Humans in Culture and Culture in Humans: Origins of Human Behaviour

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INTRODUCTION

The behavioural roots for mankind lie in its biological and cultural heritage. So people inherit their biological makeup, and this along with the tutoring of the individuals' host culture, eventually make human beings (at least to some extent) what they become biologically and behaviourally. Culture therefore, is not just *out there,* but makes fundamental changes to what the person is inside, at the biological level and more particularly at the behavioural level. Thus each individual exists in the culture, and also has that same culture internalised within. *The culture is both out there and in here.* This means that there is a dynamic interactive relationship between each person and the culture. As the individual changes, so forces for change will be exerted on both the physical and social surroundings by that same individual. The reverse also holds true; as the physical and social surroundings change so the individual will be forced to make some modification at the biological or behavioural level.

BEHAVIOURAL ROOTS AND ADAPTATION

There comes a time in children's lives when they ask, *Where do I come from*? And that is what we are going to look at; the origins of human behaviour in the physical and social environment, from a cross-cultural view.

The basic assumption is that the human body, with its inherited inventory of genetic material and its congenital background, is involved in continuous interaction with the total environment. For human survival, this interaction between the body and its physical and social environments, for adaptation, is essential. Indeed the origins of human behaviour lie in human pre-programmed behaviour from heredity, and from learned behaviour in each individual's social and physical environments (Leigh, 1999a).

In this process, there is only one vehicle for humans to interact with the surroundings, and that is through the physical body's using its five senses and other biological processes for survival behaviour and thriving which includes:

- Gradual genetic pool selection and change within species
- Body functions, through its physiology and anatomy
- Human actions and gestures
- Mental activity
- Language

And so we will view humans as adapting beings within both their physical and social contexts. This adaptation is made from within the bounds of specific behaviour which includes mentality, actions and language. Also at the biological level, through the anatomy and physiology, everyone adapts in order to survive and thrive in that total environment.

Let us now look at adaptive modes more clearly by focusing on humans as beings with their biology and culture inseparably intertwined. That means that there are a total of three major adaptive modes here and they are:

1. Biological: genetic change and selection within species
2. Biological: physiology and anatomy
3. Behavioural: thought, actions and language which are largely bound up in culture

These categories are used for convenience and with caution as there are many interactions between these modes. For example, changes in genes can lead to changes in physiology and anatomy. Also the body can acclimatize to severe environmental pressures by making adjustments in its physiology (body functioning), without any effect on the genes. So when a person has a bacterial infection he adjusts by defending the body with antibodies to fight the invading organism. However, this coping mechanism does not involve genetic changes normally.

Actually any change in the person's environment is a stress, leading to a complementary change in the body in order to reach some biological equilibrium for a comfortable state to support life and well-being.

We have great ability to deal with environmental stresses through culture, and we have incredible ability to make necessary adjustments under, what at times, seem impossible odds. For example, we set up systems and machines for our people to survive in outer space where there is no food, air or warmth. Eskimos live in subpolar regions, Asians survive in tropical rain-forests and Arabs have lived for centuries in the arid deserts as nomads. Eskimos abandon the aged and infirm, African tribes maximize family sizes by allowing a man to have as many wives as he can support, and they believe that this leads to greater security for all. Similarly, in the Moslem Arab world up to four wives at any one time is acceptable.

Indeed, humans react to a whole host of environmental stresses including climate, landscape, disease, diet, language and culture. Each time we make adjustments to a changing environment, it is an attempt to survive, or at least an attempt to improve a situation. Culture aids adaptation by the use of behaviour for easing the stress, and physiological changes modify the body's functioning. Neither of these - culture or physiology, is mutually exclusive since they interact dynamically and a change in one often modifies the other.

A likely story from Africa will help amplify a point here. A professor was travelling through the desert in Africa and asked Omar, his driver, to stop at an oasis outpost for some refreshments. While sitting with Omar, sipping Benkashir and Bitter, a local Arab came up to the professor and said:

- *From your speech and actions I knew it was you.*

This man, Musa, had been a student of the professor some years before and remembered his unique speech and behaviour (mannerisms).

It was a welcoming statement from Musa, and it highlights the fact that we all interact (communicate) with our environment through our bodies by using our peculiar:

- Actions
- Language

Each person's thoughts, actions, and language (which are largely culturally bound) form the only vehicles for interaction with the surroundings, and its people.

The approach taken in this study is the result of the following ideas, which are proposed to explain the influences on humans, and their adaptation, as individuals and groups:

- Human thoughts, actions and language are a result of their physical and social environment.
- The initial trends and successive development in the physiology and behaviour of each individual are to some extent determined by heredity.
- Individuals are largely the result of the interaction of their heredity and environment.
- Thus each human or group is different from and equal to other humans and groups respectively.
- Each human or group, even though different, is an example of specific adaptation to the parochial social and physical environment.

For thousands of years humans have known that, not only what they do, but also the way they think - their beliefs and ideas - are an integral part of them.

- In the New Testament of the Bible, THOUGHT is considered to be closely linked to CONDUCT. In actual intent, for personal accountability, THOUGHT and CONDUCT are considered to be the same. *You have heard that it was said by them of old time, Thou shalt not KILL; and whosoever shall kill shall be in danger of the judgement: But I say unto you, That whosoever is ANGRY with his brother without a cause shall be in danger of the judgement* (Matthew 5:21-22) and *For as he THINKEST in his heart, so IS he* (Proverbs 23:7).
- In Buddhism it is taught that, *All that we are, is the result of what we THINK*.
- Cicero said, *To THINK is to live*.

Also in every society, individuals are judged not only by what they say, but also by what they do. Indeed social norms and laws forbid, tolerate or encourage specific actions in each society.

Homosexuality may have been accepted in Ancient Greece and openly practiced, but in Hebrew society men were stoned for such acts. Eskimos traditionally abandoned the old folk to die when they could no longer take care of themselves, but in western countries old people are put in *old peoples' homes* which provide professional care. Euthanasia is still a crime in most Western societies. In many developing countries where there are extended families, the old people are cared for by the family until death, or until acute sickness takes them into hospital. Here we see different actions in each society because the ideas and beliefs in each society are different.

There is now widespread agreement among scholars, that not only are humans the pinnacle of life forms on this planet, but they are also unique creatures in the animal kingdom. It has often been said that it is the human ability to conduct the following activities that sets humankind apart from the other animals:

- To learn so much and especially so in the formative years and
- To think conceptually, which leads to
- Complex purposeful activities (actions and language)

No other animal thinks or acts with the complexity, diversity or degree of self-realization and self-awareness as a human (McCrone, 1990, p. 1). Humans make tools, create works of art, have theologies and philosophies to

make sense of their situation, and they produce science and technology to control and change present and future circumstances.

However, it is only from thought, and the resulting actions and language mediated through each person's body that he or she can interact with the surroundings. These surroundings, as we have seen, are made up of the twin physical and social contexts.

The physical world around us is made up of many factors that shape the thoughts and perception in our minds. Some of the factors, just to name a few are:

- Landscape
- Weather
- Animal life
- Plant life

The sociocultural environment around each one of us also shapes our perception and actions. Culture has been described as:

> *A mixture which incorporates behaviour (thoughts, actions and language), knowledge, belief, art, morals, law, custom and any other qualities acquired by man as a social being*(Leigh and Stanbridge, 1991, p. 2).

Indeed Hall (1966) in *The Silent Language* has gone as far as to say that culture is communication. And the culture of humans can only be expressed through their various behaviours. Human behaviour is made up of:

- Thoughts
- Actions
- Language

And language (as total communication) which forms an integral part of culture has been previously identified as:

> *A peculiar set of spoken symbols, body movements and pictorial or written symbols through which an individual can express himself to others or receive the expressions of others. Language is therefore the symbolic behaviour that makes up the expression, wittingly or unwittingly, to and from others* (Leigh and Stanbridge, 1991, p. 3).

