

Race Differences in Intelligence

An Evolutionary Analysis

Richard Lynn



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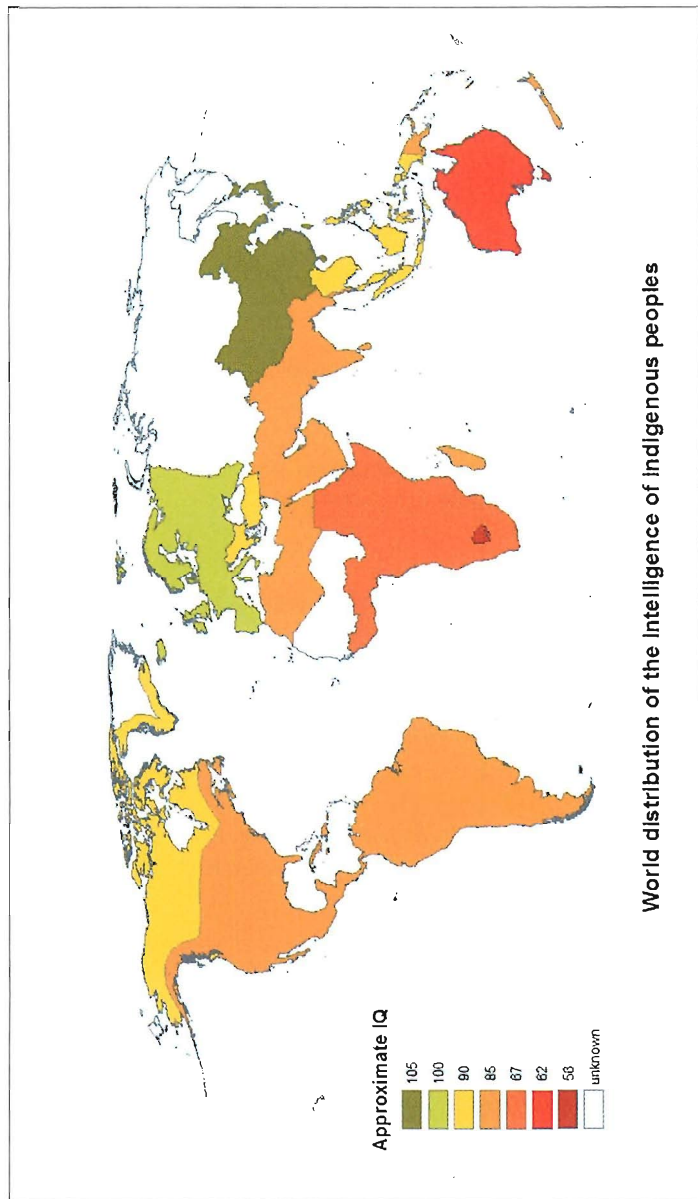


Christopher Brand (left) and Richard Lynn

Race Differences in Intelligence
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Richard Lynn
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For Joyce
Sei il mio amor e tutta la mia vita
(You are my love and my whole life)
Mimi - La Boheme, Act V



World distribution of the Intelligence of indigenous peoples

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Chapter 1. The Meaning and Measurement of Intelligence

1. Definition of Intelligence
2. The Hierarchical Model of Intelligence
3. The IQ
4. Flynn Effects

Race differences in intelligence began to be analyzed scientifically in the middle years of the nineteenth century. In the 1830s, Samuel Morton (1849) in the United States assembled a collection of skulls, measured their volume, and calculated that Europeans had the largest brains followed by Chinese, Malays, and Native American Indians, while Africans and finally Australian Aborigines had the smallest brains. He concluded that these differences in brain size accounted for the race differences in intelligence. A similar view was advanced a few years later in France by Paul Broca (1861, p. 304): "in general, the brain is larger in eminent men than in men of mediocre talent, in superior than in inferior races." About the same time Francis Galton (1869) in England arrived at the same conclusion by a different route. He assessed the intelligence of the races by the numbers of geniuses they produced in relation to the size of their populations. He concluded that the Greeks of classical Athens were the most intelligent people, followed in descending order by the lowland Scots, the English, the Africans, and the Australian Aborigines.

In the twentieth century this question continued to be debated. The intelligence test was constructed by Alfred Binet in France in 1905. It was translated into English by Lewis Terman (1916) at Stanford University and later in the century a number of other intelligence tests were constructed. This made it possible to measure and compare the intelligence of the various races and by the end of the twentieth century many hundreds of studies had been published on this issue. Most of these have been concerned with the difference between blacks and whites in the United States, but studies have also been made of the intelligence of peoples in virtually every part of the world. For the difference between blacks and whites in the United States, the most authoritative studies are by Shuey (1966), who summarized all the studies from World War I up to 1965, Osborne and McGurk (1982), who updated this summary to 1980, Loehlin, Lindzey, and Spuhler's *Race Differences in Intelligence* (1975), Herrnstein and Murray's *The Bell Curve* (1994), and a series of publications by Jensen culminating in *The g Factor* (1998). There has been some interest in the intelligence of the Chinese and Japanese, which was reviewed by Vernon in *The Abilities and Achievements of Orientals in North America* (1982). A number of studies of the intelligence of Africans, Caucasians, and East Asians have been summarized by Rushton in *Race, Evolution and Behavior* (2000). All of these studies have been concerned with two problems. These are the evidence on race differences in intelligence, and the degree to which these differences are determined by genetic and environmental factors. It is widely accepted that race differences in intelligence exist, but no consensus has emerged on whether these have any genetic basis. All those named above have argued that there is some genetic basis for race differences. However, a number of authorities have concluded that there is no compelling evidence for genetic factors. This position has been adopted by Flynn in his *Race, IQ and Jensen* (1980), Brody in *Intelligence* (1992), and Mackintosh in *IQ and Human Intelligence* (1998).

The present book differs from previous studies in four respects. It is the first fully comprehensive review that has ever been made of the evidence on race differences in intelligence worldwide. Second, it reviews these for ten races rather than the three major races (Africans,

Caucasians, and East Asians) analyzed by Rushton (2000). The races analyzed here are the Europeans, sub-Saharan Africans, Bushmen, South Asians and North Africans, Southeast Asians, Australian Aborigines, Pacific Islanders, East Asians, Arctic Peoples, and Native American Indians. Studies of these are presented in Chapters 3 through 12; Chapter 13 summarizes these studies and gives evidence on the reliability and validity of the IQs of the races. Third, Chapter 14 discusses the extent to which race differences in intelligence are determined by environmental and genetic factors. Fourth, Chapters 15, 16, and 17 discuss how race differences in intelligence have evolved over the course of approximately the last 100,000 years. These discussions are preceded by accounts of the nature of intelligence and the measurement of race differences given in this chapter, and of the concept of race in Chapter 2.

1. Definition of Intelligence

There is a widespread consensus that intelligence is a unitary construct that determines the efficiency of problem solving, learning, and remembering. A useful definition of intelligence was provided by a committee set up by the American Psychological Association in 1995 under the chairmanship of Ulrich Neisser and consisting of eleven American psychologists whose mandate was to produce a report on what is generally known and accepted about intelligence. The definition of intelligence proposed by the Task Force was that intelligence is the ability "to understand complex ideas, to adapt effectively to the environment, to learn from experience, to engage in various forms of reasoning, to overcome obstacles by taking thought" (Neisser, 1996, p. 1). This definition is generally acceptable, except for the component of effective adaptation to the environment. All living species are adapted effectively to their environment or they would not have survived, but many living species such as snakes and other reptiles cannot be regarded as intelligent. In economically developed nations, the underclass with its culture of long-term unemployment, crime, drug dependency, and welfare-dependent single mothers, is well adapted to its environment in so far as it is able to live on welfare and reproduce, but it has a low average IQ, as shown in detail by Herrnstein and Murray (1994), and is not intelligent in any reasonable sense of the word or as measured by intelligence tests.

A definition which avoids this misconception was proposed by Gottfredson and endorsed by 52 leading experts and published in the *Wall Street Journal* in 1994:

Intelligence is a very general mental capacity which, among other things, involves the ability to reason, plan, solve problems, think abstractly, comprehend complex ideas, learn quickly and learn from experience. It is not merely book learning, a narrow academic skill, or test taking smarts. Rather, it reflects a broader and deeper capability for comprehending our surroundings - "catching on," "making sense" of things, or "figuring out" what to do (Gottfredson, 1997, p. 13).

Intelligence conceptualized as a single entity can be measured by intelligence tests and quantified by the IQ (intelligence quotient). The theory of intelligence as largely a single entity was first formulated in the first decade of the twentieth century by Charles Spearman (1904), who showed that all cognitive abilities are positively intercorrelated, such that people who do well on some tasks tend to do well on all the others. Spearman devised the statistical method of factor analysis to show that the performance of all cognitive tasks is partly determined by a common factor. He designated this common factor *g* for "general intelligence." To explain the existence of the common factor, Spearman proposed that there must be some general mental

power determining performance on all cognitive tasks and responsible for their positive inter-correlation.

2. The Hierarchical Model of Intelligence

Spearman also proposed that in addition to *g*, there are a number of specific abilities that determine performance on particular tasks, over and above the effect of *g*. In the 1930s an alternative theory was advanced by Thurstone (1938) that there are seven "primary abilities," which he designated reasoning, verbal comprehension, numerical ability, spatial ability, word fluency (the ability to produce a number of words as exemplars of a concept in a short period of time), memory, and perceptual speed. In the second half of the twentieth century, a general consensus emerged that both the Spearman and the Thurstone models were partially correct and that intelligence is best conceptualized as a hierarchical structure that can be envisioned as a pyramid in which there are some seventy narrow abilities at the base (Spearman's specific abilities), eight to ten second-order or group factors at the next level (Thurstone's primary abilities), and a single general factor (Spearman's *g*) at the apex. The leading contemporary formulations of this model have been set out by Horn (1991), Carroll (1993), and McGrew and Flanagan (1998). Their models are closely similar and propose that the eight to ten second-order factors consist of "fluid ability" (reasoning), "crystallized ability" (verbal comprehension), long-term memory, short-term memory, visualization (visual and spatial ability), numerical ability (arithmetic), mathematical ability, cultural knowledge, processing speed, and reaction time. This hierarchical model of intelligence is widely accepted among contemporary authorities such as the American Task Force on Intelligence (Neisser, 1996), Jensen (1998), Mackintosh (1998), Deary (2000), and many others. An extensive exposition of *g* and its structure, heritability, biology, and correlates has been presented by Jensen (1998) in his book *The g Factor*. He conceptualizes *g* as a construct or factor that he defines as "a hypothetical variable that 'underlies' an observed or measured variable" (p. 88). It is not possible to measure *g* directly, but the non-verbal reasoning IQs and scores obtained from intelligence tests and expressed as IQs (intelligence quotients) are approximate measures of *g*.

3. The IQ

The metric employed for the measurement of the intelligence of the races has been to adopt an IQ of 100 (with a standard deviation of 15) for Europeans in Britain, the United States, Australia, and New Zealand as the standard in terms of which the IQs of other races can be calculated. The mean IQs of Europeans in these four countries are virtually identical, as shown in Chapter 3 (Table 3.1), so tests constructed and standardized on Europeans in these countries provide equivalent instruments for racial comparisons. In Britain, Australia, and New Zealand, the intelligence tests have been standardized on Europeans, and this was also the case in the United States in the first half of the twentieth century. In the second half of the twentieth century American tests were normally standardized on the total population that included significant numbers of blacks and Hispanics. In these standardization samples the mean IQ of the total population is set at 100; the mean IQ of Europeans is approximately 102, while that of blacks is 87 and of Hispanics about 92 (see, e.g., Jensen and Reynolds, 1982). This means that when the IQs of other races are assessed with an American test standardized with an IQ of 100 for the total American population, 2 IQ points have to be deducted to obtain an IQ in relation to 100 for American Europeans. This problem does not arise with the only British test

used in cross-cultural studies of intelligence. This is the Progressive Matrices, which has been standardized on British Europeans. The tests used in the studies of racial intelligence are identified by acronyms in the tables in which the results are presented. The full names of the tests and description of the abilities they measure are given in the Appendix.

In the summaries of studies of race differences in intelligence, IQs are given for general intelligence and, where possible, for the major primary abilities of reasoning, verbal comprehension, and visualization. IQs for general intelligence are obtained either from general intelligence tests that contain a mix of reasoning, verbal, visualization, perceptual, memory, and sometimes other items, or from tests of non-verbal reasoning ability such as the Progressive Matrices, which provide closely similar results to those of tests of general intelligence (Carroll, 1993; Jensen, 1998). A few studies are also available and summarized for race differences in immediate memory and musical abilities.

4. Flynn Effects

A problem with the quantification of race differences in intelligence is that IQs have been increasing since the 1920s in many parts of the world. These secular increases were first shown by Smith (1942) in Hawaii and have been confirmed in several subsequent studies such as that of Cattell (1951) in Britain. They have become known as the Flynn effect following their documentation by James Flynn (1984, 1987). When results are reported for the IQs of populations an adjustment needs to be made for Flynn effects, as otherwise populations obtain spuriously high means when they are scored on norms obtained from Europeans a number of years previously. The magnitude of the Flynn effect varies with different tests. Mean IQs on the Wechsler tests increased in several countries by approximately 3 IQ points per decade from the mid-1930s to the 1990s, but the Verbal IQ increased by approximately 2 IQ points per decade and the Performance IQ by approximately 4 IQ points per decade (Flynn, 1984, 1998; Lynn and Pagliari, 1994). For the Standard Progressive Matrices, the British mean IQ increased at a rate of approximately 2 IQ points per decade from 1938, when the test was constructed, up to 1979, when the last British standardization on children was carried out (Lynn and Hampson, 1986; Flynn, 1987). IQs on the Goodenough Draw-a-Man Test in the United States increased by 3 IQ points a decade between 1955 and 1968, calculated from the Harris (1963) and the United States Department of Health, Education and Welfare (1970) standardizations. The same rate of increase on this test has been found for blacks in South Africa from 1950 to 1988 (Richter, Griesel, and Wortley, 1989). Adjustments for Flynn effects have been made in all the figures for IQs presented for the populations in subsequent chapters. Where tests have been used for which the magnitude of the secular increase is not known, an increase of 3 IQ points per decade has been assumed.

