellectual functions fostered by Western culture? Are the dynamics of volitional behaviour those postulated by psycho-analysis, or do comparative studies show that this kind of development is only found in societies that have the family structure and moral codes indigenous to the West?
>
> Such studies can be of the utmost theoretical significance to psychology as a science. It may well involve a reformulation of its concepts, particularly those concerning thought, motivations, personality and character" (pp. 161 - 162).

From his work on literate Africans, Irvine (1969), has found it necessary to redefine intelligence as " ..... that which is learned, socially valued,

purposeful and commendable" (p. 230). He has also gone on to make a distinction between primary and secondary modes of thinking. He regards initial learning within the parental value system and language code as primary and learning in school, when it takes place largely through a second language, as secondary. In tests of a verbal kind he finds that ideas learnt in school are easily overruled by those of the primary system.

Many of the objectives of psychological research in Africa may be realised best of all in a study of Africans in transition from a rural-illiterate-tribalized state to an urban-literate-detribalized state. Adaptation of a high order is demanded of individuals who are expected to make such change. Yet, although this situation is a reality of Africa, relatively little work connected with this problem has been carried out. An examination of the proposed dichotomy will show how these two aspects of African life differ and how they are likely to influence the intellect of individuals who happen to live in one or the other.

2. Factors Influencing African Intelligence

A useful point of departure, in discussing factors which influence African intelligence, would be to examine Biesheuvel's definition of intelligence. His definition arose out of first hand experience associated with assessing the "capacity" of Africans at all levels of development. He has defined intelligence as:

> " ..... the capacity to gain insight into the nature of things and events, to grasp causal relations, to profit by experience and so to acquire a number of skills whereby the adjustment between individual and environment is mediated" (Biesheuvel,1956b, p. 447).

He goes on to state that "capacity" can be looked upon as the "power of the mind"; that it is innate and genetically determined and that the degree to which it can be effectively applied will depend on how well its growth is stimulated during the years from birth to maturity. This definition shows the influence of concepts which are to be found in the thinking of Spearman, Burt and Piaget. "Power of the mind" is similar to Spearman's "mental energy"; the genetic basis of intelligence is also in Burt's definition and the developmental aspects of the interaction between the individual and the environment are attributable to Piaget (cf. Chapter I, pp. 4, 7 and 31).

Through Biesheuvel (1943, 1956b) environmental factors affecting African intelligence have received the attention that they deserved. At the time of his writing factual evidence supporting his observations was sparse, but later studies have shown many of them to be correct. Some of these factors will be dealt with in relation to rural and urban environments. It will be shown that a rural environment is impoverished and that an urban environment by comparison is enriched.

One of the most controversial factors that Biesheuvel (1956a) has raised is the debilitating effects of the climate

in tropical regions. He maintains that humid heat all the year round is hostile to energetic action and that: "Climate is a permanently limiting factor in the amount of effort, mental and physical, that can be expected from most African populations" (p 306). He points out that in the tropics there are hardly any seasonal variations in the daily temperature range and that as a consequence work tempo will be stabilized at a comparatively low level. He also alludes to tropical diseases which by causing debility are likely to affect the liveliness of the mind. No conclusive evidence for the effect of climate on intelligence has been established (Inter-African Labour Institute, 1960), nor for that matter has a link been established between tropical diseases and intelligence. Although the question remains an open one it is likely that both aspects do have a detrimental effect on intelligence. Africans living in tropical rural areas are likely to be more prone to the adverse effects of climate and disease. In the urban areas of South Africa tropical diseases are now rare, and it is also true that most urban areas are situated in the cooler parts of the country. Hypothetically speaking, climate and disease might have an effect on "experience-producing drives" (Hayes, 1962) which in turn affect level of intelligence.