Thus we can see that the following expressive activities are vital parts which form the total language system:

- Spoken symbols

- Symbolic body movements
- Pictorial and written symbols

These expressive activities are made possible by, or facilitated by the human large brain size, the ability to walk on two legs, the capacity to make and use tools with a clutching hand, language, self consciousness, and conceptual thinking. These are the adaptive physical and mental traits. All of these characteristics, singularly and combined, attest to the uniqueness of humans above the animal kingdom (McCrone, 1990, pp. 3,4,7; Nanda, 1991, p. 57).

HUMAN INHERITANCE

Children inherit, at conception, half of their genetic endowment from the father and half from the mother. This genetic package usually means that the child is destined to realize a considerable potential.

As we have already seen, this potential will be manifested through a large brain size (burning up 20% of the body's oxygen), the ability to walk on two legs and the capacity to make and use tools with a gripping hand. These major adaptive traits attest to the uniqueness of humankind above the animal kingdom (McCrone, 1990, pp. 3,4,7). Humans like no other creature, have the potential to communicate conceptually in a complex and sophisticated way through language and gestures. They are also conscious of their own actions and the world around them, as no other creature.

From inherited genetic material and the intra-uterine environment, the child will appear at birth in a state of health or sickness. So the legacy for children at birth is their inheritance made up of a genetic and congenital background.

We will consider some factors of this human inheritance (genetic and congenital) for what each child has at birth.

If the child inherits a dominant gene from at least one of its parents, then that generally means the child will display that characteristic. However, if a characteristic is to be manifested from a recessive gene, that usually means that the child will have to inherit the recessive genes for that same characteristic from both parents. Indeed if a recessive gene is inherited from only one parent, then the person will probably not develop the characteristic of this inheritance, but will carry the inherited genetic code, which can be passed on to any offspring.

However, many characteristics are not so simple, as they may be a result of a whole mix of genes, or a result of the genes and the environment interacting together. Height is a good example of this. Indeed IQ is another case which is the result of a very complex interplay of nature and nurture.

For example, measured IQ level and profile is at least the result of many identified and unidentified factors some of which are: basal metabolism rate, EEG alpha frequency, height, weight, anxiety level, genetic endowment, personality of the examiner, father's occupation, father's years of schooling, mother's attitude toward achievement, home cultural level, mother's concern with language development, level of anoxia at birth, the motivation to master intellectual skills, and numerous others (Anastasi, 1958, pp. 197-208; 1968, pp. 21-38; Tyler, 1965; Hirai, 1978, pp. 35,36,97).

The legacy of what the newborn baby comes into the world with includes both genetic material and a congenital background. Both the genetic and congenital background of the human may be associated with disease, and this sometimes means that a disease is inherited or a predisposition to the disease is inherited, and not necessarily the disease itself. In the following list some of the more common genetically based diseases in humans are shown:

- Cystic Fibrosis
- Osteogenesis Imperfecta
- Achondroplasia
- Congenital Sphericytosis
- Thalassemia
- Huntingdon's Chorea
- Diabetes
- Klinefelter's Syndrome
- Phenylketonuria
- Sickle Cell Anemia
- Hemophilia
- Duchen Muscular Dystrophy
- Epilepsy
- Congenital Heart Disease
- Down's Syndrome
- Spinabifida
- Turner's Syndrome

(Berkow, 1978, pp. 1089-1113; Miller and Callander, 1989, pp. 443-447; Edwards and Bouchier, 1991, pp. 18,19).

Various congenital diseases that probably arise in the womb as a result of genes, intra-uterine environment or other unknown factors, are also found in humans. Some of these congenital diseases are listed below:

- Hydrocephalus
- Cardiac Lesions
- Cleft Lip

- Cleft Palate
- Imperforate Anus
- Club Foot
- Accessory Digits
- Webbed Digits
- Oesophageal Atresia with Tracheo Fistula

  (Berkow, 1978, pp. 1089-1113; Miller and Callander, 1989, pp. 443-447; Edwards and Bouchier, 1991, p. 19).

Not only the genes *per se* but the genetic diversity seems to be influential on the condition of humans. For example, the genetic diversity of ancestors seems to influence fertility rates. Spontaneous abortion and still-birth rates have been found to be lower for married couples who have ancestors from the same country. For those with ancestors from several countries, the more countries represented in the ancestors of the couple the higher the rates were for abortion or still birth (Bressler, 1970, pp. 17-25).

In the child's development from conception, the presence of malnutrition, drugs, alcohol and smoking may also have serious effects on the growing fetus (Nurcombe, 1976, p. 36; Berkow, 1978, pp. 1089-1113; Miller and Callander, 1989, pp. 443-447).

Malnutrition leads to permanent damage of body tissue including the brain. Even prior to birth, nutrition is very important. Specifically poor intra-utero nutrition and low birth weights have been linked by research to lower IQs (Nurcombe, 1976, pp. 36,53-57).

Drug side-effects have been well documented. An interesting case is with the anti-abortion drug stilboestrol. If this drug is taken by the mother during the pregnancy, it may later lead to cancer of the vagina in the teenage daughter (Bergersen, 1976, p. 597; British National Formulary, 1987, p. 23).

It is also well known and amply demonstrated that Thalidomide, taken by pregnant women in the fifties, to ease nausea, led to a iatrogenic failure of the long bones to develop in the fetus. Many children were born with deformed limbs or even without limbs at all.

Alcoholism in mothers has been associated with small heads, maxillary hypoplasia, eye deformities and abnormalities of the gastrointestinal tract, of their newborn (Miller and Callander, 1989, pp. 453-454).

Smoking during pregnancy has been related to abortion, premature births, perinatal death, low birthweight, and the possibility of long term retardation of physical growth and intellectual development. Much of this damage may

be the result of carbon monoxide intoxification and a lack of oxygen carrying capacity in the blood of the mother (Miller and Callander, 1989, pp. 453-454).

There is also an ongoing role played by inheritance that at least in part seems to influence the final outcome for intelligence. Researchers, to show the potential effects of the genes on intelligence, took a group of intelligent rats and a group of dull rats and reared them in a natural environment. The pedigreed rats, which had been specially bred for thirteen generations to perform well on maze tests, were found to perform better on these tests than other rats who were inferred dull from their breeding. The intelligent rats performed on maze tests with only 117 errors but the dull rats had 164 errors. Thus the intelligent rats had a considerable edge over the dull rats (Cooper and Zubeck, 1958, pp. 159-164).

The debate regarding nature and nurture has been raging for centuries in the sciences. In 1690 John Locke argued that all behaviour must be learned. He believed that at birth, the human mind was a clean slate, a *tabula rasa*, upon which the environment and the concomitant experience inscribe personality and behaviour. Thus he argued that no human behaviour was biologically inherited. It was from here that for almost two centuries the school of cultural determinism continued to gain in momentum.

By 1842 the direction of the momentum began to change when Charles Darwin finished his first unpublished version of his theory of natural selection, arguing for a strong role in biological inheritance and selection of species to fit with the environment. Darwin's *Origin of Species*, first published in 1859 (1970), argued that humans, physically, behaviourally and emotionally were largely the result of biological inheritance and natural selection (Fisher, 1983, p. 74). Much of what Darwin suggested has been generally accepted (even if somewhat modified), although there has been much contention over Darwin's fundamental arguments of natural selection, and how this can lead to new species.