There is no general consensus regarding the causes of the Flynn effect. A number of different theories by leading experts are presented in Neisser (1998). Some, including Flynn (1987) himself, believe that there has not been any significant increase in what may be called "real intelligence" and that the increases must be due to improvements in test taking skills. Others such as Greenfield (1998), Mackintosh (1998), and Williams (1998) have argued that the increases are genuine and that a number of factors are likely to be responsible, including a generally more cognitively stimulating environment, especially from television, computer games, improvements in education, and the increased education of parents. The presence of the Flynn effect in the development of infants measured by tests such as the age at which an infant is able to stand up makes these factors unlikely. It is probable that there has been some genuine

increase in intelligence as a result of improvements in nutrition that have produced increases in height, in brain size, and probably in the neurological development of the brain during the twentieth century (Lynn, 1990a, 1998b).

Chapter 2. The Meaning and Formation of Races

1. The Formation of Races, Varieties, and Breeds
2. Varieties in Non-human Species
3. Taxonomies of Races
4. Race Differences in Diseases
5. Do Races Exist?

A b concerned with race differences in intelligence needs to define both intelligence and race. In the last chapter intelligence was defined and in this chapter a definition is offered of race. A simple and straightforward definition of race is that it consists of a group that is recognizably different from other groups. A fuller definition is that a race is a breeding population that is to some degree genetically different from neighboring populations as a result of geographical isolation, cultural factors, and endogamy, and which shows observable patterns of genotypic frequency differences for a number of intercorrelated, genetically determined characteristics, compared with other breeding populations. Geographical contact zones between races generally contain racial hybrids, who show intermediate values of gene frequencies from the more central distributions of the breeding groups. These hybrid and mixed race populations are known as *clines*.

1. The Formation of Races, Varieties, and Breeds

It is a general principle of evolutionary biology that when populations of species become isolated from one another they evolve into two or more sub-species. These are generally termed varieties, strains, or breeds. In the case of humans these different varieties are called races. These different varieties evolve as a result of the four processes of founder effects, genetic drift, mutation, and adaptation. The founder effect is that when a population splits and one group migrates to a new location to form a new population, the group that migrates will not be genetically identical to the one left behind. Hence the two populations differ genetically. The genetic drift effect is that gene frequencies change over time to some extent as a matter of chance and this leads to differences between populations. Drift continues with time and leads to increasing differences between races. The mutation effect is that new alleles (alleles are alternative forms of genes) appear through chance in some populations and if they are advantageous for survival and reproduction will gradually spread through the population. An advantageous new allele may appear as a mutation in one race, but not in others. The adaptation effect is that when a population migrates to a new location some alleles will be advantageous that were not advantageous in the old location. Individuals possessing advantageous alleles in the new location have more surviving offspring, so their alleles will be selected for and will gradually spread through the population. New varieties of several species have evolved as adaptations when populations have migrated into arctic environments. Some of these, such as foxes, bears, and hares, have evolved white fur to give them camouflage so they are not so easily seen by predators or prey. In all these cases mutations for white fur have appeared and

spread through the population because they have given the animals possessing them a selective advantage. Eventually the new advantageous alleles entirely replace the less advantageous alleles and are then said to have become "fixed."

In many cases it is uncertain why different strains have evolved different characteristics. For instance, the fur of the European squirrel is red while that of the North American squirrel is grey. Possibly one of these colors confers a selective advantage and appeared by chance in one of these populations through a genetic mutation.

2. Varieties in Non-human Species

It has long been recognized that most species have several varieties or what in humans are called *rac*es. Early in his career Charles Darwin noted the different varieties of turtles on the Galapagos Islands and it was this that set him thinking how these had evolved. Later in his book *The Variation of Animals and Plants under Domestication* (1868) he described the different varieties of a number of species such as pigeons, each of which have their own distinctive manner of flight, movement, and cooing.

There are a number of different varieties or races among the apes. There are four races of chimpanzee. These are the true chimpanzee (*Pan satyrus verus*) indigenous to West Africa between Guinea and Nigeria, the bald chimpanzee (*Pan satyrus satyrus*) of Cameroon and Gabon, the pygmy chimpanzee (*Pan satyrus paniscus*) of north central Zaire, and the Schweinfurth chimpanzee (*Pan satyrus schweinfurthi*) of northeast Zaire. These races differ in physical appearance, distribution of blood groups, and the cries they utter. Different races have evolved among animal species in accordance with the same principles as among humans. For instance, there are two races of gorilla. These are the mountain gorilla (*Gorilla beringei*) native to the mountains around lakes Edward and Kivu in eastern Zaire, Rwanda, and western Uganda, and the coast gorilla (*Gorilla gorilla*) of the forests of Cameroon and Gabon. The two races are geographically isolated from one another by about a thousand miles and have evolved differences in physical appearance and blood group. The mountain gorilla has a narrower skull, shorter arms, longer legs, thicker hair, and blood group A, while the coast gorilla has a broader skull, longer arms, shorter legs, thinner hair, and blood group B (Baker, 1974). Some of the differences between the two races have evolved as adaptations to their different environments. The mountain gorilla inhabits a colder and open environment while the coast gorilla inhabits a warmer and densely forested environment. The mountain gorilla has developed thicker hair than the coast gorilla as a protection against the cold. The coast gorilla has developed longer arms to swing from tree to tree. There is no obvious explanation for why the mountain gorilla has a narrower skull, longer legs, and blood group A. These differences may have arisen through founder effects, genetic drift, or chance mutations, or they may confer some unknown advantage.

There are also a number of varieties among domestic animals. These are normally called *breeds* and have been bred by humans to serve a variety of useful purposes. Frequently they have been bred for greater size or, in the case of cattle, milk yields. In some cases they have been bred to adapt better to certain environments. For instance, varieties of hardy sheep have been bred that flourish on mountains and differ from lowland sheep. Humans have bred as many as seventy-nine different breeds of dogs for a variety of abilities, such as retrievers for retrieving game, sheep dogs for rounding up sheep, rottweilers for guarding premises, cocker spaniels for house pets, and so on. These breeds differ in their general intelligence, their spe-

cific abilities, and the ease with which they can be socialized and made obedient (Coren, 1994).

3. *Taxonomies of Races*

Biologists and anthropologists began to analyze and classify races in the middle years of the eighteenth century. The first taxonomy of races was advanced by the Swedish biologist Carl Linnaeus in 1758. In his *System Naturae* he proposed that there are four races which he designated *Europaeus* (Europeans), *Afer* (black Africans), *Asiaticus* (Asians), and *Americanus* (Native Americans). In 1776 the German physician Johann Friedrich Blumenbach added a fifth race and proposed a classification based principally on skin color. He designated these five races the Caucasian (white), Mongolian (yellow), Ethiopian (black), American (red), and Malayan (brown). These taxonomies were based on the clustering of morphological features and coloration in different races such as the Europeans' white skin, straight hair, and narrow nose, the sub-Saharan Africans' black skin, frizzy hair, and wide nose, the Mongolians' (East Asians) black hair, yellowish skin, and flattened nose, the Native Americans' reddish skin and beaky nose, and the Malaysians' brown skin. Morton (1849) used Blumenbach's five-race classification when he made the first analysis of brain size in relation to race.

In the early twentieth century data were collected on differences in the frequencies of blood groups in various populations throughout the world. Hirszfled and Hirszfled (1919) showed that the frequencies of a number of blood groups are consistent with race differences in coloration and morphology. For instance, blood group A is present in 41 to 48 percent in Europeans but in only about 28 percent of sub-Saharan Africans, while blood group B is present in between 10 and 20 percent of Europeans and about 34 percent of sub-Saharan Africans. Native Americans have virtually no A or B blood groups and almost all of them have the O blood group.

The accumulation of data on the distribution of the Rhesus (Rh) blood groups was used by Boyd (1950) to advance a five-race taxonomy consisting of (1) Europeans with high frequencies of blood groups Rh cde and cde; (2) Africans with very high frequencies of Rh cde; (3) East Asians with high frequency of B and virtually no cde; (4) American Indians with very high frequency of O, absence of B, and few cde; and (5) Australids with high A, negligible B, and cde. This analysis showed that blood-group distributions were consistent with the morphological and coloration racial taxonomies of classical anthropology.

A more detailed taxonomy of races was advanced by Coon, Garn, and Birdsell (1950), who proposed seven major races, each of which was subdivided into two or more subraces. These were (1) Caucasoids, subdivided into Nordics of Northwest Europe, Slavs of Northeast Europe, Alpines of Central Europe, Mediterraneans of South Europe, North Africa, and the Near East, and Hindi of India and Pakistan; (2) East Asians, subdivided into Tibetans, North Chinese, Classic East Asians (Koreans, Japanese, Mongolians), and Eskimos; (3) Southeast Asians, subdivided into South Chinese, Thais, Burmese, Malays, and Indonesians; (4) American Indians, subdivided into north, central, south, and Fuegians; (5) Africans, subdivided into East Africans, Sudanese, West Africans, Bantu, Bushmen, and Pygmies; (6) Pacific Islanders, subdivided into Melanesians, Micronesians, Polynesians, and Negritos; and (7) Australian Aborigines, subdivided into the Murrayian peoples of southeastern Australia and the Carpentarian people of northern and central Australia. A closely similar seven-race taxonomy was proposed by Baker (1974) comprising the five major races of Blumenbach and the *Khoi*

Bushmen, consisting of the Hottentots and Bushmen of southwest Africa and the Kalahari desert, and the *Australids*, consisting of the Australian Aborigines and Melanesians.

In the 1980s and 1990s Nei and Roychoudhury (1993) and Cavalli-Sforza, Menozzi, and Piazza (1994) developed a new method of classifying humans into races on the basis of a number of genetic polymorphisms (polymorphism means that a gene has more than one allele or alternative form). The technique is to take a number of polymorphic genes for blood groups, blood proteins, lymphocyte antigens, and immunoglobins, and tabulate the different allele frequencies in populations throughout the world. These tabulations are then factor analyzed to find the degree to which the allele frequencies are associated to form clusters of populations that are genetically similar to one another. The Nei and Roychoudhury data for 26 populations have been factor analyzed by Jensen (1998) to show the existence of six major groups of humans that correspond closely to the races proposed by classical anthropologists. Using the traditional terminology, these are (1) Africans of Sub-Saharan Africa (Pygmies, Nigerians, Bantu, Bushmen); (2) Caucasoids (Lapps, Finns, Germans, English, Italians, Iranians, North Indians); (3) East Asians (Japanese, Chinese, Koreans, Tibetans, Mongolians); (4) Southeast Asians (Southern Chinese, Thais, Filipinos, Indonesians, Polynesians, Micronesians); (5) Amerindians (North and South Native American Indians and Inuit); and (6) Australian Aborigines (Australian Aborigines and New Guineans).

The same technique has been used by Cavalli-Sforza, Menozzi, and Piazza (1994) to analyze a larger data set of 120 alleles for 42 populations. These data were used to calculate the genetic differences between each population and every other population. From these they calculated a genetic linkage tree that groups the populations into what they called "clusters." They have found ten major clusters. These are (1) Bushmen and Pygmies; (2) sub-Saharan Africans; (3) South Asians and North Africans; (4) Europeans; (5) East Asians; (6) Arctic Peoples; (7) Native American Indians; (8) Southeast Asians; (9) Pacific Islanders; and (10) the Australian Aborigines and the Aboriginal New Guineans. It is apparent that this classification corresponds closely to the racial taxonomies of classical anthropology based on visible characteristics of color of skin, hair, eyes, body shape, limb length, and the like but for some reason Cavalli-Sforza, Menozzi, and Piazza (1994) prefer the term "clusters."

4. Race Differences in Diseases

There are race differences in a number of diseases that have a genetic basis including cystic fibrosis, PKU (phenylketonuria), hypertension, stroke, diabetes, prostate cancer, breast cancer, obesity, myopia, and schizophrenia. These differences have arisen through the processes of founder effects, genetic drift, mutation, and adaptation. There is such an extensive body of research on these that it would take a book to summarize it. The differences are illustrated here by the gene frequencies of cystic fibrosis and PKU in Europeans, sub-Saharan Africans, and East Asians (Orientals) given by Bodmer and Cavalli-Sforza (1976). These are shown in Table 2.1. The figures represent the gene frequencies (percentage prevalence rates) in the population. It will be seen that the gene frequencies of cystic fibrosis in Europeans are four or five times higher than in sub-Saharan Africans and East Asians, while gene frequencies of PKU are slightly more than twice as high in Europeans than in the other two races. The lower half of the table shows that the gene frequencies of the two diseases are quite similar in different European populations as widely dispersed as Austria, Australia, Canada, England, and the United States.

Table 2.1. Gene frequencies (percentages) of cystic fibrosis and PKU in Europeans, sub-Saharan Africans, and East Asians

Race	Cystic Fibrosis	PKU
Africans	0.4	0.3
East Asians	0.3	0.5
Europeans	2.0	1.1
Austria	-	1.2
Australia	2.2	1.1
Canada	-	0.9
England	1.9	1.5
United States	1.9	0.9

5. Do Races Exist?

From the eighteenth century until the middle years of the twentieth century all anthropologists, biologists, and social scientists accepted that the human species contains a number of biologically distinct races. Thus, in the 1920s the British anthropologist Sir Arthur Keith wrote:

So clearly differentiated are the types of mankind that, were an anthropologist presented with a crowd of men drawn from the Australoid, the Negroid, East Asian or Caucasoid types, he could separate the one human element from the other without hesitation or mistake (Keith, 1922, p. xviii).

Curiously, this seemingly indisputable observation began to be disputed from the middle decades of the twentieth century, when a number of anthropologists began to assert that races do not exist. One of the first to adopt this position was the anthropologist Ashley Montagu (1945a.) in his book *Man's Most Dangerous Myth: The Fallacy of Race*. The title suggests that the concept of race is a myth and therefore that there is no such thing as race. However, in the book Montagu made it clear that he believed that races do exist. He wrote:

In biological usage a race is conceived to be a subdivision of a species which inherits the physical characteristics serving to distinguish it from other populations of the species. In the genetic sense a race may be defined as a population which differs in the incidence of certain genes from other populations, with one or more of which it is capable of exchanging genes across whatever boundaries (usually geographic) may separate them. If we are asked whether in this sense there exist a fair number of races in the human species, the answer is that there do (p. 6).