Nutrition is an important factor affecting intelligence. Kwashiorkor or infantile protein malnutrition has been shown to result, in some cases, in permanent brain

damage (Nelson, 1959; Nelson and Dean, 1959). Pellagra, which occurs among adults as a result of a protein deficient diet, is known to be associated with a wide range of electroencephalograph abnormalities (Nelson, 1963). Cowley and Griesel (1959) were able to demonstrate marked effects of dietry deficiencies, especially in proteins, on the learning in rats. A startling aspect of this investigation was the fact that these deficiencies were carried over into successive generations. The effects of inadequate nutrition on children have been demonstrated by Stoch (1967). He followed up coloured children severely malnourished in the first two years of life for over five years and compared them with an adequately nourished control group of similar socioeconomic level. The experimental group scored 15.7 I.Q. points lower than the control group on the S.A. version of the WISC scale. The profiles of the experimental group also resembled those of brain-damaged children. In a number of studies (Geber, 1958, 1961, Bardet et al, 1960 and Falade, 1960) the effects of abrupt weaning on psychomotor development in African babies have been shown to be severe. This is probably due to a change in diet. After weaning most African babies are put onto a largely carbohydrate diet.

These studies have an important bearing on African intelligence for it is a well-known fact that the diets of Africans, especially those in rural areas, consist mainly of carbohydrates and little protein. Urban

Africans, on the other hand, being better informed are likely to be more aware of the connection between diet and health and will thus supplement their diets with protein-rich foodstuffs. It is also true though that dietry habits die hard.

Socioeconomic status is yet another factor which has a bearing on intelligence and in the African context it is particularly important. Africans residing in rural areas have a subsistence economy which meets their immediate needs. Should a drought threaten their crops then the prospect of starvation becomes a very real danger with which to contend. Rural Africans belong, in general, to a peasant class and poverty is the rule rather than the exception. The domestic environment does not provide the kind of stimulation that is necessary for the adequate deployment of intelligence. For the infant and the growing child there are grave disadvantages in growing up in a rural environment. The material environment offers little scope for the development of manipulative and perceptual skills. Because of poverty parents cannot afford toys, furniture, household utensils etc. Whatever materials are present are constructed by members of the society and on the whole are relatively scarce. Urban Africans, on the other hand, at least have a steady income, which although limited, far exceeds what rural Africans can earn. The opportunity is therefore present to be able to provide their children with a wider material environment. Because of a higher

income and the availability of foodstuffs the prospect of starvation in an urban area becomes a remote possibility. The effects of socioeconomic status and urbanization on the intelligence of members of Western societies have been reviewed by Anastasi (1958, pp. 505 - 535). From the results of the studies reviewed one would expect urban Africans to surpass the intellectual capabilities of their rural counterparts.

Another factor which has a bearing on intelligence is the general cultural, as distinct from familial, environment. In recent years a number of studies carried out in the perceptual realm have high-lighted the importance of culture. Cowley and Murray (1962), for instance, compared the spatial development of groups of Zulu and European school children who were matched for sex and age. The Zulu children came from families in the upper socioeconomic levels and the European children from a wide range of economic levels. The subjects were matched in terms of educational range. Whilst the sequence of development was the same for both groups the rate of development of the Zulus was far below that of the Europeans. The work of Hudson (1960, 1962 and 1967) on 3-D perception has shown that the earlier children are exposed to pictorial material, the sooner and better they learned to obtain a depth impression from two-dimensional data. It would appear from his results that even advanced education could not compensate for early deprivation.

In an interesting study, Berry (1966) applied perceptual and conceptual tests to members of the Temne tribe and to Eskimos in an attempt to demonstrate a relationship between the cultural and ecological characteristics of their societies and the perceptual skills developed by the respective members of these societies. The results obtained were compared with Scottish subjects who represented a western control group. He also divided his groups into rural and urban sub-groups. His results showed Scots and urbanised Eskimos to perform best and rural Temne to perform worst. In explaining his data he points out that the groups differed in terms of culture and child upbringing. The Eskimos emphasised independent individuality and resourcefulness while the Temne were dependent and conformistic. He also showed that the more acculturated, urbanized Eskimos and Temne were closer to the Scots control group than they were to their unacculturated, rural counterparts. In a related study (Dawson, 1967 a) the effects of socialization processes on spatial-perceptual abilities was demonstrated. It was found that Temne, who are subjected to severe socialization processes, tended to manifest a more field-dependent (cf. Witkin et al, 1962) perceptual style as contrasted with the Mende whose socialization processes were less severe. In the same study it was also shown that perceptual skills (as measured by Hudson's materials) were limited by the field-dependence variable. Thus, the results indicate, in

general, that a strict, conformist environment has a negative effect on the perceptual abilities of members of societies which foster a restrictive style of life.