A strong reaction in this century, led by Boaz (1979), gave new emphasis to the ideas of Locke. Boaz argued that the culture or environment largely determine behaviour, not biological inheritance.

The alternative view of Wilson (1974) in the 1970's argued for the major role of sociobiology for the behaviour of humans. His conclusion was to press for the biological foundation of human behaviour.

The great difficulty is that the roots of much of human abilities, and especially intelligence, are not only illusive multifactorial phenomena

defying specific definition, but the measurement of these abilities can be culturally chauvinistic (de Lacey, 1992).

However, there is no doubt, and there is scientific consensus that there is a genetic and physiological component for many human abilities and intelligence on the individual level. The big debate has been to apportion to what extent each of the biological and social factors of humans can influence the final outcome of intellect and ability. At present, however, the consensus in the current literature is slightly in favour of the role of biological inheritance, as the more decisive influence on the development of intelligence (de Lacey, 1992).

The idea that there might be significant radical differences in inherited behavioural potential excites panic in some minds. Others are distinctly allergic to it or dogmatically assertive about it, thus falling into two groups, namely, racist, on the one hand, who claim that a particular race is in some global sense better than all others, and ignoracists, who maintain that no significant intelligence or other temperamental behavioural difference can exist among the races. Both, if the underlying value assumptions in their views are examined, share the conviction that any demonstrated difference should lead to hostility and mutual rejection.

If there can be real differences of hereditary potential between one individual and the other - which is unquestionable - then there can be significant hereditary behavioural differences between the mean of one group of, say, twenty people, and another group of twenty people. And since national populations and races are simply collections of people, genetic differences are possible between two populations of virtually any size (Cattell, 1987, pp. 305, 355, 356).

Certainly the author of this study, remembers from his childhood years, that the different breeds of cattle on his father's stud farm displayed quite different behaviour and temperament. This behavioural difference was noted in such diverse breeds as Hereford from the United Kingdom, and Brahman from Indian Zebus through the United States.

Indeed quite different behaviour has been noted in many breeds of the same species. Ducks, for example, of different breeds, may display quite different behaviour, and this behavioural-difference phenomenon in different breeds of the same species, is true for many animals, including dogs, birds and horses for example (Honore and Klopfer, 1990).

Humans have bred birds for thousands of generations, leading to the modern egg-laying hen which has been bred for maximum egg production over the longest possible period. This behaviour is obviously not compatible with

brooding and so it is not surprising that the modern egg-laying hen is notoriously nonbroody in comparison to wild fowl, the progenitor (Honore and Klopfer, 1990, pp. 97,98).

Freedman (1978) has given a fascinating account of the sex instincts and habits of dozens of creatures from snails to dolphins. These graphic accounts show that much of the diverse sex behaviour in a wide array of creatures is transferred through the generations in the genetic code.

Henry (1993) suggests that not only lower-order behaviour for survival is largely determined by instinctual reactions, but also higher-order behaviour like heterosexual orientation in humans has a genetic basis.

Le Vay (1991) has produced research evidence to suggest that there may be a physiological difference in homosexual men. He has shown that the anatomy, and therefore physiology, of homosexual male hypothalmic structure is different in homosexual men. Of course the scientists are not certain whether the behaviour leads to the different structure of the brain or whether it is the genetically determined brain structure of these individuals which has led to the sexual orientation. It may, be in this case, that the behaviour actually changes the physiology.

Interestingly, Darwin has argued strongly for the biological basis of humans and in his study of behaviour presents a good argument for a genetic component in the behaviour of human beings. Much of his work was on facial and body gestures, and he has concluded that humans and animals have innate orientations for much of their behaviour. For example, he highlighted the following:

> *In almost all animals* [and humans] *... terror causes the body to tremble. The skin becomes pale, sweating* [occurs]*, ... the hair bristles, ...* [urine and faeces] *are involuntarily voided, ...the breathing is hurried,* [and] *the heart beats quickly, wildly and violently* (Darwin, 1965, pp. 30,77).

There is therefore little question, as it has been amply demonstrated towards a scientific consensus, that the genetic and congenital condition of humans affect their physiological and mental processes, which in turn influence their behaviour and potential development.

THE BODY IN ITS PHYSICAL ENVIRONMENT

The environment shapes, moulds and influences the anatomy, physiological functioning and mental processes of the human organism from the raw materials of its genes.

Each human, through a once-only combination of genes, and individual adaptation to the specific parochial environment, has become unique even though he or she shares many common characteristics with all other humans.

For example, acclimatizing to a hot climate requires complicated interactions. However, heat stress is not as influential as heat and humidity stress combined. Heat and humidity are a powerful twin stress because of the way our bodies dissipate heat with evaporation. If the environment is hot but dry, it is easy for the body's perspiration to evaporate and therefore remove heat. On the other hand, if the surrounding air is already moist and the perspiration does not evaporate so easily, there will be low efficiency for dissipation of heat from the body.

Unexpectedly, human populations do not vary in the number and distribution of sweat glands on the body. Each human has a total of around 2.5 to 3 million sweat glands which can secrete up to four litres an hour in extreme heat (Vander, Sherman and Luciano, 1970, pp. 433-439).

But there are other physiological ways that human groups must have developed in order to cope with heat stress more readily. It has, for instance, been shown that Negro soldiers had a higher tolerance to humid heat than white soldiers, but that conversely the Negroes did not cope so well as whites in hot dry conditions (Newman, 1956, pp. 101-105; Barnicot, 1959, pp. 115-129; Baker, 1958, pp. 287-305). Indeed European foreigners in India and Sri Lanka find it difficult coping with the wet heat, and these Europeans often have vomiting, nausea, dizziness, boils and other skin problems in, what for them is, a relatively hostile environment.

In hot conditions the body must reach a compromise between the conflicting factors of heat loss and water loss. Without drinking, a person suffering water loss due to sweating, can be endangered and even die, in a very short time (Edwards and Bouchier, 1991, p. 84).

The two ecological rules of Bergmann and Allen expound on the relationship of size and shape of bodies to cope with heat stress (Hock, 1970, pp. 195-204; Young, 1974, p. 566; Baker, 1958).

The Bergmann rule says that:

- If two bodies are similarly shaped, the larger body has less surface area per unit volume and so retains heat.

The Allen rule states that:

- In hotter climates, body extremities are elongated to maximize surface area for heat dissipation.

In support of these two rules, several research studies have shown that human body weight is less in hotter areas and more in colder areas. Newman's research (1953, pp. 311-327) among American Indians and people in Eurasia and Malaysia supported these rules. It was found that in the hotter climates people will tend to be shorter and more slender.

Thus the trend is that in climates with high temperatures, average body weight will be low and vice versa. There is some evidence to suggest that this is also a physiological adaptation and not only a genetic one. In support of this proposal, it was found that children in the Panama Canal Zone are lighter in weight than children of the same gene pool in cooler United States (Mills, 1942, pp. 1-13).

It has also been amply demonstrated that pumas in the Northern and Southern American continent are smaller in body size in the hotter areas (Weiss and Mann, 1978, p. 448).

In line with this principle, we find that many Central and Southern Africans have a lithe body shape but subpolar peoples, like Eskimos, have a more rotund build. This is because a compact or spherical shape is best for retaining heat as the volume per unit surface area is high.

Now we shall consider several other inheritance characteristics which are also greatly influenced by the environment. For instance, sunshine can darken the skin and bleach the hair, and humidity can change the hair texture.

Ultraviolet light is important for the production of vitamin D by our bodies in the deeper layers of the skin. If we do not have enough of this sunshine vitamin, from underexposure to sunlight or low vitamin dietary intake, the intestines cannot absorb enough calcium. Calcium is required to keep the nervous system functioning and for strong bones. If there is a calcium deficiency, then the body ensures proper functioning of the nervous system by extracting calcium from the bones. Therefore, severe calcium deficiency leads to rickets (deformed legs, spine and pelvis and in severe cases death).