It is clear from this that race is neither a "myth" nor a "fallacy." Considering that Montagu evidently accepted that races exist it seems strange that he should have given his book such a misleading title.

Later in the second half of the twentieth century a number of anthropologists and geneticists came to assert that there is no such thing as race. In 1962 the anthropologist F. B. Livingstone (1962) published a paper "On the non-existence of the human races" in which he declared "There are no races, there are only clines" (p. 279). Clines are hybrids between two pure races. Clines invariably appear at the junction between races who interbreed and produce mixed-racial hybrids. Thus, in Latin America there is a large population of Mestizos, who have European and Amerindian ancestry and can be considered a cline. Similarly, the Pacific Islanders are a mixed race cline derived from the interbreeding of Southeast Asians and East Asians. It has often been asserted that the existence of intermediate forms, clines, or hybrids invalidates the concept of races. This is obviously not the case. Among dogs, clines and hybrids are called mongrels, but the existence of mongrels does not mean that there are not pure breeds.

However, in the next decade the geneticists Walter Bodmer and Luigi Cavalli-Sforza (1976, p. 698) were to write of "the existence of many different racial groups in man" and that the "races could be called sub-species if we adopted for man a criterion from systematic zoology. The criterion is that two or more groups become sub-species when 75 percent or more of all individuals constituting the groups can be unequivocally classified as belonging to a particular group." They go on to say that when human races are defined broadly, it is possible to identify the race of many more than 75 percent of the population. Hence races certainly exist among humans. Some twenty years later this same Luigi Cavalli-Sforza opted to go with the flow and we find him writing of the "scientific failure of the concept of human races" and that "the concept of race has failed to gain any acceptance" (Cavalli-Sforza, Menozzi, and Piazza, 1994, p. 19). However, they write "we can identify 'clusters' of populations." These clusters turn out to be the same as the races of classical anthropology and later in their book we find the authors using the classical racial terminology. For instance, they write that Africa "is inhabited by two aboriginal groups, Caucasoids in the north almost down to the southern borders of the Sahara, and Negroids in sub-Saharan Africa" (p. 167). Evidently they had forgotten their previous assertion that the "scientific failure of the concept of human races human species can only be divided into 'clusters'" (a transparent euphemism for races). Only six years later this same Luigi Cavalli-Sforza apparently changed his mind again because he pronounced that races do exist and that a race can be defined as "a group of individuals that we can recognize as biologically different from others" (Cavalli-Sforza, 2000, p. 25). It appears that he has made a resolution to deny the existence of race but every now and then he forgets and the r— word slips out.

By the beginning of the twenty-first century the denial of the existence of races became increasingly frequent. In 2004 the American Anthropological Association announced on its website that "race is not a scientifically valid biological category." "There are no biological races," asserts Jefferson Fish (2002, p. xii), a professor of psychology at St. John's University in New York, but he does not explain the grounds on which he makes this assertion. Graves (2002, p. 2-5), a biologist at the University of Arizona, also asserts that "biological races do not exist" and writes that "the term race implies the existence of some nontrivial underlying hereditary features shared by a group of people and not present in other groups," and that this is not true for human races. Contrary to this assertion, there are a number of "hereditary features" that are present in some races and absent in others. For instance, the genes for black skin are present in Africans and absent in Europeans, East Asians, and American Indians, while the genes for the epicanthic eyefold are present only in East Asians, Arctic peoples, and in some American Indians. Furthermore, the concept of race need not imply that there are some alleles (alleles are alternative forms of genes) that are only present in some races but are absent in others. It is sufficient that there are differences in allele frequencies between differ-

ent races. There are a number of alleles for which this is the case. For example, the allele for sickle cell anemia is much more frequent in Africans than in other races, while the allele for cystic fibrosis is much more common in Europeans (Table 2.1, p. 12).

Graves (2002, p. 5) writes "The majority of geneticists, evolutionary biologists and anthropologists agree that there are no biological races in the human species." Cohen (2002, p. 211) likewise asserts "Almost all anthropologists agree that races in the popular sense do not exist and never have existed." These assertions are incorrect. A survey of the views of American anthropologists carried out in 1985 found that the existence of races was accepted by 59 percent of biological and physical anthropologists and about one third of cultural anthropologists (Lieberman and Reynolds, 1996).

Despite the denials of the existence of race by a number of American anthropologists, the reality of race is widely accepted throughout the rest of society. Medical journals contain numerous papers on race differences in a variety of diseases and disabilities, including the prevalence of HIV infection. There is a journal *Ethnicity and Health* devoted to racial differences in the prevalence of diseases. In the social sciences there are two journals devoted to race differences (*Race and Class* and *Ethnic and Racial Studies*) and other journals contain numerous papers on race differences in intelligence, educational attainment, earnings, socioeconomic status, unemployment, prejudice, discrimination, alcohol consumption, tobacco use, drug addiction, sexual experience, longevity, crime, and mental retardation. Corporations promote equal opportunities for the races in their employment. Employees sue corporations for racial discrimination and frequently obtain substantial compensation awarded by juries who have no problem in understanding the meaning of race. Many universities exercise positive discrimination in favor of black and Hispanic applicants. Judges pronounce that racially segregated schools are unconstitutional. Citizens in many countries state their race in census returns and these are analyzed by sociologists and demographers. In Britain there is a Race Relations Commission whose task is to promote racial equality and prosecute employers for racial discrimination. Neither the people responsible for this work nor the general public has any difficulty in understanding what race means and no doubt would be amazed to learn that many American anthropologists assert that race does not exist.

It may be wondered why a number of American anthropologists reject the concept of race. The answer has been given by two Polish anthropologists, Kaszycka and Strkalj (2002, p. 334). They write:

Americans have become very sensitive to race, and the term has acquired strongly sensitive connotations. Many American scientists have opted for the non-existence of human races. Furthermore, the growing demands of "political correctness" militate against the use of the term in and outside science.... Few scientists dare to study racial origins, lest they be branded racists simply for being interested in the problem.

The reason for the rejection of the concept of race by a number of American anthropologists is apparent from the title of Montagu's book *Man's Most Dangerous Myth*. Montagu evidently believed that people's consciousness of race is dangerous because it tends to foster racial antagonisms that can escalate into conflict. To prevent this it would be better for the concept of race to be suppressed. In Europe most anthropologists accept the validity of the concept of race. Thus, a survey of Polish anthropologists carried out in 2001 found that 75 percent agreed with the proposition "There are biological races within the species *Homo sapiens*" (Kaszycka and Strzalko, 2003). It is mainly in the United States that the existence of race has come to be

denied by a number of anthropologists and a few biologists and social scientists who have sacrificed their scientific integrity to political correctness.

Chapter 3. Europeans

1. Intelligence of Indigenous Europeans
2. Europeans outside Europe
3. European University Students
4. Brain Size
5. The Heritability of Intelligence in Europeans

The Europeans have been recognized by all the classical anthropologists as one of the major races. Linnaeus (1758) described them as *Europaeus*. They have frequently been designated Caucasians or *Caucasoids* because of the belief that they originated in the Caucasus. A number of anthropologists have categorized them together with the South Asians and North Africans in a single *Caucasoid* group. However, the Europeans are distinguishable from the South Asians and North Africans by their lighter skin color and, in the northern Europeans, blonde hair and blue eyes. The distinction between the Europeans and the South Asians and North Africans has been confirmed by Cavalli-Sforza, Menozzi, and Piazza (1994) in their classification of the human races on the basis of a number of genetic markers. This has shown that Europeans represented by Italians, Danes, English, and Basques comprise a homogeneous "cluster" differentiating them from other races. Coon, Garn, and Birdsell (1950), Cole (1965), and a number of other anthropologists have sub-divided the Europeans into seven sub-races consisting of the Mediterranean peoples of Spain, Italy, and southeast Europe; the Alpine peoples of France and central and southern Germany; the Nordic peoples of England, the east of Ireland, and Scotland, the Netherlands, Belgium and Northern Germany, Denmark, Norway, Sweden, and Western Finland; the Celtic peoples of Wales, the west of Ireland, and the western highlands of Scotland; the Dinaric peoples of east-central Europe; the Slavic peoples of northern Poland, the Baltic states, and Russia west of the Urals; and the Basques of northern Spain and southwest France. The Nordic peoples have lighter skin color, blonde hair, and blue eyes, while the central and south Europeans more typically have darker skins, darker or black hair, and dark eyes.

1. Intelligence of Indigenous Europeans

Studies of the IQs of Europeans in Europe are summarized in Table 3.1. These IQs are calculated in relation to a British mean of 100 and standard deviation of 15. Twenty-one of the studies were carried out by Buj (1981) on samples of adults from major cities. Most if the remainder are derived from one of the three versions of the Progressive Matrices (CPM, SPM, and APM). Row 61 giving an IQ of 89 for Serbia is probably a shade too low because the sample is described as being from "predominantly lower or lower middle class families" in and around Belgrade (Moyle and Wolins, 1973, p. 372). The range of IQs of the Europeans is from 87 for one of the studies in Ireland and 88 for one of the studies in Greece to 107 for one of the studies in Germany and the Netherlands. There are also some inconsistencies in the same countries, where the IQs typically differ by two or three IQ points and in the cases of Portugal and Poland by as much as 13 and 14 IQ points. These differences are partly caused

by sampling errors and are partly genuine, arising from differences in living standards and possibly from sub-racial differences in Europe. Sampling errors in studies of the intelligence of national populations arise in the same way as in opinion polls on voting intentions, where normally several polls carried out at the same time give results that differ by a few percentage points. We should not search for the meaning of differences of a few IQ points between studies when in many cases these are simply sampling errors. The important thing is to look for general patterns.

The only significant general pattern of the IQs in Europe appears to be that IQs are a little lower in southeast Europe than in the remainder. In the Balkans IQs are 94 for Romania, 92.5 (the average of the two studies) for Bulgaria, 90 for Croatia, 89 for Serbia, and 92.5 (the average of the four studies) for Greece. The probable explanation for this is that the Balkan peoples are a hybrid population or cline, comprising a genetic mix between the Europeans and South Asians in Turkey. Hybrid populations or clines arise in the borderlands between two races as a result of interbreeding. In the Balkans such a cline evolved because of the close geographical proximity between southeast Europe and Turkey, and the occupation of large territories in southeast Europe by Turkey for a number of centuries during the time of the Ottoman empire. This has brought about a mixing of Turkish and European genes with the result that contemporary Turks and Greeks are genetically quite similar. This has been shown by Cavalli-Sforza, Menozzi, and Piazza (1994) in their genetic linkage tree, in which Greeks are shown to be more closely related to Iranians and other southwest Asian peoples than to Italians, Danes, and English. This genetic similarity is also apparent for intelligence, for which the IQ of 90 in Turkey is closely similar to those in the range of 90 to 94 in Greece, Romania, Bulgaria, and Croatia in southeast Europe. Because the peoples of southeast Europe are a cline it is considered appropriate to exclude these in estimating the European IQ. The median IQ of the remaining countries is 99 and is considered the best estimate of the IQ of Europeans.

Apart from the lower IQs in the Balkans, there are three other countries with IQs somewhat lower than the European average. The first is Lithuania, with an IQ of 90-92. These low figures may be sampling errors because they are rather lower than in neighboring Russia (97), Poland (99), and Estonia (99). The second is Ireland, for which the mean IQ of the four studies is 92. The most probable explanation for this is the long history of emigration in which there has been some tendency for the more intelligent to migrate, leaving the less intelligent behind. This has also occurred in Scotland, where the average IQ is 97, and in Corsica, where the average IQ is lower than in mainland France (Lynn, 1979, 1980). The third country with a slightly depressed IQ is Portugal, for which the two results are IQs of 101 and 88, which can be averaged to 94.5. The depressed IQ in Portugal is consistent with its having the lowest per capita income in western Europe and its modest intellectual achievement. The Portuguese have only won one Nobel Prize for science out of the 346 awarded during the period 1901-2003. This was awarded in 1949 to the neurosurgeon Antonio Moniz for the innovation of the operation of prefrontal leucotomy as a treatment for mental illness, and is not now considered a desirable therapy. It may be that intelligence in Portugal has been depressed by the admixture of sub-Saharan Africans in the population. Portugal was the only European country to import black slaves from the late fifteenth century onwards for agricultural and domestic work. According to Du Bois (1939, pp. 132-133), in the sixteenth century blacks outnumbered whites in Lisbon and in the plantations of the Algarve in the south of the country. This may be an exaggeration, and it may be that the proportion of blacks has declined in succeeding centuries. Nevertheless, if the present population of Portugal contains 20 percent of African descent and the IQ of the Africans is 70, this would be expected to produce a population with an IQ of 94.

It may be surprising that there does not appear to be much difference between IQs in the twelve former communist countries of Eastern Europe, among which the median IQ is 96, and the 14 countries of western Europe, among which the median is 98.5. The difference is small and not statistically significant, so it seems that although the former communist countries have had much lower living standards for some sixty years following the end of World War II, this has not impaired the intelligence of the populations.