In a recent book (Segall, Campbell and Herskovits, 1966) the influence of culture on visual perception has been dealt with in detail. The authors' results showed significant differences across cultures in susceptibility to several geometric or optical illusions. Their findings consistently showed that the more acculturated an individual is the more susceptible he is to these illusions. These findings suggest that acculturation leads to greater flexibility.

It may be concluded from these studies that Africans living in a conformistic tribal state are likely to be at a distinct disadvantage when subjected to intelligence tests which have a visual-perceptual basis. In societies governed by custom and conformity there is inevitably little to stimulate and much to inhibit thought. Curiosity will not be encouraged as there are traditional answers for most questions and where something is not understood magic is invoked to provide an answer. Africans are likely to lead a fuller intellectual life by breaking their tribal bonds. As will be demonstrated in Chapter VI urbanization as a process leads, at least, to a loosening of these bonds.

Scholastic education is one of the strongest factors influencing African intelligence. In nearly every

investigation of African intelligence strong positive correlations between formal schooling and test performance will be found. Though educational facilities for Africans are increasing they affect only a minority. Those who do attend school will usually go only as far as standard six and then drop out. A bare minimum go beyond, not because of a lack of motivation but rather because of a lack of financial means or proper facilities. On the whole schooling facilities are better in urban areas. Of course in those rural areas where schools have been established by missionaries, facilities are likely to be equivalent.

Biesheuvel (1956) has commented on the importance of scholastic education for the growth of intelligence. He has written:

> "Scholastic education is the mechanism which establishes the mental skills through which intelligence can best make itself effective, and whereby the mind is raised to higher adaptive levels" (p. 448).

Confirmation for these views is provided by Bruner (1966) who draws a distinction between pre-literate and literate societies. In pre-literate societies most instruction occurs by <u>showing in context</u>. He points out that there is no practice or drill as such, save in the form of play modelled directly on adult models. In the end every man in the culture knows nearly all there is to know about how to get on with life. Each person in the society has his place and if he does not conform to his

established role he is reprimanded and brought back into line. In literate societies there is knowledge and skill in the culture far in excess of what any one individual knows. And so, increasingly, there develops an economical technique of instructing the young based heavily on telling out of context. In literate societies this practice is institutionalized in the school or teacher and both promote this abstract way of instruction which in turn leads to the ability to manipulate symbolic information.

Through adequate exposure to scholastic training it has been shown that African subjects can improve their performance on intelligence tests. McFie (1961) applied six WISC tests, including Kohs Blocks, together with a Memory for Designs and Weigl Sorting test to a group of boys at a technical training school. The subjects then received training in perceptual and memory skills during the course of their studies. He re-tested the group two years later and found most improvement in Kohs Blocks and Memory for Designs. He attributed these improvements to the experience the subjects had obtained in studying physical objects, in accurate spatial orientation and working at speed. Ombredane (1956 and 1957) has shown that the performance of Africans on the coloured version of the Progressive Matrices test, with age held constant, increased regularly with educational level. Latouche and Dormeau (1956) also found that the performance of

candidates at centres for accelerated training improved on the Progressive Matrices from year to year although conditions of admission remained unchanged (cf. Faverge and Falmagne, 1962).

It would seem then that scholastic education leads to improvement in performance on most visual-perceptual tests. It is no wonder then that differences in perception, reasoning, spatial abilities etc. have repeatedly been found between literates and illiterates.

As a final point of comparison between acculturated and unacculturated groups there appear to be other differences in their general environments which are worth noting. In cities, where acculturated groups are most likely to be found, the tempo of life is much faster than in rural areas. There is a greater diversity of ideas to which city-dwellers are exposed, there is greater contact with members of other social groups, more ambiguous situations are encountered and life, in general, is more stimulating. In the work situation urban dwellers learn new skills, have greater contact with Europeans and their lives are regulated by the importance of time.

It may be concluded, from this review of the major environmental factors influencing intelligence, that a rural-illiterate-tribalized environment is impoverished and that its antithesis i.e. an urban-literate-detribalized environment is, by comparison, enriched. It is expected, therefore, that most cognitive tests will reflect the effects of these differences.