Alternatively, too much vitamin D can cause other illness: calcium deposits in soft tissue and eventually kidney dysfunction, resulting in death.

Dark skin is effective in filtering out excessive amounts of ultraviolet light to avoid skin burn and the risk of cancers, and light skins are more adapted to absorbing greater amounts of ultraviolet light in the surroundings. Thus we tend to see darker skin people are naturally in the areas of the equator and as we move towards the poles the skin of the inhabitants becomes lighter. Where there is less light, the lighter skinned people are adapted to absorb more of the ultraviolet light through their skins (Garn, 1960; Dobzhansky, 1962; Mayr, 1963).

We have also seen that genetics is associated with wellness or disease. However, this sometimes means that a predisposition to the disease is inherited, not the disease itself. Thus disease may not only be genetic affliction of nature, but also a result of a group's way of life (Dreitzel, 1971, p. VI).

For example, it seems fairly conclusive that there are individuals who are prone to psychological illness as a result of their heredity. However, their suffering and weakness may only be manifest in an environment with excessive stress and high anxiety.

The onset of psychological illness can also be brought on by other diseases, diet (e.g., vitamin deficiency) and social lifestyle. Thus, for many diseases, the cause is not only the genes or the environment, but an unfortunate combination of specific genes and a specific environment (Hilgard, Atkinson and Atkinson, 1971, pp. 477-480; Edwards and Bouchier, 1991, p. 19).

The combination or interaction of genes and environment is shown by sickle cell anemia and malaria as they have a very tight association. Malaria is a disease caused by a parasite that enters the body through the bite of an infected female anopheles mosquito. Once inside, the parasite lives in the red blood cells and these cells eventually die prematurely as a result of the parasite. Malaria therefore can lead to high fever, malaise, joint pains, nausea, chills and death (Eshuis and Manschot, 1985, pp. 53-60; Stirk, 1991, p. 36).

However, the parasite is not able to develop and reproduce in sickle red blood cells. So for those who through heredity do not have the full-blown dose of sickle cell anemia from both parents, only half of their red blood cells will be sickled and thus they are not so susceptible to severe malarial attack and will not develop sickle cell anemia either.

This is a prime example of a variant gene's being potentially debilitating if inherited in full-blown form, which in the case cited, leads to the serious and deadly disease sickle cell anemia, but if not inherited in full-blown form this variant leads to blood characteristics which retard the development of malaria and do not lead to sickle cell anemia either.

In many African Negro tribes more than 20% of the people have through inheritance the sickle trait, and in some tribes the percentage goes as high as 40%. In Greece frequencies as high as 17% have been found and in some Negro populations in the United States similar levels have been found. Much of the reduction in the prevalence of the sickle trait is a result of the eradication of malaria and hybridization. Sickle cell anemia is so closely associated with malaria that, given time in a malaria-free environment, this genetic trait will probably disappear (Pollitzer, 1958, pp. 241-263).

Diet is another important part of the environment. Winick (1969, pp. 667-678) and Nurcombe (1976, p. 53) have argued that, during the critical growth period, from prenatal period into the first year after birth, a child who experiences malnutrition may suffer irreversible damage of the central nervous system.

Obviously much of what we eat, and how we eat it, is a result of our culture, but actually humans can eat and survive, at least for a time, on almost any food. However, both short-term and long-term chronic and acute effects, from various diets, may reduce the health and wellness levels of the consumers.

Yanamamo Indians of South America get their protein from a diet of fresh raw lice and fried insects. There is of course great variety in the diets of various cultural groups around the world, as humans have great tolerance built into their bodies to eat a wide range of foods. Australian Aborigines eat insects and grubs, Eskimos almost exclusively eat meat and Hindus are strictly vegetarians. But there are obviously limits if we want to maintain good health on a long-term basis. Kellock (1985) has shown that a whole host of diseases including cancers are highly associated with lack of fibre in the diet.

In many underdeveloped countries, low protein and calorie intake leads to kwashiorkor and marasmus respectively. Perhaps up to half of the children in developing countries suffer from these disorders of malnutrition. The symptoms are edema, muscle waste, anemia, hair loss and apathy. Many of these children are impaired or die of respiratory and other infectious diseases as their resistance to infection is low. Particularly infections of the eye, skin, ear, brain, respiratory system, and intestinal tract affect both the

physical and cognitive development of many children around the world (Nurcombe, 1976, pp. 54-56).

Thus insufficient food or an unbalanced diet can lead to physical and psychological difficulties and in some cases severe and incurable diseases. An adequate and balanced diet should include a mix of:

- Carbohydrates
- Proteins
- Fats
- Vitamins
- Minerals
- Roughage
- Water

Vitamin deficiency for example, from a poor diet, can have a profound effect on the functioning, anatomy and physiology of the body, and also lead to functional problems of the central nervous system. Many of these diseases are severe and incurable. For instance, there is no cure for stunted growth, rickets and many of the other diseases shown below.

- Vitamin A: Stunted Growth, Night Blindness, Keratinisation, Xerophthalmia
- Vitamin B Complex: Lethargy, Beri Beri, Dermatitus, Diarrhoea, Dementia, Eye Lesions, Angular Stomatitus, Cheilosis, Pernicious Aenemia, Megaloblast Arrest, Degeneration of Central Nervous System, Conjunctivitis, Anemia, Liver Degeneration, Peripheral Neuritis
- Vitamin C: Haemorhages, Slow Wound Healing, Anemia, Scurvy, Schizophrenia
- Vitamin D: Rickets, Osteomalacia
- Vitamin E: Muscular Dystrophies
- Vitamin K: Slow Clotting, Newborn Haemorrhages

  (Ross and Wilson, 1981, pp. 204-213; Bierer, 1984, p. 140; Edwards and Bouchier, 1991, pp. 940,941)

Diet, physiology and behaviour are closely intertwined. Diet as we have seen can have great effect on health, and it is common knowledge that poor diet leads to a reduction in immunity from vitamin deficiency. Thus vitamin deficiency also leads to a higher chance of contracting, and becoming disabled from, infectious disease. Even certain types of schizophrenia might be brought on by vitamin C deficiency. One therapy, as a corollary, used for this disease, has been to administer massive doses of the vitamin. Generally malnutrition is associated with psychotic and neurologic symptoms of

memory disturbance, listlessness, apathy, irritability, personality changes and psychoses (Bierer, 1984, p. 140).

It is widely accepted that diet affects the central nervous system. Experiments have suggested that Vitamin B complex supplements can produce an increase in IQ (Weiss and Mann, 1978, p. 434).

Additionally of course there are many allergies from foods and food additives, and the environment generally, and we are only just now beginning to understand the cause and treatment of many of them.

Diet can also affect not only the central nervous system, resistance to disease and IQ, but also how tall a person will be. It is well known that the height of individuals will be increased from their underprivileged forebears if they grow up in a more favourable environment, with improved diet and living conditions. For instance, Japanese who were born in California grew several centimetres taller than their parents who were from Japan (Greulich, 1957, pp. 489-515).

To illustrate this further, a person from his or her genes may have a height range of from 160 cms to 170 cms. The mature height of the person will, however, be the result of the genes' interacting with the environment - including health, diet and exercise. If the environmental pressures demand a response which is outside the range of the genes, the person will not survive (Weiss and Mann, 1978, p. 438).

Forced physiological alterations as adaptations to the environment can also lead to anatomical change. This is usually more likely to occur in a child or youth under some substantial pressure from the environment. For example, the body can adjust its growth pattern to fit in with the amount of food and oxygen available. However, the limits of our physiological and anatomical adjustment are at least partly set by the genes.