Table 3.1. IQs of indigenous Europeans

	Location	Age	N	Test	IQ	Reference
1	Austria	14	67	SPM	98	Moyles & C Wolins, 1973
2	Austria	Adults	187	CF	101	Buj, 1981
3	Belgium	7-13	944	CPM	99	Goosens, 1952a
4	Belgium	10-16	920	CF	103	Goosens, 1952b
5	Belgium	Adults	247	CF	99	Buj, 1981
6	Britain	Adults	1,405	CF	100	Buj, 1981
7	Britain	6-15	3,250	SPM	100	Raven et al., 1998
8	Bulgaria	Adults	215	CF	94	Buj, 1981
9	Bulgaria	11-17	1,456	CF	91	Lynn et al., 1998
10	Croatia	13-16	299	SPM	90	Sorokin, 1954
11	Czech Rep.	Adults	363	CF	98	Buj, 1981
12	Czech Rep.	5-11	832	CPM	96	Raven et al., 1995
13	Czech Rep.	11	64	SPM	100	Persaud, 1972
14	Denmark	5-11	628	SPM	97	Vejleskov, 1968
15	Denmark	Adults	122	CF	99	Buj, 1981
16	Estonia	12-18	2,689	SPM	100	Lynn et al., 2002
17	Estonia	7-11	1,835	SPM	98	Lynn et al., 2003
18	Finland	7	755	CPM	98	Kyostio, 1972
19	Finland	Adults	122	CF	99	Buj, 1981
20	France	6-9	618	CPM	97	Bourdier
21	France	6-11	328	CMM	102	Dagueetal., 1964
22	France	Adults	1,320	CF	94	Buj, 1981
23	France	6-16	1,120	WISC-3	98	Georgas et al., 2003
24	Germany	7-11	454	SPM	90	Kurth, 1969
25	Germany	5-7	563	CPM	99	Winkelman, 1972
26	Germany	11-15	2,068	SPM	105	Raven, 1981
27	Germany	11-15	1,000	SPM	99	Raven, 1981
28	Germany	Adults	1,320	CF	107	Buj, 1981
29	Germany	7	200	CPM	97	Guthke & Al-Zoubi, 1987
30	Germany	6-10	3,607	CPM	101	Raven et al., 1995
31	Germany	5-10	980	CPM	97	Raven et al., 1995
32	Germany	6-16	990	WISC-3	99	Georgas et al., 2003

33	Greece	9-14	400	wise	88	Fatouros, 1972
34	Greece	6-12	227	DAM	97	Georgas Sc Georgas, 1972
35	Greece	Adults	220	CF	95	Buj, 1981
36	Greece	6-17	731	MAT	89	Petrogiannis et al., 1999
37	Greece	6-16	990	WISC-3	92	Georgas et al., 2003
38	Hungary	Adults	260	CF	98	Buj, 1981
39	Iceland	6-16	665	SPM	101	Find et al., 2003
40	Ireland	6-13	3,088	SPM	87	Gill & Byrt, 1973
41	Ireland	Adults	75	CF	97	Buj, 1981
42	Ireland	6-12	1,361	SPM	93	Carr, 1993
43	Ireland	9-12	2,029	SPM	91	Carr, 1993
44	Italy	11-16	2,432	SPM	103	Tesi & Young, 1962
45	Italy	Adults	1,380	CF	102	Buj, 1981
46	Lithuania	8-12	259	CPM	90	Lynn & Kazlauskaite, 2002
47	Lithuania	6-16	381	WISC-3	92	Georgas et al., 2003
48	Malta	5	134	CPM	97	Martinelli & Lynn, 2005
49	Netherlands	Adults	333	CF	107	Buj, 1981
50	Netherlands	5-10	1,920	CPM	99	Raven et aL, 1995
51	Netherlands	6-12	4,032	SPM	101	Raven et al., 1996
52	Netherlands	6-16	1,100	WISC-3	99	Georgas et al., 2003
53	Norway	Adults	333	CF	100	Buj, 1981
54	Poland	Adults	835	CF	106	Buj, 1981
55	Poland	6-15	4,006	SPM	92	Jaworowska & Szustrowa, 1991
56	Portugal	Adults	242	CF	101	Buj, 1981
57	Portugal	6-12	807	CPM	88	Simoes, 1989
58	Romania	6-10	300	CPM	94	Zahirnic et al., 1974
59	Russia	14-15	432	SPM	97	Lynn, 2001
60	Russia	27-55	745	CF	96	Grigorenko 8c Sternberg, 2001
61	Serbia	15	76	SPM	89	Moyles & Wolins, 1973
62	Slovakia	5-11	823	CPM	96	Raven et al., 1995
63	Slovenia	8-18	1,556	SPM	96	Raven et al., 2000
64	Slovenia	6-16	1,080	WISC-3	95	Georgas et al., 2003
65	Spain	Adults	848	CF	98	Buj, 1981
66	Spain	6-9	854	CPM	97	Raven et al., 1995
67	Spain	11-18	3,271	APM	102	Albalde Paz &C Mufioz, 1993
68	Sweden	6-14	1,106	wise	97	Skandinaviska, 1970
69	Sweden	Adults	205	CF	104	Buj, 1981
70	Sweden	6-16	2,231	WISC-3	99	Georgas et al., 2003
71	Switzerland	Adults	163	CF	101	Buj, 1981
72	Switzerland	6-10	200	CPM	101	Raven et al., 1995
73	Switzerland	9-15	246	SPM	104	Spicher, 1993

2. Europeans outside Europe

Europeans have migrated to many parts of the world. Studies of the intelligence of these populations are summarized in Table 3.2. Rows 1 and 2 give IQs of 93 and 98 for Argentina. Row 3 gives an IQ of 97 for Australia based on a standardization of the American Otis test. Row 4 gives an IQ of 100 for Australia derived from the administration of the SPM to National Servicemen (the IQ of this sample was 102, but because men obtain higher

Table 3.2. IQs of Europeans outside Europe

	Location	Age	N	Test	IQ	Reference
1	Argentina	9-15	1,680	SPM	93	Rimoldi, 1948
2	Argentina	5-11	420	CPM	98	Raven et al., 1998
3	Australia	9-13	35,000	Otis	97	McIntyre, 1938
4	Australia	18	6,700	SPM	100	Craig, 1974
5	Australia	5-10	700	CPM	98	Raven et al., 1995
6	Brazil	9-10	735	SPM	95	Fernandez, 2001
7	Canada	7-12	313	SPM	97	Raven et al., 1996
8	Canada	6-16	2,200	WISC-3	100	Prifitera et al., 1998
9	Chile	21	178	3DW	99	Broer, 1996
10	Colombia	13-16	50	WISC-R	95	Ardila et al., 2000
11	Mexico	7-10	155	SPM	98	Lynn et al., 2005
12	N. Zealand	9-15	26,000	OTIS	99	Redmond & Davies, 1940
13	N. Zealand	9-17	3,108	SPM	101	Reid & Gilmore, 1989
14	N. Zealand	8-9	1,692	WISC-R	102	Fergusson & Horwood, 1997
15	S. Africa	15	1,056	SPM	94	Owen, 1992
16	USA	11	1,000	SB	100	Scottish Council, 1933
17	USA	11	1,215	TM	99	Scottish Council, 1949
18	USA	14-18	10,000	DAT	101	Lynn et al., 1987b
19	USA	18-70	625	SPM	100	Raven et al., 1996
20	USA	16-80	332	WAIS-3	101	Wycherley & Benjamin, 1998
21	USA	4-14	2,097	PPVT	103	Michael, 2003
22	Uruguay	12-25	1,634	SPM	96	Risso, 1961
23	Zimbabwe	7	256	SB	100	Weyl, 1967a&b

mean IQs than women by approximately 5 IQ points on this test (Lynn and Irwing, 2004), the figure has been reduced to 100). Row 5 gives an IQ of 98 for a sample of young Australian children. Row 6 gives an IQ of 95 for European children in Brazil from Sao Paulo. Row 7 gives an IQ of 97 for Canada obtained from a sample of 7 to 12 year olds. Row 8 gives an IQ

of 100 for Canada obtained from the standardization of the WISC-111 on a representative sample of 2,200 6-16 year olds.

Row 9 gives an IQ of 99 for Chile based on a study finding that European students at the Universidad Catolica de Valparaiso had the same IQ as Austrian students (n=320). Row 10 gives an IQ of 95 for European children in Colombia. Row 11 gives an IQ of 98 for European children in Baja California in Mexico. Row 12 gives an IQ of 99 for New Zealand obtained from a standardization of the Otis test in the 1930s. Row 13 gives an IQ of 101 derived from the standardization of the Progressive Matrices. Row 14 gives an IQ of 102 obtained from the Christchurch Child Development Study. Row 15 gives an IQ of 94 for European 16-year-olds in Natal in South Africa. Rows 16 through 21 give six IQs in the range between 99 and 103 for Europeans in the United States compared with those in Britain. The IQ of 100 given in row 20 is derived from the standardization of the WAIS-3 in Britain. Row 22 gives an IQ of 96 from a standardization of the Progressive Matrices in Uruguay. Row 23 gives an IQ of 100 for European 7-year-olds in Zimbabwe.

The median of these IQs is 99, the same as that of Europeans in Europe. The results show that even in the quite poor countries of Latin America (Argentina, Brazil, Colombia, Mexico, and Uruguay), which have per capita incomes about one third of those in North America and Western Europe, the IQs of Europeans are only fractionally below those in affluent nations. This confirms the results in Europe, where the much poorer former communist countries have about the same IQs as the affluent Western countries.

3. *European University Students*

Studies of the intelligence of European university students are summarized in Table 3.3.

All the samples have IQs of 100 or above, as would be expected, and the median IQ is 105. The principal interest of the results is for comparison with university students in Africa and South Asia, where IQs are typically about 10 to 20 points lower.

Table 3.3. Intelligence of European university students

	Location	University	N	Test	IQ	Reference
1	Australia	-	745	APM	106	Yates & Forbes, 1967
2	Britain	-	-	APM	109	Raven et al., 1994
3	New Zealand	-	381	APM	106	Yates & Forbes, 1967
4	Poland	-	2,072	APM	103	Raven et al., 1994
5	Romania	-	1,316	APM	101	Raven et al., 1994
6	Netherlands	Tilberg	30	SPM	105	Sonke, 2001
7	South Africa	-	40	APM	103	Poortinga, 1971
8	South Africa	-	50	Blox	100	Poortinga & Foden, 1975
9	South Africa	-	197	Blox	100	Taylor & Radford, 1986
10	South Africa	Witwatersrand	136	SPM	103	Rushton & Skuy, 2000

11	South Africa	Witwatersrand	86	SPM	106	Rushton et al., 2002
12	South Africa	Witwatersrand	67	APM	113	Rushton et al., 2003
13	USA	Wyoming	-	Stanford	106	Maity, 1926
14	USA	Stanford	-	Stanford	113	Maity, 1926
15	USA	Berkeley	300	APM	108	Paul, 1985
16	USA	Wisconsin	40	-	103	Osmon and Jackson, 2002

4. Brain Size

We noted in Section 1 that IQs are lower in Southeast Europe and in the Iberian Peninsula than in the remainder of Europe. We would expect that these differences would also be present in brain size because of the correlation between brain size and intelligence of 0.40 (Vernon, Wickett, Bazana, and Stelmack, 2000). We look now at differences within subpopulations of Europeans to see whether this is the case. The data on brain sizes of a large number of populations collected by Jurgens, Aune, and Pieper (1990) are shown in Table 3.4 together with IQs. Row 1 shows that Europeans in North America have the largest brain size and IQ. Row 2 shows that these are followed by Europeans in North, Central, and Eastern Europe. Row 3 shows slightly smaller brain size and IQ in Spain and Portugal. Row 4 shows a continuation of the downward trend with smaller brain size and IQ in Southeast Europe. Row 5 shows a further continuation of the downward trend with smaller brain size and IQ in the Near East obtained from samples of South Asians from Turkey and Iraq. Row 6 shows the lowest brain size and IQ in South Asians in India. Details of the IQs of the South Asians in Turkey, Iraq, and India are given in Chapter 6.

Table 3.4. Brain size (cc) and intelligence in Europeans and South Asians

	Location	N. Studies	Brain Size	IQ
1	North America	34	1,322	100
2	N. C. & E. Europe	104	1,320	99
3	Spain & Portugal	6	1,315	97
4	Southeast Europe	40	1,312	92
5	Near East	5	1,249	89
6	India	26	1,185	82

5. The Heritability of Intelligence in Europeans

The heritability of intelligence is the extent to which differences in intelligence are determined by genetic factors. We are interested here in the question of the heritability of race differences in intelligence, but before discussing this we need to consider the heritability of individual differences in intelligence within countries. There are three sources of evidence on this problem. These consist of studies of identical twins reared apart, a comparison of identical

and non-identical twins reared in the same families, and a comparison of unrelated adopted children reared in the same families. All three kinds of evidence show that the heritability of intelligence for adults is approximately 0.80, or 80 percent. This means that if all individuals were reared in identical environments, the differences between individuals would be reduced to 80 percent of the actual differences.

Studies on the heritability of intelligence for adults and children have been summarized by Bouchard (1993, p. 58). For adults, the evidence from identical twins reared apart is based on five studies for which the average correlation weighted by sample size is 0.75. This figure needs to be corrected for test reliability (correction for attenuation), for which a reasonable figure is about 0.9 (Bouchard, 1993, p. 49; Mackintosh, 1998). This correction increases the correlation to 0.83. This is a measure of the heritability. The evidence from a comparison of the degree of similarity between identical twins and same-sex, non-identical twins brought up in the same families is that there is a correlation of 0.88 for identical twins and 0.51 for same-sex non-identicals. Correcting the correlations for the reliability of the tests and adopting a reliability coefficient of 0.9, the corrected correlations become 0.98 for identicals and 0.56 for same-sex non-identicals. The heritability can be calculated by Falconer's (1960) formula consisting of doubling the difference between the correlations of identical and same-sex non-identicals. The difference between the two correlations is 0.42, and doubling this difference gives a heritability of 0.84.

A third method for estimating the heritability of intelligence is to examine the correlation between the IQs of unrelated children adopted and reared in the same families. The magnitude of the adopted family environmental effect (the "between family effect") is expressed by the correlation between the twin pairs. The summary of the research literature by Bouchard (1998) concludes that among adults the correlation is 0.04, indicating a heritability of 0.96. However, this method underestimates the environmental effect because it does not take into account effects operating on one child but not on the other, such as prenatal and perinatal effects. The two twin methods yielding heritabilities of intelligence of 0.83 and 0.84 are more accurate. These figures are very close to the estimate of approximately 0.85 given by Jensen (1998, p. 179).

The heritability of intelligence among children is considerably lower, at approximately 0.42 among 4-6 year olds and 0.55 for the age group 6 to 20 (Bouchard, 1993, p. 58; Jensen, 1998, p. 179). The reason for this is probably that parents exert environmental effects on children that progressively wear off during adolescence. It is by including the lower heritability figures derived from children with the higher figures for adults that some scholars put the heritability of intelligence at between around 0.40 to 0.80. For instance, in a statement drawn up by Gottfredson (1997, p. 14) and endorsed by 52 experts, it is stated that "Heritability estimates range from 0.4 to 0.8, most indicating that genetics plays a bigger role than environment in creating IQ differences among individuals." Most of the studies from which these high heritability figures are obtained come from Europeans in affluent western nations. However, a study of 144 identical and non-identical twin pairs in Russia yielded a heritability of 0.78, which corrected for test unreliability is increased to 0.87 (Lipovechaja, Kantonistowa, and Chama-ganova, 1978).