So adaptation takes many forms. Steatopygia, is a genetic trait, found in Bushmen and Hottentots of Africa. The buttocks of the female protrude because fat is stored there in much the same way as a camel stores fat in its hump, for more lean times or when extra energy is needed, during food shortages and pregnancy for instance. This adaptive characteristic gives greater security to the female to survive in a harsh, uncertain environment.

Intelligence, as we have seen, is partly a result of the physical environment. Research with nearly 1,000 preterm babies from birth to eight years old suggests that a diet of breast milk, in infancy, leads to higher intelligence. This research was controlled to exclude the breast feeding process and found

that breast milk led to a significantly increased IQ of 8.3 points in the children (Lucas, Morley and Cole, *et al*., 1992, pp. 231-264).

Humans' awareness of their environment is determined by their physiological mechanisms which are involved in processing information through the senses into coded neural activity (Vander, Sherman and Luciano, 1970, p. 509).

Several studies suggest that if humans and animals are deprived of an interesting and varied environment, then they will not develop to an otherwise expected potential (Ausubel, 1968, p. 183). Hunt (1961) says that curtailing toddlers' explorations may hinder their rate of development and even lower the final level of intelligence that they can achieve.

It has been found, and is now well established, that if children do not go through the crawling stage, then their psycho-motor development may be retarded, and because of this, some children at school have difficulty developing physical co-ordination skills necessary for writing.

Unless a youngster has adequate mental stimulation during the preschool years, the work of the school for the following ten years might be largely wasted (Bloom, Davis, and Hess, 1965)

It may be that a non-stimulating environment actually retards physiological development of the brain. For example, it has been found that, if rats live in stimulating environments, they might have larger brains than rats which live alone in non-stimulating environments (Krech, 1969, pp. 370-374).

Evidence of the association of brain size and human intelligence is inconclusive and contentious in the present climate of research. However, actual brain size (not cranial size) may be a factor among many others (including cell density and number of convolutions) that, at least in part, is associated with intelligence (Cattell, 1987, pp. 213-215; Cobb, 1965, pp. 555-561).

The body adapts through its systems and there are seven generally recognized body systems:

- Endocrine
- Nervous
- Excretory
- Muscular and skeletal
- Respiratory
- Circulatory
- Digestive

These systems are interrelated, and so we can often see a paradox when studying human adjustment. Paradoxically, a change in physiological function to increase chances of survival can be lethal. Sweating under heat stress is meant to cool the body, but it can also lead to death by dehydration. Thus the adaptive process is like a two-edged sword. It may be advantageous from one point of view, yet harmful from another.

The Quechua Indians of the highlands in Peru live in very high altitudes. The Andean plateau reaches an exalted altitude. Some of these Indians have even lived as high as 17,000 feet. Such high-altitude living causes stresses that are very different from those of lowland living. There must be adjustment to lower levels of oxygen and air pressure, and to lower temperatures which cause considerable cold stress. These people living at high altitude have greater *aerobic capacity*; greater ability to use available oxygen to complete the work at hand (Baker, 1966, p. 291). Quechuas (of the same gene pool), who live in the lowlands, need more oxygen to complete the work at hand as they have not been stressed to be as efficient in oxygen as their relatives in the highlands have been stressed.

Even though genetic factors influence the final morphology, the environmental pressures can guide the development towards the final outcome also. If oxygen is in low supply in the developmental years of a person, the chest cavity and probably the lungs will be bigger. So during development, the plasticity of the body adjusts itself to match the prevailing conditions for oxygen (Weiss and Mann, 1978, p. 440; Hock, 1970, pp. 195-204).

When an adult is exposed to a stress which was not encountered during childhood development, there are generally two stages of physical response; the first and immediate response which is usually not so efficient, and the second response which involves a more lasting acclimatization.

For instance, when a lowlander first moves to a high altitude, the stress of hypoxia will initially cause higher respiratory and pulse rates, increase in blood pressure and cardiac output and a dilation of the arteries. These rather inefficient responses are made in order to get more oxygen into body cells by working the heart harder.

Later on when the body produces more red blood cells and hemoglobin, the heart does not have to work so hard to supply oxygen to the cells, as the blood can now carry much more oxygen. The lungs also increase slightly in size, and therefore surface area, making it easier for oxygen to get into the blood stream and carbon dioxide to be released from the body also (Hock, 1970, pp. 195-204).

The incidence of miscarriage at high altitude is quite high in the surviving high-altitude population. However, not every adult can adapt to such high-altitude stresses, and so fainting, nausea and loss of peripheral vision may occur in some individuals. Some people will even die if they remain in these altitudes (Weiss and Mann, 1978, pp. 441,442; Hock, 1970, pp. 195-204; Vander, Sherman and Luciano, 1970, pp. 331,332; Edwards and Bouchier, 1991, pp. 86,87).

The environment is powerful in changing the manifestation of living characteristics, even from the same set of genes. The environment of a rabbit can produce stunning changes in the colour of its coat. A Himalayan strain rabbit reared in a cold place will have black fur. Another rabbit of the same family, which is reared in a warm climate, will have white fur except on the extremities. Reared in a very hot climate, the same rabbit would have been entirely white. This change in colour is produced by the enzyme, which adjusts colour, being activated in hotter climates. This change from white to black occurs with the same inheritance and is produced by a different environment (Sinnott, Dunn and Dobzhansky, 1958; Weiss and Mann, 1978, p. 324).

A whole multitude of factors is associated with the individual's physical appearance, as genes, disease, diet, life style and the physical environment are all powerful in moulding body shape.

King-Boyes (1977, p. 16) graphically describes how well the Australian Aborigines are adapted to their desert environment. From the human biologist's viewpoint, the Aborigines are of great interest.

Variations in skin pigmentation are the result of a high concentration of melanocytes at the dermo-epidermal junction. High levels of melanin in their skin offer the Aborigines a good degree of protection from the sun and assists in their survival.

By contrast, people in temperate and subpolar regions have lighter skin, so that sunlight will be better absorbed in order to stimulate Vitamin D production, to enable calcium to be used. Misplaced in the tropics, light skinned people are likely to suffer from skin cancer, almost unknown among Africans, Indians, Semitics and Orientals (de Lacey, 1992).

The physical characteristics of the desert Aborigines, which include wide nostrils, protuberant forehead, receding eyes, long and thin legs, are good examples of being biologically equipped for the environment. The nasal passages seem to be designed to regulate the temperature and humidity of the air breathed into the lungs. By contrast, the other races occupying the

colder areas of the world tend to have developed a high-bridged, narrow-nostril nose characteristic.

It is not necessary for the desert Aborigines to warm the air they breathe, but as the air is dry it is necessary to have greater internal mucous-membranous surface area to moisten the air entering the lungs. So the phenotype to flourish in this environment, is different to the phenotype for the environment of say the Northern European region.

THE BODY IN ITS CULTURAL ENVIRONMENT

The lifestyle of humans influences their total state: their physiology, wellness, behaviour, perception and attitudes. Due to physiological reasons, usually an infection is more severe in previously unexposed adults than in children. For instance, in Tanzania where Polio is endemic, Eshuis and Manschot (1985, p. 160) note that a young child has only a 0.001 chance of suffering paralysis with Polio. However, an adult of 20 years or more has a 0.02 chance of paralysis. Thus the adult has twenty times the risk of becoming paralyzed with Polio as compared with the child.

Along with these physiological factors are various cultural practices in every group of people, which influence who gets sick and who does not; and who may even get treated and eventually recover. The recent history of poliomyelitis shows how the twin factors biology and culture interrelate to cause infection at an individual and mass level.

Poliomyelitis is caused by a virus, commonly transmitted from child to child by contact with contaminated fecal matter through poor sanitary conditions. However, in the past, symptoms in most infected children were mild with only headache, low fever with respiratory or gastrointestinal irregularities, followed by complete recovery, and the body's immune system produced antibodies (Weiss and Mann, 1978, p. 453; Eshuis and Manschot, 1985, pp. 159,160). Even with a very virulent strain, most people developed antibodies and escaped paralysis and death.

Poliomyelitis used to be a widespread disease and before the nineteenth century was endemic. Epidemics only began to appear as dense population hordes developed and their economic progress and improved sanitation left them unexposed with no immunity. So when a virulent strain appeared, epidemics appeared widespread and with dramatic deathly results (Berkow, 1978, p. 49; Hetzel, 1977, pp. 20,21).

So epidemic, infectious diseases, it has been argued, are largely a symptom of urbanization. In any epidemic, not all exposed individuals contract the disease and not every infected individual has the same type and degree of

symptoms, nor does every individual pass the disease to someone else. If the population is small and scattered, there is a low probability that the disease will spread as an epidemic. However, as population size and density increases, so does the probability that the infection finds new victims and causes an epidemic (Weiss and Mann, 1978, p. 455).

As our modern culture became cleaner and cleaner, many children were not exposed to the virus and the accompanying mild symptoms in order to develop antibodies. So when epidemics from highly virulent strains of the virus appeared in the 1950s, many young adults could not make antibodies quickly enough when infected, to avoid crippling and paralysis. This virus can violently attack a population which was previously unexposed to the disease. For instance, the virus hit several Eskimo communities in 1949, and 14% of the population died and 40% were paralyzed (Weiss and Mann, 1978, p. 454; Eshuis and Manschot, 1985, pp. 159-160).

In 1952 a Poliomyelitis epidemic hit Detroit, but affected mostly those of the high socio-economic class, who were mainly whites, because their children who were used to hygienic living had not been exposed to the disease before. Thus these whites had seven times the number of paralytic polio, cases as compared to the poorest blacks in the area.

After this epidemic, there was another wave of infection which occurred after limited vaccination campaigns were racially administered in favour of the whites. So paralytic polio in this wave occurred a massive 37 times more among the blacks as compared to the whites. By 1960, immunization was almost universal in the area and polio had become very rare (Weiss and Mann, 1978, p. 457).

Travel also is a good spreader of infectious disease and this mobility of populations in modern times has facilitated the spread of disease. For instance, flu epidemics are not uncommon to become world-wide in a short span of time. AIDS is an example of a modern disease which, in the space of only a few years, has found victims in every corner of the globe. Its dramatic spread is probably fanned by cultural factors like travel, blood transfusions, drug addiction and freer sexual behaviour of these times. There are almost certainly other cultural and physiological factors associated with contracting and spreading of disease that we are unaware of at present.

Infectious diseases, up until AIDS, had waned as a cause of death in the developed western world. This has been the result of improved standards of living, hygiene and advances in medical sciences. Alternatively, non-infectious diseases have become a major killer in western affluent culture. Cancer, heart disease and psychological problems are the big killers in modern society and these diseases it has been argued are largely the result of

behaviour in the western cultures, where stress, alienation, smoking, drug addiction, lack of exercise and alcoholism have become a way of life for many people. No doubt bad diet, food additives, processed food, and environmental pollution have also become facilitators of many modern diseases.

One factor that has brought non-infectious diseases to the fore as killers is that most people in the West, through improved medical services and standard of living, live longer, and with longevity come many of these non-infectious age-related disorders (BBC, 1993).

Diet, biology and culture are always linked. Another genetic variation found in many adults is the inability to digest the lactose sugar found in milk. Actually, the absence of lactase, an enzyme usually found in the digestive system, causes this inability. This characteristic is a result of the genetic make-up of a person when that same person has two recessive alleles relating to this characteristic. Thus if a lactase-deficient child or adult takes in any lactose, the following symptoms may result: flatulence, cramps and diarrhoea (Gray, 1986 p. 35).

It is no wonder that generally in a population which has lactase-deficient adults, there has not been a ubiquitous presence of herders and drinking of milk. It has been suggested that, in societies which introduced herding and the drinking of milk, the natural selection favoured humans who were lactase-sufficient. Thus a group's subsistence will influence its biology. This has been put to good use in some societies. For instance, in some Asian societies milk is used as a laxative (Weiss and Mann, 1978, p. 485).

The eye, with its very powerful and large optic nerve, close proximity and strong connection to the brain, and a jam-packed power center of nerve activity, is a major organ of perception. For instance, the eye has 125 million light sensitive receptors in the retina alone (McNaughton, 1989, p. 36). In spite of this awesome sophistication and complexity, colour blindness is quite a common genetic variant.

Colour blindness is mostly manifested in reduced not absent colour vision, and is a sex-linked inheritance favouring women (<1%) over men (8%) (de Lacey, 1992).

Colour blindness may also be associated with subsistence patterns. Colour blindness is generally less common in societies where hunting and gathering are carried out. Thus only around 2% of Eskimos, Australian Aborigines and American Indians are colour blind and this contrasts with up to 10% in other populations. It has been suggested that colour blindness would be a disadvantage in hunters as they would not be so adept in spotting the prey

(Weiss and Mann, 1978, p. 484; Young, 1974, p. 553). Chinese, who are long removed from hunting and gathering, have poor colour vision, American Indians who have recently been hunters and gatherers have good colour vision and the Brahmin caste that does not have a history of hunting and gathering had the worst colour vision statistics of all other castes in the study (Post, 1962a, pp. 131-146, 1962b, pp. 189-212, 1964, pp. 65-81; Spuhler and Lindzey, 1967).

Myopia is found to be more prevalent in some racial groups - 10% in English Anglocelts, 20% in London Jews, and 30% in some Oriental groups. It also appears that this trait, at least partly genetically endowed, has its roots in the subsistence style of its people (de Lacey, 1992).

Many adaptations by humans to the environment are cultural and forestall or reduce the level of genetic or physiological adaptation required for survival. The Quechua Indians, for example, have made various cultural adaptations to cope with substantial cold stress. Any outdoor activities are carried out in warmer periods of the day, and their adobe huts, while simple, provide a fairly good insulation against the cold. Even when it is freezing outside, the huts maintain a warmer internal temperature of around 8° Centigrade.

There is also some evidence that the body extremities of these Indians cope better with the cold by increased blood flow to these body parts. Also alcohol drinking is a cultural way to cope with the cold, as this causes greater blood flow to the extremities causing a rise in the skin temperature (Baker, 1966, p. 291).

Of course there are also many cultural ways to handle heat stress. In hotter climates the siesta (midday nap) is common. Also the following adaptive behaviour is widely present in hot climates to cope with heat stress: staying indoors or under shade, wearing a hat (or other head cover), loose-fitting and light clothes, and limiting strenuous activity to the cooler hours of early morning or late afternoon. Diet in some groups shows adaptation. These diets will be low in calories and protein which require little for the metabolism and keep insulating body fat from building up.

Overcrowding as a sociocultural stress can have a powerful affect on a population. Mammals react physiologically to dense populations around them. Mammals secrete the hormone ACTH from the pituitary gland when they experience emotional stress or other trauma. Subsequently the cortex of the adrenal gland secretes glucocorticoids. These substances seem to prepare the body to cope with stress by physical activity whether it be fleeing or fighting (the *fight or flight reaction)*.