The conclusion that intelligence has a high heritability implies that there are genes that determine intelligence. The first of these in normal populations was discovered in the late 1990s by Chorley et al. (1998). It lies on chromosome 6, and possession of one of the alleles of this gene contributes about 4 IQ points to an individual's intelligence.

Chapter 4. Africans

1. Intelligence of Africans in Sub-Saharan Africa
2. University Students in Africa
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The term *africans* is used here for the principal indigenous peoples of sub-Saharan Africa. They should be distinguished from the North Africans, indigenous to Africa north of the Sahara; from the pygmies; and from the Bushmen or Khoisans, the other race in sub-Saharan Africa, of whom only a few tens of thousands now survive, principally in the Kalahari Desert and as Hottentots in South Africa. A variety of terms have been used for the African peoples, including *Afer* (Linnaeus, 1758), *Ethiopians* (Blumenbach, 1776), and *Negroids* (Cole, 1965). Whatever the name used, the Africans have always been regarded as one of the major races in the taxonomies of classical anthropology, including that of Linnaeus (1758), Blumenbach (1776), and Coon, Garn, and Birdsell (1950). Cavalli-Sforza, Menozzi, and Piazza (1994) have confirmed the distinctive genetic characteristics of the Africans in their classification of humans into genetic "clusters," in which these peoples were represented by west Africans of the region west of Nigeria, Nilotics of the upper Nile in southern Sudan, Ethiopians, and Bantus, a large group present in most of sub-Saharan Africa from Nigeria in the west to Kenya. The most distinctive features of Africans are their very dark skin, dark eyes, broad nose, thick everted lips, and woolly hair. Their blood groups differ from Europeans in having a lower frequency of group A, which is present in about 27 percent as compared with around 46 percent in Europeans, and a higher frequency of group B, which is present in about 34 percent as compared with around 14 percent in Europeans.

1. Intelligence of Africans in Sub-Saharan Africa

The first attempt to estimate the intelligence of Africans was made by Galton (1869) on the basis of his own experience of them during his travels in southwest Africa and the accounts of other travelers. He constructed a scale of grades of intelligence in which one grade was equivalent to 10.425 IQ points on the IQ scale. He estimated that Africans were about two grades below the English, giving them an IQ of 79. Subsequent studies of the IQs of general

population samples of Africans in sub-Saharan Africa have shown that this estimate overestimated the African IQ by slightly over one grade.

Studies of the IQs of Africans in sub-Saharan Africa are summarized in Table 4.1. Explanations of the results set out in the table are given when appropriate. Row 1 gives an IQ of 64 for Cameroon for adult workers. Row 2 gives an IQ of 64 for the Central African Republic for young men applying for a technical training course at a college in the city of Bangui during the years 1951-1955. Rows 3 through 5 give IQs of 64 for samples from Congo-Brazzaville collected at the same time in the cities of Brazzaville and Pointe-Noire. Rows 6, 7, 8, 9, and 10 give IQs of 64, 68, 62, 68, and 65 for Congo-Zaire. Row 11 gives an IQ of 59 for Equatorial Guinea. Row 12 gives an IQ of 80 for adults in Ghana. The IQ is exceptionally high for sub-Saharan Africa, possibly because the sample came from the capital city of Accra; the people in capital cities typically have higher IQs than those in the rest of the country, probably because there is a tendency for more intelligent individuals to migrate to the capital; IQs in London and Paris are higher than in the rest of Britain and France (Lynn, 1979, 1980). Row 13 gives an IQ of 62 for a representative sample drawn from the whole

Table 4.1. IQs of Africans in sub-Saharan Africa

	Location	Age	N	Test	K	Reas	Verb	Vis	Reference
1	Cameroon	Adults	80	CPM	64	64	-	-	Berlioz, 1955
2	Cent. African Rep.	Adults	1,149	SPM	64	64	-	-	Latouche & Dorneau, 1956
3	Congo Brazz.	Adults	1,596	SPM	64	64	-	-	Latouche & Dorneau, 1956
4	Congo Brazz.	17-29	320	SPM	64	64	-	-	Ombredane et al., 1952
5	Congo Brazz.	88	73	SPM	73	-	-	-	Nkaya et al., 1994
6	Congo - Zaire	Adults	67	SPM	64	-	-	-	Verhagen, 1956
7	Congo - Zaire	10-15	222	SPM	68	68	-	-	Laroche, 1959
8	Congo - Zaire	8	47	KAB	62	-	-	-	Boivin Si Giordani, 1993
9	Congo - Zaire	7-12	95	KAB	68	-	-	-	Boivinetal., 1995
10	Congo - Zaire	7-9	130	KAB	65	-	-	-	Giordani et al., 1996
11	Equatorial Guinea	10-14	48	WISC-R	59	-	-	-	Fernandez-Ballesteros et al., 1997
12	Ghana	Adults	225	CF	80	-	-	-	Buj, 1981
13	Ghana	15	1,693	CPM	62	62	-	-	Glewwe & Jacoby, 1992
14	Guinea	5-14	50	AAB	63	-	-	-	Nissen et al., 1935
15	Guinea	Adults	1,144	SPM	70	70	-	-	Faverge & Falmagne, 1962
16	Kenya	Adults	205	CPM	69	69	-	-	Boissiere et al., 1985
17	Kenya	6-10	1,222	CPM	75	75	-	-	Cosrenbader & Ng.m. 2000

18	Kenya	12-15	85	CPM/ MH	69	69	64	-	Sternberget al., 2001
19	Kenya	7	118	CPM	76	76	-	-	Daley et al., 2003
20	Kenya	7	537	CPM	89	89	-	-	Daley et al., 2003
21	Kenya	6	184	KAB	63	-	-	-	Holding et al., 2004
22	Madagascar	Adults	147	CPM	82	82	-	-	Raveau et al., 1976
23	Mozambique	20	149	CPM	64	64	-	-	Kendall, 1976
24	Nigeria	Children	480	Leone	70	-	-	-	Farron, 1966
25	Nigeria	Adults	86	SPM	64	64	-	-	Wober, 1 969
26	Nigeria	6-13	375	CPM	69	69	-	-	Fahrmeier, 1975
27	Sierra Leone	Adults	122	CPM	64	64	-	-	Berry, 1 966
28	Sierra Leone	Adults	33	CPM	64	64	-	-	Binnie-Dawson, 1984
29	South Africa	10-14	293	AAB	65	-	-	-	Pick, 1929
30	South Africa	12-14	80	KB	68	-	-	68	Dent, 1937
31	South Africa	6-13	1,726	DAM	70	-	-	70	Hunkin, 1950
32	South Africa	8-16	1,008	SPM	75	75	-	-	Notcutt, 1 950
33	South Africa	Adults	703	SPM	64	64	-	-	Notcutt, 1950
34	South Africa	10-12	278	NVR	74	74	-	-	Lloyd & Pidgeon, 1 96 1
35	South Africa	Adults	140	WISC- R	71	-	74	68	Avenant, 1988
36	South Africa	5-13	415	DAM	77	-	-	77	Richteretal., 1989
37	South Africa	9	350	SPM	63	63	-	-	Lynn & Holmshaw, 1 990
38	South Africa	16	1,096	SPM	63	63	-	-	Owen, 1992
39	South Africa	15-16	1,093	JAT	68	58	58	69	Lynn & Owen, 1994
40	South Africa	Adults	153	WAIS- R	69	-	-	-	Nell, 2000
41	South Africa	16	26	SPM	68	-	-	-	Sonke, 2000
42	South Africa	14-17	152	WISC- R	67	-	60	66	Skuy et al., 2001
43	South Africa	17	100	WCST	64	-	-	-	Skuy et al., 2001
44	South Africa	8-10	806	CPM	67	-	-	-	Jinabhai et al., 2004
45	Sudan	7-16	291	Various	69	-	-	-	Fahmy, 1964
46	Sudan	6	80	DAM	64	-	-	64	Badri, 1965a
47	Sudan	9	293	DAM	74	-	-	74	Baclri, 1965b
48	Sudan	8-12	148	SPM	72	72	-	-	Ahmed, 1989
49	Tanzania	13-17	2,959	SPM	78	78	-	-	Klingclhofer, 1967
50	Tanzania	Adults	179	CPM	65	65	-	-	Boissiere et al., 1985
51	Tanzania	11-13	458	WCST	72	-	-	-	Sternberg et al., 2002
52	Uganda	12	50	Various	80	81	80	78	Vernon, 1969
53	Uganda	11	2,019	CPM	73	73	-	-	Heyneman & Jamison, 1980
54	Zambia	13	759	SPM	77	77	-	-	MacArthur et al., 1964
55	Zambia	Adults	152	SPM	64	-	-	-	Pons, 1974

56 Zimbabwe	12-14	204	WISC-R	61	-	66	62	Zindi, 1994
57 Zimbabwe	12-14	204	SPM	70	70	-	-	Zindi, 1994

of Ghana. Rows 14 and 15 give IQs of 63 and 70 obtained in two studies for Guinea. Rows 16 through 21 give IQs of 69, 75, 69, 76, 89, and 63 for Kenya. The IQ of 89 in row 20 for a sample of 7-year-olds tested in 1998 is much higher than the other figures and the IQ of 76 found by the same investigators in their 1984 study (row 19) and than any other IQ in sub-Saharan African populations. Its disparity from the other studies makes its validity questionable because the IQ of 75 given in row 17 is obtained from a standardization of the same test for the whole of Kenya carried out in the same year, and the IQ of 69 given in row 19 was also obtained in the same year. These two IQs are typical of those obtained throughout sub-Saharan Africa and are credible, but they cast doubt on the IQ of 89. Furthermore, the gain of 15 IQ points from an IQ of 76 to 89 over the 14-year period is uniquely high in studies of the secular rise of IQs and cannot be accepted as credible. Further, it is difficult to believe that children in Kenya can have a higher IQ than African Americans in the United States, where the IQ has remained constant at approximately 85 since the 1920s but where the living standards and nutrition of Africans are much higher than in Kenya. For these reasons the reported IQ of 89 for Kenya is considered unreliable. The IQ of 63 given in row 21 is an average of 65 for 6-year-olds at school and 61 for those not at school, suggesting that the effect of schooling is to raise the IQ by 4 points.

Row 22 gives an IQ of 82 for Madagascar. Although usually counted as part of sub-Saharan Africa, the population of the island includes a significant number of Southeast Asians originally from Indonesia who migrated to the island about the first century AD (Cole, 1965). The population also contains Africans and hybrids of the two races. The proportions of the three groups in the population are not precisely known although it is believed that African ancestry predominates. The mean IQ of 82 is higher than that of any of the samples of the Africans in sub-Saharan Africa given in Table 4.1 except for the questionable 89 for Kenya given in row 20. The population's IQ is intermediate between that of around 65-70 of Africans and around 87 of Southeast Asians (see Chapter 7), although somewhat closer to that of Africans, as would be expected for a Southeast Asian and African mixed race population in which African genes predominate. There is no apparent environmental explanation for why the IQ of the population of Madagascar should be higher than that throughout mainland sub-Saharan Africa.

Row 23 gives an IQ of 64 for Mozambique. This sample had a mean of 3.5 years schooling and included some individuals from Transkei and Malawi. Row 24 gives an IQ of 70 for Nigeria obtained for children (age not given) attending schools in the town of Zaria. An elite sample of boys at grammar school (number=179) in the same town obtained an IQ of 81. The test was the Leone Test and is described by the author as "devised by an African for African children" (Farron, 1966, p. 53). The result belies the assertion often made that Africans are handicapped on tests constructed by Europeans. Rows 25 and 26 give IQs of 64 and 69 for two further studies in Nigeria.

Rows 27 and 28 give IQs of 64 for two samples of adults in Sierra Leone. Row 29 gives an IQ of 65 obtained in the first study of the intelligence of Africans in South Africa, carried out in the 1920s. Rows 30 through 41 give IQs in the range between 58 and 77 obtained in twelve later studies. Row 35 gives an IQ of 71 for prison warders who had had between 9-12 years of education. Row 36 gives an IQ of 77, which is the highest for general population samples in

sub-Saharan Africa but was obtained from the Draw-a-Man test, which is a rather poor test of general intelligence. Row 39 gives an IQ of 58 for a large sample of 16-year-old Africans in school who had completed approximately ten years schooling. The comparison is with South African Europeans. Row 40 gives an IQ of 69 for a sample of adults described as "competent men, all in long standing employment in a sophisticated environment...." (Nell, 2000, p. 27). Row 41 gives an IQ of 68 for adolescents with a few years of schooling in the Northern Transvaal. Rows 42 and 43 give IQs of 67 and 64 for samples of adolescents at school in Soweto. Row 44 gives an IQ of 67 for third-grade Zulu school children in Natal.

Row 45 gives an IQ of 69 for Sudan obtained for Shilluk children and adolescents described as "one of the primitive Nilotic Negro tribes" (p. 164) in the Southern Sudan. The IQ given is the mean of four tests: the Goddard and Porteus Mazes, Alexander Passalong, and Draw-a-Man. Rows 46, 47, and 48 give IQs of 64, 74, and 73 for three further studies in the Sudan.

Row 49 gives an IQ of 78 for a sample of secondary school students in Tanzania and is exceptionally high for African samples. The author of the study explains that the reason for this is that the sample was highly selected because "the number of places in secondary school is extremely limited and eligibility is determined by competitive examination" (Klingelhofer, 1967, p. 207). The high IQ of this sample cannot be regarded as representative. The result is informative in so far as it shows that an elite sample at secondary school has an IQ of 78 and this suggests that the IQs in the range of 65-72 typically found in sub-Saharan Africa are valid. Rows 50 and 51 give IQs of 65 and 72 for two more representative samples in Tanzania and are consistent with those typical in sub-Saharan Africa. Row 52 gives an IQ of 80 for Uganda for a selective sample of schoolchildren described by Vernon (1969, p. 182) as "much superior to the East African population in general." This explains why the IQ is higher than that of representative samples in sub-Saharan Africa. Row 53 gives an IQ of 73 for a large and representative sample of Ugandan children. Rows 54 and 55 give IQs of 77 and 64 for Zambia. Rows 56 and 57 give IQs of 61 and 70 for Zimbabwe obtained by Zindi, an African psychologist at the University of Zimbabwe.