Investigations have shown that levels of glucocorticoids increase markedly in humans in crowded conditions. Increased levels of glucocoiticoids lead to a decrease in the body's ability to resist infection because both white-blood-cell production and antibody production are retarded. It is also interesting that increased glucocoiticoid levels influence the hormones that direct development of the reproduction system.

For instance, if population densities are high enough the sexual development of mice may be delayed or totally inhibited. Some of the fertility problems may be weak sperm, impotence, small testes and uterus, miscarriage and still birth. Even when there is a birth, crowding may retard lactation which results in stunted growth (Weiss and Mann, 1978, p. 462).

High population densities can also lead to behavioural changes. Aggression, cannibalism and unusual sexual activity and desertion of the young, in mice, have all been associated with overcrowding. It does seem that, beyond a certain point, overcrowding produces behavioural and physiological changes that inevitably lead to a lowering of the population density (National Geography Society, 1971).

Actually the full effect of overcrowding on humans is blurred and often ameliorated by cultural adaptation. It may be that cultural adaptation can often override the disadvantages of overcrowding on human physiology and psychology.

Desmond Morris in *The Human Zoo* (1969) suggests that in crowded conditions in urban living, most people feel more aggressive, tense and alienated. He argues that human life in cities is like caged-animal life in a zoo, and attributes much of the human deviant behaviour and violence in cities to overcrowding.

There are many other stresses in modern urbanized society and some of these are: chemical food additives, fabric softeners, synthetic materials for clothes, radiation from electrical equipment, noise pollution, air pollution, cosmetics, processed and therefore depleted food, overly high calorie and overly high protein diets, lack of physical activity, drugs, iatrogenic side-effects, preoccupation with sex and sensual gratification, status seeking, financial security, success, competition, freedom, individualism, choice, consumerism, materialism, stress and alienation.

Living indoors is another cultural factor that can have dramatic effects on the prevalence of rickets in a population. For example, wealthy Moslems in India tend to live indoors more than higher class Hindus, and low class Hindus spend much of their time outdoors. Interestingly, the Moslems have

the highest incidence of rickets and the Hindus, who live in poverty, the lowest incidence of rickets (Weiss and Mann, 1978, pp. 415-417).

Kuru is a disease found among the Fore speaking population in New Guinea and associated with dietary habits of a specific cultural group. It is a very severe disease which causes death by the inability to swallow through starvation, suffocation and pneumonia. Mainly women and young children contract the disease. Kuru is caused by a virus, and was passed through cannibalism. Women and to a lesser extent children were the main practitioners of cannibalism, as it was shunned by the men who thought it would stunt their growth or rob them of their strength. The disease can take years to develop symptoms. It infects the brain and is spread through cannibalism. When cannibalism was eradicated, the disease disappeared (Weiss and Mann, 1978, p. 482).

Even the preference for light skin colour can influence social behaviour. Traditionally in many societies (e.g., Greek, Japanese and Chinese) a fair skin for women has been considered more sexually attractive and elegant. In Japanese society, for instance, light-skinned middle-class women are able to move up the social ladder, whereas dark-skinned middle-class women have found difficulty maintaining their social class through marriage and other social connections.

I remember having a Chinese friend from Macao when I was a student. When we went out in our group one time, even though there was only a slight sun, she wore a bonnet to keep the sun off her skin. She commented that in order to remain a beautiful Chinese girl, she would keep her skin as fair as possible.

There is some evidence to suggest that body build may be related to the subsistence pattern in the population. For instance, average American birth weights in the 60s show substantial variation. However, this variation correlated highly with the adult stature of the parents. Children from those who were once food growers were small, but descendants of the bison hunters were large. Is this difference adaptive to various levels of nutrition or is it a genetic characteristic which best equips the populations for the tasks that surround them? The answer has yet to be found (Weiss and Mann, 1978, p. 484).

Finally, social and mental activity can be massively influenced during the formative years. Harlow (Harlow and Harlow, 1962, pp. 136-146; in Hetzel, 1977, p. 75) has shown that impersonal mothering of monkeys by wire mothers did not seem to have immediate obvious adverse side effects but later on these same monkeys:

- Did not mate
- Had not developed any maternal behaviour
- Could not mix socially with other monkeys

Indeed mothering, affection and submission, and much other behaviour, must be learned by chimps from their family and group environment as a youngster (Attenborough, 1985).

The same is true of humans. Bowlby (1953, 1969) and Spitz (1975, pp. 29-44) have conclusively shown the following similar dramatic effects on children who suffer from maternal deprivation:

- Retarded mental development
- Inactivity
- Apathy

In other words, complete psychological development depends on a multiplicity of environmental stimuli and conditions. In their absence, or if they are inadequate, intelligence does not develop normally and the personality may become grossly atypical and maladjusted (Dubos, 1969, p. 22).

BURNING-IN OF BEHAVIOUR

Some animals, like horses and wildebeest, are born with fully functional sight and are able to run within minutes of birth. However, other animals, like cats and mice, do not open their eyes for the first days or weeks of life. Felines are born with instinctive pouncing and killing movements. Indeed it seems that many animals are born with the visual ability for discrimination of distance and depth (Day, 1972, p. 165; Hilgard, Atkinson and Atkinson, 1971, p. 152).

A human child is born with built-in sucking and clinging responses (McCrone, 1990 p. 27), and maybe an already developed sense that solid objects do actually exist, and a perception of height and depth, along with various pre-programmed behaviours for walking and clinging (Barnes-Gutteridge, 1974, pp. 6,7; Campbell, 1989, p. 26; Gibson and Walk, 1960, pp. 64-71).

Generally, however, the human baby comes into the world with minimal readiness and a low integration of abilities to look after itself. So the human baby is born with incredible potential, but virtually in a helpless state and unable to fend for itself.

The burning-in period, which lasts for the first few years, is important as this is the moulding period that produces what the fledgling will become at maturity. Even the Jesuits used to say,*give me a child till he is seven and he will not depart from the way*. To a large extent this burning-in process leads to irreversible results and sets the behaviour and perception in a particular mould, and, beyond some limitations, that mould cannot be broken.

Two Indian girls, who had been raised by wolves, ran around on all fours, howled and ate only raw meat, and slept curled up all day. Very soon after being taken into human society, they both sickened and died. A six-year-old boy in Uganda was raised by Vervet monkeys; he moved on all fours and chatted like a Vervet, and even though he learned to wear clothes and walk haltingly upright, he did not pick up even one word of speech (McCrone, 1990, p. 26).

Even though some of these stories lack adequate documentation, they do illustrate the point that human potential must be developed from a young age, or it is at risk never to be developed in later years.

Both Doman (1975) and Luria (1975) have illustrated different levels of plasticity. Through case studies, they show different possibilities of flexibility and potential for development in a child as compared to an adult. Doman cites the case of Tommy who lost half his brain due to disease, but grew up to lead a normal life. Conversely, Luria documents the life of a wounded soldier who suffered brain damage from a bullet and the painful and arduous task of limited recovery for this person just to remember events, words and their meanings.

There are some sensitive areas in which a child needs stimulation and experience, or there is great risk of permanent loss of potential.

Children who have been blind in childhood experience great difficulty in learning to distinguish visually a square from a circle after their vision has been restored (Dubos, 1969, p. 21).

Many scientists have suggested that if humans and animals are deprived of an interesting and varied environment, then they will not develop to an otherwise expected potential (Ausubel, 1968, p. 183; Dubos, 1969, pp. 14-19).

If a lamb is deprived of running with its mother and the flock for the first few days of its life, it will grow up to become a loner and never show gregarious behaviour as a member of any flock.

Konrad Lorenz (1952) notes that if a gosling is not exposed to its mother, or another goose, but to a moving human during the first 20 hours after hatching, its *critical period*, the gosling will develop a lifelong preference for humans over all geese including its mother.