The most striking feature of the IQs of Africans in sub-Saharan Africa is that they are consistently so much lower than those of Europeans set out in Table 3.1 of Chapter 3. The median IQ is 67 and is adopted as the best estimate of the IQ of Africans. With the exceptions of the IQ of 82 for Madagascar, which is the highest in the table because of the Southeast Asian element in the population, and the IQs of 78 for the elite secondary sample in Tanzania (row 48) and 80 for the elite secondary sample in Uganda (row 51), and the questionable 89 for Kenya (row 21), all the IQs fall in the range of 59 to 77, while all the European Caucasoid IQs fall in the range of 87 to 105. There is no overlap between the IQs of the two populations. The variations of the African IQs do not appear to vary by geographical location and are probably attributable to sampling and measurement errors. The IQ of Africans has not shown any change since the first study published by Pick (1929) obtained an IQ of 65 for Africans in South Africa. The four most recent studies of Africans in South Africa carried out in the 1990s found virtually identical IQs of 69 (Nell, 2000), 68 (Sonke, 2000), 67 and 64 (Skuy et al., 2001).

2. University Students in Africa

Twelve studies have been reported of the intelligence of African university students in South Africa. Some of these also give IQs of European students tested at the same time. The studies

are summarized in Table 4.2. Row 1 gives an IQ of 75 for African students at Legon University in Ghana tested with the Block Design (Kohs Blocks) test from the Wechsler Test. All the remaining rows give results for South Africa. Row 2 gives an IQ of 84 for African and 103 for European university students calculated in relation to American adult norms given in Raven, Court, and Raven (1994). Rows 3 and 4 give results for students on the Blox test and gives the IQs of Africans in relation to South African European student norms of 100. Row 5 gives results for the WAIS-R for students with an average age of 25 years at the African universities of Fort Hare, Zululand, the North, and the Medical University of South Africa. The Verbal IQ was 78 and the Performance IQ 73, showing once again that the Africans have low IQs in all major cognitive abilities and disconfirming the claim sometimes made that Africans are handicapped in language tasks. Row 6 gives an IQ of 100 for science students at the University of the North. Row 7 gives an IQ of 77 for students at a less prestigious African university. Row 8 gives an IQ of 83 for students at the University of the Witwatersrand and the Rand Afrikaans University in Johannesburg. Row 9 gives an IQ of 82 for African students at the Venda University in the Northern Transvaal. The comparison European group was at the University of Tilberg in the Netherlands. Row 10 gives an IQ of 81 for psychology students at the University of the Witwatersrand. Row 11 gives an IQ of 93 for first year engineering students at the University of the Witwatersrand. Row 12 gives an IQ of 99 for a slightly reduced number of the same students who took the Advanced Progressive Matrices 16 months later. Both Africans and Europeans obtained IQs approximately 6 points higher on the second testing, probably as a practice effect. Row 13 gives an IQ of 101 for a further sample of African engineering students at the University of the Witwatersrand and shows that the African students scored 15 IQ points lower than the European whites.

The mean IQs of general student samples shown in rows 1 to 5 and 7 to 9 all fall in the narrow range of 72 to 84 with a median of 81. The IQs of 100 in row 6, 93 in row 11, and 99 in row 12 are higher than the others because they are for science and engineering students who were admitted to the universities on the basis of their performance in entrance tests of mathematics and physics, and these normally have higher reasoning ability than students in most other academic disciplines. For instance, in Iran 18-year-olds studying math scored 10 IQ points higher than those studying literature (Mehryar, Shapurian, and Bassiri, 1972). In Britain, education students with degrees in science scored 9 IQ points higher than those with degrees in arts (Heim, 1968). The IQs of European students in South Africa are in the range between 100 and 105 and are about the same as those of European students in other countries (see Chapter 3, Table 3.3). The interest of these results is that they show that typical African students who have had some 12 years of school and have gained entry to university obtain IQs in the range of 72-84. Since these are an African cognitive elite, these results suggest that the IQ of about 70 for the general population is valid and about right. The results also show that IQs of African students in South Africa are on average about 20 IQ points lower than those of European students, and that a considerable gap between the IQs of Africans and Europeans remains when they are matched for years of education, African university students have had ten to twelve years of formal education but apart from those studying math and physics, obtain IQs in the range of 72-84. Their IQs are some 10 to 12 IQ points higher than the African average because they are a select group.

Table 4.2. IQs of African and European university students in Africa

	Test	Africans		Europeans		IQ Diff	References
		N	IQ	N	IQ		
1	BD	66	75	-	-	-	Jahoda, 1970
2	APM	40	84	40	103	19	Poortinga, 1971
3	Blox	47	72	50	100	28	Poortinga & Foden, 1975
4	Blox	403	79	197	100	21	Taylor & Radford, 1986
5	WISC-R	63	75	-	-	-	Avenant, 1988
6	SPM	147	100	-	-	-	Zaaiman, 1998
7	SPM	30	77	-	-	-	Grieve & Viljoen, 2000
8	SPM	173	83	136	103	20	Rushton & Skuy, 2000
9	SPM	30	82	30	105	23	Sonke, 2000
10	SPM	70	81	-	-	-	Skuy et al., 2002
11	SPM	198	93	86	106	13	Rushton et al., 2002
12	APM	187	99	67	113	14	Rushton et al, 2003
13	APM	177	101	72	116	15	Rushton et al, 2004

3. Africans in the Caribbean and Latin America

Studies of the IQs of Africans in the Caribbean and Latin America are summarized in Table 4.3. Row 1 gives an IQ of 80 for children in Barbados; this figure has been calculated from the IQ of 83 of well-nourished children and 68 of malnourished children reported in the study, weighted by the results of a 1968 survey finding a prevalence of moderate and severe malnutrition in preschool children in Barbados of 16.5 per cent (Galler, Ramsay, Solimano et al., 1983). Row 2 gives an IQ of 70 for Africans in Brazil attending school in a *favela* (shanty town) in Brasilia. Row 3 gives an IQ of 64 for the mothers of these children. Row 4 gives an IQ of 71 for Africans in Sao Paulo in Brazil. Row 5 gives an IQ of 67

Table 4.3. IQs of Africans in the Caribbean and Latin America

	Location	Age	N	Test	<i>g</i>	Reas	Verb	Vis	Reference
1	Barbados	9-15	207	WISC-R	80	-	-	-	Caller et al., 1986
2	Brazil	9	100	DAM	70	-	-	-	Paine et al., 1992
3	Brazil	Adult	88	SPM	64	-	-	-	Paine et al., 1992
4	Brazil	9-10	223	SPM	71	71	-	-	Fernandez, 2001
5	Dominica	3	64	PPVT	67	-	67	-	Wein & Stevenson, 1972
6	Jamaica	11	1,730	MH	72	-	-	-	Manley, 1963
7	Jamaica	11	50	V, M, KB	75	75	78	75	Vernon, 1969

8	Jamaica	5-12	71	wise	60	-	70	56	Hertzog et al., 1972
9	Jamaica	10	128	CEFT	75	-	-	75	Bagley et al., 1983
10	Jamaica	15	31	WISC-R	67	-	67	-	Grantham-McGregor et al., 1994
11	Jamaica	25	54	PPVT	60	-	60	-	Grantham-McGregor et al., 1994
12	Jamaica	9-10	30	PPVT	71	-	71	-	Simeon & Grantham-McGregor, 1989
13	St. Lucia	4	60	PPVT	62	-	62	-	Murray, 1983
14	St. Vincent	8-11	174	CPM	71	71	-	-	Durbrow et al., 2002

for 3-year-old African children in Dominica. The low IQ of these infants suggests that poor education is not a factor responsible for the low IQs of Africans in the Caribbean. Rows 6 through 12 give IQs from seven studies of the IQ in Jamaica in the range of 60-75 with a median of 67. Row 13 gives an IQ of 60 for 4-year-olds in St. Lucia and row 14 an IQ of 70 for children in St. Vincent. The median of the fourteen studies of intelligence of Africans in the Caribbean and Latin America is an IQ of 71. This is slightly higher than the median IQ of 67 of Africans in sub-Saharan Africa. The explanation for this may be that Africans in the Caribbean and Latin America have some admixture of genes from Europeans. It has been estimated that the proportion of European genes in the African population of Jamaica is 6.8 percent (Parra, Marcini, and Akey, 1998).

4. African Americans in the United States

There have been many hundreds of studies of the intelligence of African Americans in the United States. The most important of these are summarized in Table 4.4. Row 1 gives results of the first major study based on military conscripts in World War I tested with the combined Army Alpha and Beta tests that measured non-verbal and verbal IQs and from which the later Wechsler tests were constructed. The number of Europeans was 93,973. Row 2 gives results for military conscripts in World War II and row 3 the results of military conscripts for the Vietnam War. It is noteworthy that the mean IQ of 77 of Africans is lower in World War II and the Vietnam War than in World War I, and is also lower than the average IQ of 85 that is generally given for the mean IQ of African Americans in the United States. Rows 4 through 7 give results of Shuey's compilation of all American studies. Row 4 gives an IQ of 87 derived from 17 studies of pre-school children. Row 5 gives an IQ of 85 derived from 26 studies of primary school children using individual tests such as the Stanford-Binet. Row 6 gives an IQ of 85 for primary school children derived from 103 studies for group tests of verbal ability and 41 studies of group tests of non-verbal ability. Row 7 gives an IQ of 85 for high school students. Rows 8, 9, and 10 give the results of Osborne and McGurk's (1982) updated summary of American studies published during 1976 through 1980. Row 8 gives an IQ of 80 derived from 66 studies of preschool 3-5 year olds. Row 9 gives an IQ of 87 derived from 126 studies of primary school children and row 10 an IQ of 87 derived from 17 studies of high school students.

Rows 11, 12, and 13 (Broman et al., 1975) give results for large samples not included in the Osborne and McGurk review. Row 11 gives an IQ of 85 for African mothers tested in the National Collaborative Perinatal Project

Table 4.4. IQs of African Americans in the United States

	Year	Age	N. African	N. European	Test	g	Verb	Vis	Reference
1	1918	Adults	23,596	93,973	AA&B	83	.	-	Johnson, 1948
2	1944-5	Adults	—	.	AGCT	77	.	—	Loehlin et al., 1975
3	1964-5	Adults	-	-	AFQT	77	-	-	Loehlin et al., 1975
4	1916-65	3-6	1,700	-	Various	87	-	-	Shuey, 1966
5	1916-65	6-11	7,000	-	Various	85	-	-	Shuey, 1966
6	1916-65	6-11	75,050	-	Various	85	-	-	Shuey, 1966
7	1916-65	12-18	23,000	-	Various	85	-	-	Shuey, 1966
8	1966-80	3-6	-	-	Various	80	-	-	Osborne & McGurk, 1982
9	1966-80	6-11	100,000	-	Various	87	-	-	Osborne & McGurk, 1982
10	1966-80	12-18	16,000	-	Various	82	-	-	Osborne & McGurk, 1982
11	1966	24	7,300	5,733	SRAT	85	-	-	Broman et al., 1975
12	1970	4	12,029	9,730	SB	87	-	-	Broman et al., 1975
13	1974	7	19,968	18,474	wise	87	-	-	Broman et al., 1975
14	1972	6-16	305	1,870	WISC-R	84	86	85	Kaufman & Doppelt, 1976
15	1977	16-74	7,270	16,134	GATE	81	86	84	Avolio & Waldman, 1994
16	1977	5-11	456	604	WISC-R	85	87	86	Mercer & Lewis, 1984
17	1978	16-74	192	1,664	WAIS-R	85	87	86	Reynolds et al., 1987
18	1980	14-22	3,022	6,502	AFQT	82	-	-	Herrnstein & Murray, 1994
19	1981	2-12	311	1,450	KABC	93	-	-	Kaufman &c Kaufman, 1983
20	1982	3-18	932	4,519	PPVT	84	84	-	Dunn, 1988
21	1984	12-23	210	1,303	SB-4	83	-	88	Thorndike et al., 1986
22	1984	3	86	86	SB-LM	86	-	-	Montie & Pagan, 1988
23	1985	37	502	3,535	Various	83	-	-	Nyborg & Jensen, 2000
24	1989	6-16	338	1,620	WISC-3	85	87	86	Prifitera et al., 1998
25	1991	11-93	241	1,547	KA1T	88	-	-	Kaufman et al., 1994
26	1991	16-74	7,214	14,503	GATB	81	-	-	Avolio & Waldman, 1994

27	1991	6-16	711	776	WISC-R	85	-	85	Kramer et al., 1995
28	1993	3	33	33	SB-4	85	-	-	Peoples et al., 1995
29	1993	70+	833	5,122	MMSE	85	-	-	Zsembik& Peek, 2001
30	1993	Adults	806	5,300	Vocabulary	90	90	-	Lynn, 2004
31	1998	Adults	2,113	8,751	Literacy	86	86	-	Raudenbush & Kasim, 1998

and rows 12 and 13 give IQs of 87 for their children at the age of 4 years and 7 years. Row 14 gives a *g* IQ of 86 for Africans from the standardization sample of the WISC-R. Row 15 gives IQs of 81 for *g*, 86 for verbal, and 84 for visualization for employed individuals collected by the United States Employment Service. Row 16 gives African-American IQs of 85 for *g*, 87 for verbal, and 86 for visualization for a sample in California. Row 17 gives IQs of 85 for *g*, 87 for verbal ability, and 86 for visualization ability obtained from the standardization sample of the WAIS-R. Row 18 gives an IQ of 82 from the AFQT. Row 19 gives an IQ of 93 from the standardization sample of the K-ABC. Row 20 gives a vocabulary IQ of 85 from the standardization sample of the Peabody Picture Vocabulary Test. Row 21 gives an IQ of 83 from the standardization sample of the Stanford-Binet-4; in this sample African Americans obtained a short-term memory IQ of 89 consistent with a number of other studies finding they do relatively well on short term memory. Row 22 gives an IQ of 85 for 3-year-olds from the standardization sample of the Stanford-Binet-LM. Row 23 gives an IQ of 83 calculated from the first principal component as a measure of *g* obtained from military personnel. Row 24 gives an IQ of 85 from the standardization sample of the WISC-3. Row 25 gives an IQ of 88 from the standardization sample of the Kaufman Adolescent and Adult Intelligence Test. Row 26 gives an IQ of 81 for a sample of employed individuals collected by the United States Employment Service. Row 27 gives a visualization IQ of 85 derived from the block design subtest of the WISC-R obtained from the national NHANES III sample.

Row 28 gives an IQ of 85 for infants aged 3.0 to 3.4 years from the standardization sample of the Stanford-Binet-4. Row 29 gives an IQ of 85 for a representative sample aged 70 and older from the continental United States (i.e., excluding Alaska and Hawaii). Row 30 gives an IQ of 90 for vocabulary for African adults obtained in the NORC surveys for 1990-96 from a representative sample from the continental United States. This unusually high figure is attributable to the shortness of the test, consisting of defining the meaning of ten words. Row 31 gives an IQ of 87 from the 1992 National Adult Literacy Survey, a test consisting of verbal comprehension and arithmetic administered to a representative sample from the continental United States.

There are five conclusions to be drawn from the studies of the intelligence of African Americans. First, the median IQ is 85 and is widely accepted as the best estimate of the African-American IQ. This estimate is close to the 83.5 obtained by Roth, Bevier, Bobko, Switzer, and Tyler (2001) from a meta-analysis of 105 studies based on 6,246,729 individuals. The variations in the means obtained in different studies are probably due to sampling, measurement errors, and differences in the abilities measured in different tests. It has been shown in many studies that Africans do relatively well in tests of memory, so the size of the African-European difference reflects to some degree the extent to which memory tests are represented in the IQs. For instance, one of the higher IQs in the table is the 88 obtained in Kaufman's KAIT. This test contains seven subtests, of which one is a memory for faces test that requires the identification of the faces of famous people. On this subtest Africans obtained a mean IQ of 92.5.

Second, the African-American IQ of approximately 85 appears in children aged 3, as can be seen in rows 22 and 28. These results tell against the theory often advanced by environmentalists that poor education and racism are responsible for or contribute to the low IQ of Africans. Even among 2-year-olds Africans have an IQ of 92 (row 19). This is not so low as in the other studies because African infants mature earlier than Europeans up to the age of two years (Lynn, 1998d; Rushton, 2000). It is not until their third year that their IQs fall below that of Europeans and only in their fourth year that their IQ declines to reach their IQ of approximately 85, as shown in rows 22 and 28.

Third, the IQ of approximately 85 of African Americans is substantially higher than the average IQ of 67 of Africans in sub-Saharan Africa. Two factors can explain this difference. The first is that American Africans enjoy a better environment than Africans in Africa in a number of respects, including much higher living standards and better nutrition and health. The second is that African Americans have on average about 25 percent of European ancestry and this increases their IQs above that of Africans in Africa (Reed, 1969; Chakraborty, Kamboh, Nwanko, and Ferrell, 1992).

Fourth, in the five studies giving verbal and visualization IQs, American Africans score one or two points higher on the verbal IQs. The verbal IQs appear to be more culturally biased, so this tells against the theory often proposed by environmentalists that Africans perform poorly because the tests are biased against them. This confirms the conclusions reached by McGurk (1953a, 1953b) that African Americans are not more impaired on what were considered culturally biased general information problems and by Jensen (1980) that tests are not biased against African Americans.

Fifth, there appears to have been no improvement in the IQs of African Americans over the course of the twentieth century. Thus, the median IQ of the fourteen studies carried out from 1980 to 1998 is 85, the same as that of the earlier studies. This conclusion is confirmed by the absence of any tendency for the African-American-European difference to be smaller in younger age groups. African-European IQ differences at different ages have been reported by Reynolds, Chastain, Kaufman, and McLean (1987) for the WAIS-R standardization sample collected in 1978. The African IQs are 86 in 16-19-year-olds, 85 for 20-34 and 35-54-year-olds, and 86 for 55-74-year-olds. It has also been shown in bi-yearly data that there has been no difference in African-American-European intelligence over the period 1974-1996 (Lynn, 1998e). Finally, in the standardization sample of the KAIT (Kaufman Adolescent and Adult Intelligence Test, Kaufman et al., 1994) there was no significant difference between the youngest and oldest age groups. In fact the youngest age group, born between 1980 and 1991, had a slightly lower IQ of 83 compared with an IQ of 88 of the oldest age group, born on average in 1921.

5. Africans in Britain

Africans began to migrate to Britain in substantial numbers shortly after the end of World War II. The first immigrants came mainly from the Caribbean and in the last quarter of the twentieth century a number came from Africa. From the 1960s studies were published of the IQs of African immigrants. The results of these are given in Table 4.5. Row 1 gives an IQ of 88 for what is believed to be the first published result of the children of West Indian Africans and is for a sample of Caribbean children in London, where the majority of these immigrants settled. Row 2 gives an IQ of 82 calculated by Vernon (1969, p. 169) for another sample in

London in the 1960s. Row 3 gives a reasoning IQ of 88 and a vocabulary IQ of 82 for West Indian children compared with European English children attending the same secondary school in the district of Haringey in London; the district is poor and the European children will have scored below the national average, thereby inflating the IQs of the West Indians. To adjust for this the IQ of the Europeans is assumed to be 95. Row 4 gives an IQ of 89 for a sample of children in London. Row 5 gives an IQ of 86 for samples of children in Birmingham and in Deptford, London.

Row 6 gives an IQ of 104 for 9 African children taken into institutions as infants because their mothers were unable to look after them. In the same study the IQs of mixed race children and white children also taken into institutions were measured, with the results that the mixed race had an IQ of 110 (n=15) and the whites an IQ of 104 (n=36). The results are out of line with the other results in the table, all of which show African children in Britain have IQs well below whites. Moreover, it would normally be expected that the IQs of the children would be below average intelligence because the mothers were predominantly unskilled and put them into institutions, and would probably have been of below average intelligence. The results that these children had IQs above average are remarkable and need replication. If they can be confirmed as valid, they suggest that black mothers do not provide such a good environment as the white foster parents who reared these children, but there is little evidence to support this inference. The number of children (9) was very small and possibly this is just a fluke result.

Row 7 gives an IQ of 86 for a national sample of Afro-Caribbean children in Britain. Rows 8 and 9 give IQs of 73 for children in Britain born in the Caribbean and of 82 for those born in Britain. The IQ of 73 for those born in the Caribbean is closely similar to that of 71 of indigenous Caribbean children given in Table 4.2. Row 10 gives a verbal IQ of 86 for West Indian children tested with the English Picture Vocabulary Test. Row 11 gives an IQ of 85 for West Indian children at a comprehensive school in the town of Ilford in Essex; the IQ of 85 is lower than that of Indian subcontinent children in the same school who obtained an IQ of 91; this is the first of a number of studies in Britain finding that Caribbean immigrants have lower IQs than Indian immigrants from the sub-continent. Row 12 gives a vocabulary IQ of 78 for all West Indian children at maintained (public) schools in an education authority in the Midlands.

Row 13 gives an IQ of 86 derived from a reading test on a very large national sample of 12,530 15-year-olds. Row 14 gives an IQ of 85 obtained on a vocabulary test by West Indian children in the north of England compared with 851 Europeans attending the same schools. Row 15 gives an IQ of 86 obtained by West Indian children at school in a town in the Midlands; Indians from the Indian sub-continent attending the same schools obtained an IQ of 96, showing once again that South Asians in the same environment as Africans obtain higher IQs. Row 16 gives an IQ of 90 for a sample of West Indian children in London. Row 17 gives an IQ of 87 for a sample of West Indian 4-year-olds.

Row 18 gives an IQ of 89 for a national sample of Caribbean children drawn from the whole of Britain born in 1958 and who had been in Britain for more than 4 years; a further group of 39 who had been in Britain for fewer than 4 years obtained an IQ of 83, suggesting that residence in Britain raises the IQs of Caribbean children by around 6 IQ points. It has sometimes been suggested that many of the recent immigrant children from the Caribbean spoke a form of Creole West Indian English that made it hard for them to understand the teachers, but the fact that immigrant West Indians performed about the same on non-verbal reasoning tests as on verbal comprehension makes this unlikely. Row 19 gives an IQ of

Table 4.5. IQs of Africans in Britain

	Age	N	Test	g	Reas	Verb	Vis	Reference
1	10	71	SB	88	88	-	-	Houghton, 1966
2	11	476	VR	82	82	-	-	ILEA, 1967
3	12-15	174	SPM/MH	88	88	82	-	Bhatnagar, 1970
4	5-15	61	WISC	89	-	92	88	McFie & Thompson, 1970
5	11	394	EPVT	86	-	86	-	Halsey, 1972
6	4-5	9	WPPSI	104	-	-	-	Tizard, 1972
7	5-10	548	EPVT	86	.	86	-	Payne, 1974
8	10	143	NV5	73	73	-	-	Yule et al. ,1975
9	10	201	NV5	82	82	-	-	Yule et al., 1975
10	5-10	548	EPVT	86	-	86	-	Little, 1975
11	10	66	VR	85	85	-	-	Black Peoples, 1978
12	7	139	EPVT	78	-	78	-	Phillips, 1979
13	15	12,530	Reading	86	-	86	-	Mabey, 1981
14	12	149	Vocabulary	85	-	85	-	Pumfrey, 1983
15	8-12	205	NFER	87	87	-	-	Scarretal., 1983
16	10	88	CEFT	90	-	-	90	Bagleyetal., 1983
17	4	106	WPPSI	87	-	87	-	BJarchford et al., 19S5
18	11	74	NFER	89	89	90	-	Mackintosh & Mascie-Taylor, 1985
19	10	125	NFER	94	94	92	-	Mackintosh & Mascie-Taylor, 1985
20	14	250	NFER	88	88	-	-	Maugham & Rutter, 1986
21	7-15	88	AH	92	92	94	-	West et al. ,1992
22	65-75	248	MMSE	89	-	-	-	Stewart et al., 2002

92 for a national British sample born in 1970; the high IQ of this sample may indicate that the IQ of Caribbean children has increased slightly, but the subsequent studies in the table show no improvement in the IQs of African children from the 1960s through the 1980s, so this may be a chance result.

Row 20 gives an IQ of 88 for a sample of African schoolchildren in schools in London, the majority of whom had been born in Britain. Row 21 gives an IQ of 92 for a sample of African schoolchildren in Cambridgeshire. The IQs are in relation to indigenous British children attending the same schools and these are likely to be below national norms because the British of higher socio-economic status tend not to send their children to schools where there are appreciable numbers of immigrants. The effect of this will be to inflate the IQs of the Africans. There are no national norms for the test so the IQ of the Africans in relation to British cannot be accurately calculated. Probably the IQ of the British in this study was about 95, and hence the IQ of the African sample in relation to British national norms will have been about 87 and therefore about the same as other samples of Africans in Britain. Row 22 gives an IQ of 89 for

a sample of 65-75-year-old Africans in London obtained in 1996-98 compared with a national sample of 5,379 indigenous British.

The results of the studies of the intelligence of Africans in Britain raise three points of interest. First, the median IQ of the studies is 86 and is almost exactly the same as the average of 85 of Africans in the United States. These figures are substantially higher than the median IQ of 67 of Africans in sub-Saharan Africa and of 71 in the Caribbean, from where most Africans in Britain have come in the post-World War II decades. Second, the higher IQ of Africans in Britain is attributable to the better environment. This effect is shown in the study by Yule, Berger, Rutter, and Yule (1975) given in rows 7 and 8 showing IQs of 73 for those born in the West Indies and 82 for those born in Britain, suggesting that residence in Britain raises the IQs of Caribbean children by around 9 IQ points. This result is confirmed by the Mackintosh and Mascie-Taylor (1985) study shown in row 18, where the West Indian children from the Caribbean who had been in Britain for more than 4 years had an IQ of 89, while the IQ of a further group of 39 who had been in Britain for fewer than 4 years obtained an IQ of 83, suggesting that residence in Britain raises the IQs of Caribbean children by around 6 IQ points. The two results are quite similar, suggesting that being raised in Britain increases the IQs of Africans by 7-8 IQ points. This increase is probably largely a result of better nutrition and health care and perhaps education, although there seems to be no evidence that education in the West Indies is poorer than in Britain and is sometimes asserted to be better. The effect of improved nutrition for West Indian immigrants was shown by the Yule et al. (1975) study that found that West Indian Africans born in Britain are taller than those born in the Caribbean who had come to Britain some time during childhood, a difference of $0.67d$ (standard deviation units). Third, the IQ of 87 for a sample of West Indian 4-year-olds given in row 17 is virtually exactly the same as that obtained by older West Indian children at school and shows that the low IQs of West Indian children cannot be blamed on schools, prejudice of teachers, difficulties understanding teachers' spoken English, and so on. This result confirms those found in the United States, that the low IQ of Africans is present in pre-school children.

6. Africans in the Netherlands

During the second half of the twentieth century a number of Africans migrated to the Netherlands from the former Dutch colony of Surinam in the northeast of South America and from the Netherlands Antilles, the former Dutch colony in the Caribbean. Studies of their intelligence are summarized in Table 4.6. Row 1 gives an IQ of 86 for the children of immigrants from Surinam. The test used and the age of the sample are not given. The population of Surinam consists of 35 percent Creoles of mixed African-European ancestry, 10 percent Africans, 33 percent Asian Indian, 16 percent Indonesian, and 3 percent American Indian. The IQ of 86 is about what would be predicted from this racially mixed population because the largest group, the Creoles, would be expected to have an IQ about midway between Africans in Africa (67) and Northwest Europeans (100), and the second largest group, the Asian Indians, should have an IQ of approximately 82 (see Chapter 6). Row 2 gives an IQ of 84 for a sample of the children of first generation immigrants from Surinam and the Netherlands Antilles. Row 3 gives an IQ of 88 for a sample of the children of second-generation immigrants from Surinam and the Netherlands Antilles. These children have a four-IQ-point gain compared with the children of first generation immigrants shown in row 2. This confirms the studies in Britain showing that second generation immigrants obtain higher IQs than first generation. Row 4 gives an IQ of 85 for a further sample of the children of immigrants from Surinam. The test used and the age of the sample are not given. Row 5 gives an IQ of 83 for another

sample of immigrants from Surinam and the Netherlands Antilles. Row 6 gives an IQ of 85 for adult immigrants from Surinam. Row 7 gives an IQ of 85 for immigrants from the Dutch Antilles, whose population is 85 percent African and mixed African-European. The IQs obtained in the studies are closely similar, with a median of 85, the same as that of Africans in the United States.