Kittens which are nurtured in a *complex-free* environment are more lethargic (Wilson, Warren and Abbot, 1965, pp. 362-370). Indeed, it has been found that if a kitten is reared in a room where everything is painted with vertical lines, at later time when the same kitten is presented with horizontal lines or forms, it will simply not be able to perceive them. This is because its eyes have become used to seeing only vertical form. Such kittens will be maladapted in the normal environment, and when they confront horizontal edges will not see them, and will tend to bump into chair rungs and walk over steps without any precautions to avoid injury (McCrone, 1990, pp. 24,25; Blackmore and Cooper, 1970, pp. 477,478).

This fine tuning process of burning-in the human brain has been graphically illustrated by the fact that if a two year old child's eye is bandaged for a week this can lead to permanently poor sight in that eye. Even more dramatic is the possibility that a baby's eye, if bandaged for too long at birth, can lead to blindness (McCrone, 1990, p. 25).

Even though language ability is a pre-programmed orientation in humans, it must and can only be fully realised in development by and through our social and physical environments (Leigh, 1999b). Joan Beck (1977, pp. 45-48) talks of a *switch* mechanism in the brain, and argues that if certain abilities are not developed in childhood then these abilities are lost to the adult, as the brain slowly but automatically switches off permanently the potential for development of these abilities. She cites the case of second-language learning, and says that if this ability is not capitalized on in childhood, then later on in life the adult can not reactivate this ability as it has been permanently switched off. Thus the brain's physiology has been burned in to a specific mould.

DIFFERENCE, DEFICIT OR DISADVANTAGE

Humans have known for thousands of years that there are differences between the various groups of people on earth. In the last 100 years many scientists have entered the arena in attempts to ascertain why these differences are present and what role nature and nurture have to play.

The question of deciding which is most influential on the human potential - nature or nurture - is fundamentally flawed, except perhaps for some relatively easily identifiable factors, a few of which have already been discussed like some diseases, skin colour and height. For example, to ask

the question, which is most important, nature or nurture, is often like asking which is most important part of the house, the walls or the roof. One without the other does not make a house and it is not possible to say which is the most important. In addition to that, human inheritance is complex, as is the environment, and the interrelationship of the two is even more complex. So, to ascertain whether nature or nurture is more decisive in explaining the final outcome for an individual, is also probably beyond our research techniques, at least at present (Neisser, 1986).

The Gestalt principle is that, *the whole is greater than the sum of its parts*, and it may be that the efficacy of this principle has propelled humans beyond some threshold whereby the interactive functioning of the human anatomy, physiology and as yet other unknown influences, has led to a qualitative difference in mental prowess. However, to fully understand this mechanism in action, we would at first have to develop a deeper appreciation for all the elements that make up humans as living intellectual entities.

The biological concept of differentiation, that cells and organisms develop and grow to carry out specialized tasks has been observed by biologists for many years.

Swanson (1960) and Waddington (1966) have argued that biological development is possible through growth and differentiation. Differentiation implies that a cell has its own physiology and therefore function.

From a generalized cell at conception the embryo develops into a structure of specialized cells with differing physiologies and functions. The embryo develops and increasingly is made up of a greater array and number of highly differentiated cells which function in harmony to the benefit and fitness of the embryonic organism. The more differentiated a cell becomes the more committed it becomes to a particular specialized function and the less likelihood there is that it will deviate from that function.

Werner (1948), Witkin (1967) and Berry (1966) have all applied the biological concept of differentiation to the psychology of humans. This approach is that humans specialize to adapt to their particular physical and social environment, in order both to survive and thrive.

It is therefore not difficult to see that the culmination of the human heritage has led to various kinds of differentiation in the various groups of mankind. This differentiation is a result of the physical and social setting having influence on the type of specialization required of human physiology, anatomy, genes, psychology, and culture, so that the members of any

particular group can effectively function in their prevailing peculiar surroundings.

In spite of the tendency for humans to adapt in order to survive in their surroundings, many descriptions of different racial, national and ethnic groups have been developed for those individuals who do not fit the western, urbanized formally educated model. Some of these descriptions, just to name a few, have been:

- deprived
- deficient
- disadvantaged
- dull
- handicapped
- retarded
- underdeveloped
- savage
- stupid
- beastly
- maladapted
- maladjusted

Indeed, extreme views on other cultures and its peoples have always been a tendency in the human race.

Even it has often been stated by individuals of a particular race, that other races and cultural groups are not human. I have even heard that one cultural and racial group will say of another exotic one, *They are not human, just dumb animals*.

It is reputed that Abel Tasman expressed the following on the Australian Aborigines in 1644, when he commented that, *Certain parts* [of Australia are] *inhabited by savage, cruel, black barbarians...* (cited in de Lacey, 1974, p. 29).

Lieutenant Breton (1833) said that, *Speaking of* [the Aborigines] *collectively, it must be confessed I entertain very little more respect for the aborigines of* [Australia]*, than for the orang-outang; in fact I can discover no great difference*.

A more correct term, to replace derogatory terms implying deficit, would be *pragmatic disadvantage*, which would acknowledge that an individual has a physical and mental development for a particular environment, but in another environment he or she could be at a distinct disadvantage. For example, de Lacey (1974, p. 37) says that there are obvious differences

between the races and various human groups. He cites the case of Pygmies who cannot reach as high as Europeans, and the Masai of Kenya who can outreach almost all other peoples.

The *pragmatic difference hypothesis* avoids any implication of derogation, stating instead that, for better or worse, in each culture, there is a set of knowledge and skills which provide access to some benefits, as well burdens that a particular society has to offer (Poole, de Lacey and Randhawa, 1985).

Genetic and physical differences between the races and human groups are therefore facts of nature and adaptations, rather than signs of inferiority or superiority in themselves. Differences tend to be, for the most part, the results of adaptation to ancient or contemporary environmental diversity, especially climatic and disease factors. Indeed, human behaviour is very much dependent on both genetics and physiology (Deutsch, Katz and Jensen, 1968, pp. 24,48).

A CONCLUDING OVERVIEW

It has been shown that humans survive and are adapted to their environment through their genetic makeup, their anatomy, physiology, and culture (which includes behaviour and language).

There are similarities in all humans but the specific physical and cultural environment can change the physiology, anatomy, behaviour and language to produce somewhat unique people, in the different settings around the world.

Culture - including behaviour and language - not only offers humans a process for adaptation, but culture also provides human groups with their own norms, values and beliefs within which they can have their own parochial and individual identity to interpret, not only themselves, but their surroundings also.

In addition, it is through the cultural elements of behaviour and language that each individual is able to communicate with others. Also for its development and maintenance, culture has its own systems and structure, and these ensure the ongoing viability for each culture.

The one great universal that can not escape any perceptive observer, is that the fundamental physiological and mental tendency for all humans, is to adapt to the surroundings, to make their survival style fit as best as possible with the pressures around them.

However, the process and the resultant fit is not always perfect and can be deleterious, as built-in methods of adapting to the environment can lead to advantage on one hand and disadvantage on the other, or advantage in one environment and disadvantage in another.

Actually the adaptive process involves continual negotiation between both the physical and cultural aspects of the surroundings and each human's place in them. Culture, its members and the physical environment are dynamically interrelated, and a change in one automatically leads to a change in the others.

This continual negotiation process leads to different behaviour and therefore specific language, and body language, in each of the myriad parochial environments of humans around the world.

So we actually see a dynamic interaction going on between what each individual is, and the total environment *out there*. Much of that environment is incorporated into each one of us - mentally internalised or biologically integrated, so that we are indeed not only *humans in culture, but that culture is also inside us*.

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