Table 4.6. IQs of Africans in the Netherlands

	Age	N	Test	<i>g</i>	Reas	Verb	Vis	Reference
1	Children	110	GALO	86	-	-	-	De Jong & van Batenburg, 1984
2	Children	123	RAKIT	84	-	-	-	Resing et al., 1986
3	Children	77	RAKIT	88	-	-	-	Resing et al., 1986
4	Children	138	-	85	-	-	-	De Jong, 1988
5	11	404	CITO	83	83	88	-	Pieke, 1988
6	Adults	535	GATE	85	85	85	85	Te Nijenhuis, 1997
7	Adults	129	GATE	85	85	80	86	Te Nijenhuis, 1997

7. Africans in Israel

A number of African Ethiopian Jews migrated to Israel during the closing decades of the twentieth century. The intelligence of a sample of 250 15-year-olds was assessed by Kaniel and Fisherman (1991) using the Standard Progressive Matrices. The authors write:

The Ethiopian Jews were tested one year after they arrived in Israel. All the subjects were tested in groups in their schools, using standard procedure. Each group was shown the first practice item of the test and solved it together. Special care was taken to make sure the Ethiopian Jews understood how the test was organized, to ensure their ability to fill out the answer sheet. There was no time limit (p. 28).

The authors made errors in the calculation of the IQ of the Ethiopians. I have given the correct figures in Lynn (1994b). The mean score on the test was 27, equivalent to the first percentile on the British 1979 standardization norms and to an IQ of 65. It is assumed that the Israeli data were collected in 1989 and that the British IQ increased by 2 IQ points between 1979 and 1989. To adjust for this increase, the IQ of the Ethiopian Jews needs to be reduced to 63.

A second study of the IQ of Ethiopian Jews has been published by Kozulin (1998). These were 14-16-year-olds who had been in Israel four or more years, were attending Israeli boarding schools, and were tested with the Progressive Matrices. Their mean IQ was 65. These results suggest that education in western schools does not benefit the African IQ.

8. Short-Term Memory and Perceptual Speed Abilities of Africans

Hitherto African intelligence has been considered in terms of *g* (general intelligence), reasoning, verbal, and visualization abilities. We now consider studies on the short-term memory and perceptual speed ability of Africans. Short-term memory is typically measured by the Digit Span test, consisting of the ability to recall a series of numbers either in the order in which they are presented (forward Digit Span) or in reverse order (backward Digit Span). Perceptual Speed is typically measured by the Coding and Digit Symbol subtests in the Wechsler tests that require accurate and rapid scanning of visual information. These studies have shown that Africans have relatively strong short-term memory and perceptual speed abilities. The results are summarized in Table 4.7. Row 1 gives IQs of 75 and 76 for African 10-12-year-olds ($n=1,123$) compared with Europeans ($n=1,489$) obtained for non-verbal reasoning and for verbal ability measured by the Lorge-Thorndike test, a much higher IQ of 90 for short-term memory measured by Digit Span and a remarkable IQ of 102 for Perceptual Speed. The authors comment: "given a test that involves only speed but no appreciable cognitive factor, the Negro children perform as well as or better than the European children" (Jensen & Rohwer, 1970, p. 60). Row 2 gives a typical IQ of 85 for the verbal and performance scales of the WISC-R obtained for 622 African 5-11-year-olds compared with 669 Europeans and a short-term memory IQ of 94 as the average of forward (IQ 96) and backward (IQ 92) digit span. Row 3 gives IQs for African 12-18-year-olds obtained from the Project Talent data set and shows a relatively high IQ of 94 for immediate memory as compared with 89 for abstract reasoning. Row 4 gives an IQ of 94 for short-term memory for 5-9-year-old African Surinamese immigrants in the Netherlands ($n=183$) compared with European children; the test consisted of the presentation of ten drawings, each of which was given an arbitrary name, and the task was to remember as many of the names as possible. Row 5 gives IQs for African 6-16-year-olds ($n=711$) compared with Europeans ($n=776$) of 82 for verbal ability, 78 for visualization ability, and a higher IQ of 90 for short term memory measured by Digit Span. Row 6 gives an IQ of 94 for short-term memory for Africans obtained from a meta-analysis of 31 studies of children and adults. Row 7 gives IQs for a number of primary abilities from South Africa from the study of 1,093 African and 1,056 European 16-year-olds tested with the Junior Aptitude Test, a test constructed in South Africa that provides measures of Abstract Reasoning (AR), Verbal Reasoning (VR), Verbal Comprehension (Verb), Visualization (Vis), Short-Term Memory (STM), and Perceptual Speed (PS); the sample also obtained a Mechanical Ability IQ of 68. It will be seen that the African short-term memory IQ (79) and the perceptual speed IQ (69) are both higher than their Abstract Reasoning Ability (58) and their Verbal Reasoning Ability (63), confirming the American studies. In this sample the visualization and mechanical abilities are also all stronger than abstract and verbal reasoning ability. Row 8 gives a short-term memory IQ of 74 for a sample of 196 10-year-olds in Jamaica, compared with 67 entered as the median of the seven studies given in Table 4.3.

Jensen (1998) has interpreted these and other results as showing that the African-European differences in intelligence are largely differences in Spearman's *g*. According to this theory, short-term memory and perceptual speed are weak measures of *g*, so Africans do relatively well on them. The theory has received considerable support, summarized by Rushton (2003), but has also attracted some criticism from Dolan and Hamaker (2001).

Table 4.7. Primary abilities of Africans

	Location	AR	VR	Verb	Vis	STM	PS	Reference
1	USA	75	-	76	-	90	102	Jensen & Rohwer, 1970
2	USA	-	-	85	85	94	-	Jensen & Figueroa, 1975
3	USA	89	-	86	90	94	-	Humphreys, 1988
4	Netherlands	-	-	-	-	94	-	Sijtsma & Resing, 1991
5	USA	-	-	82	78	90	-	Kramer et al., 1995
6	USA	-	-	-	-	94	-	Verive & McDaniel, 1996
7	South Africa	58	63	58	69	79	69	Lynn & Owen, 1994
8	Jamaica	67	-	-	-	79	-	Sternberg et al., 1997

9. Musical Abilities

It has often been considered that Africans have good musical abilities and a particularly strong sense of rhythm. The conclusion appears to have been first suggested in the fourteenth century by the Arab writer Ibn Butlan who wrote that if an African "were to fall from heaven to earth he would beat time as he goes down" (Lewis, 1990, p. 94). Musical abilities are associated with intelligence, so it is interesting to consider whether Africans have the good musical abilities often attributed to them, or poor musical abilities consistent with the low IQs they obtain on intelligence tests.

Musical abilities are measured by simple tests such as the identification of pitch change (identifying whether the pitch of one tone is higher or lower than that of another; in the initial items the difference between the tones is great but as the test progresses the tones become closer until it is extremely difficult to distinguish which is higher); memory (a tune is played twice and on the second playing one note is altered; the task is to identify the altered note); chord analysis (the identification of the number of notes in a chord); and rhythm (two pieces of music are played and the problem is to identify whether the rhythms are the same or different). The association between intelligence and musical ability has been shown in two studies carried out by Lynn, Wilson, and Gault (1986). In the first, a sample of 217 10-year-olds were given a number of tests of reasoning, vocabulary, visualization, and perceptual speed abilities together with four musical ability tests (pitch, memory, chords, and rhythm). All the tests were positively intercorrelated and loaded on the first principal component as a measure of general intelligence (*g*). The loadings of the four musical tests lay between 0.45 (chords) and 0.59 (rhythm). This shows that the musical tests are measures of *g*. In the second study 93 9-11-year-olds were given three tests of musical ability (pitch change, chord analysis, and memory) together with the Standard Progressive Matrices, a measure of *g*. The three musical tests were significantly correlated with the Progressive Matrices at 0.27, 0.40, and 0.37. This confirms that musical ability is associated with intelligence. Further evidence for this association has been provided by Carroll (1993).

There has been some work on the musical ability of African Americans but this is little known because it has not been summarized in general textbooks on intelligence such as those of Brody (1992) and Mackintosh (1998) or in specialist textbooks on race differences in intelligence such as those by Loehlin, Lindzey, and Spuhler (1975) and Jensen (1980, 1998). The

general outcome of these studies is that African Americans perform less well than Europeans on tests of musical abilities of pitch discrimination, tone discrimination, and memory, but they perform about the same as Europeans on tests of rhythm. To show this pattern of musical abilities, the results of these studies have been aggregated to give a Musical Quotient (MQ) derived from tests of musical ability other than rhythm, and a Rhythm Quotient (RQ). The results of these studies are summarized in Table 4.8. Row 1 gives results for a large sample of African Americans in North Carolina, South Carolina, and Virginia calculated from the Seashore Test and shows that they obtained an MQ (Musical Quotient) of 90 but a higher RQ (Rhythm Quotient) of 106. Row 2 gives results from a comparison of 272 European and 288 African American college students attending colleges in Tennessee, again showing that Europeans achieved higher scores on general musical ability (pitch, intensity, time, consonance, and total memory) but African Americans achieved a higher RQ (Rhythm Quotient) of 102. Row 3 gives results for a sample from a poor neighborhood in Washington, D.C. showing an MQ of 83 and an RQ of 96. Row 4 gives results for a sample of African-American 5-to-8-year-olds in Rochester in New York State with an MQ of 89 and an RQ of 104. Row 5 gives results for a sample of African-American 18-year-olds drawn from senior high school largely in Texas, with some from Illinois and Rochester in New York State, with an MQ of 86 based on tonal memory and pitch discrimination and an RQ of 100. The comparison group was 541 Europeans attending the same schools. All the studies show that African Americans have Rhythm IQs substantially greater than general Musical IQs by about 15 IQ points. There appears to be no change in the musical abilities of Africans over the period of approximately half a century from the 1920s to the late 1970s over which the studies have been conducted. The relatively high rhythm ability of Africans is expressed in their music in which a strong rhythmic element is frequently present. This is notably the case in the hymns sung by congregations in African and African-American churches. It also appears in jazz, which was first developed by African Americans in New Orleans in the early years of the twentieth century, and in its subsequent development in "swing," with its strong syncopated rhythms.

Several twin studies have shown that there is a genetic basis for musical abilities. For instance, a study by Vandenberg (1962) of the heritability of rhythm ability obtained from the correlations of 33 pairs of identical twins and 43 pairs of same-sex fraternal twins calculated a heritability of 0.52,

Table 4.8. Musical (MQ) and Rhythm (RQ) Quotients of African Americans

	Sample	Age	N	Test	MQ	RQ	Reference
1	Carolinas	11-20	3,500	Seashore	90	106	Johnson, 1928
2	Tennessee	18-20	288	Seashore	88	102	Peterson & Lanier, 1929
3	Washington	13-14	85	Seashore	83	96	Dawkins & Snyder, 1977
4	NY State	5-8	167	PMMA	89	104	Gordon, 1980
5	Texas	18	272	Seashore	86	100	Sung & Dawis, 1981

not corrected for measurement error. Heritabilities of this magnitude make it likely that the low general musical abilities and the high rhythm ability of Africans have some genetic basis.

The low musical abilities of Africans, except for their strong sense of rhythm, are consistent with their generally poor achievements in classical music. There are no African composers,

conductors, or instrumentalists of the first rank and it is rare to see African players in the leading symphony orchestras.

10. Reaction Times

Reaction times consist of the speed of reaction to a simple stimulus such as the onset of a light. The task is to press a button when this occurs and the reaction time is the time taken to respond, which typically takes about a third of a second. Numerous studies reviewed by Jensen (1998) and Deary (2000) have shown that reaction times are positively related to intelligence at a magnitude of around 0.2 to 0.3. It has been persuasively argued by Jensen (1998) that reaction times are a measure, of the neurological efficiency of the brain in processing information. This makes it an interesting question whether the differences between Europeans and Africans in intelligence are also present in reaction times. If they are, it means that there are race differences in the efficiency of the brain. If there are not, it means that there are no race differences in the efficiency of the brain and the differences in intelligence must be due to some other factors, such as opportunities for learning the problems in the tests, educational experiences, or test bias.

The most complete studies of African-European differences in reaction times have been carried out by Jensen (1993) in the United States and Lynn and Holmshaw (1990) and Sonke (2000) in South Africa. Jensen's study compared 585 European and 235 African 10-year-olds whose IQs assessed by the Progressive Matrices differed by 11 IQ points. The Lynn and Holmshaw study compared 350 African and 239 British 9-year-olds whose IQs differed by 37 IQ points. Both studies used the same computer-controlled apparatus, so that no human error can affect the times registered. Both studies measured the twelve components of reaction times. Three different kinds of reaction time were measured. These were simple reaction time (SRT) consisting of reactions to a single light, choice reaction time (CRT) consisting of responses to one of eight lights, and odd-man reaction time (OMRT) consisting of reaction to the one of three lights that was farthest from the other two. Each of these three reaction times was measured for four components consisting of the reaction time proper (the decision time), the movement time (time taken to move the finger to the button), and the standard deviations of the reaction times and movement times. The results are shown in Table 4.9. Column 1 gives the different measures of reaction time. Columns 2 and 3 give the Jensen data for the correlation with the Progressive Matrices IQ and the d difference between Africans and Europeans with negative signs denoting faster times by Europeans. Columns 4 and 5 give the same data for the Lynn and Holmshaw data. Correlations between reaction times and IQs are consistently positive in all the data and 16 of the 24 correlations are statistically significant (designated by the asterisks), but the correlations are very low. Reaction times shown in rows 1, 5, and 9 are faster in Europeans than Africans except for CRT in the Jensen data. Simple movement times show no difference, but Africans are significantly faster than Europeans in both CMT and OMMT in the Lynn and Holmshaw data. The faster movement times of Africans may be a factor in the fast sprinting speed of Africans shown in Olympic records. The standard deviations are consistently greater in Africans in the Lynn and Holmshaw data and in four of the six differences in the Jensen data. In general the African-European differences are much greater and more consistent in the Lynn and Holmshaw data than in the Jensen data. This would be expected because the intelligence difference is some four times greater in the Lynn and Holmshaw data. However, in the Lynn and Holmshaw data the mean of differences of the six reaction times and standard deviations between the Africans and Europeans amounts to only 0.67J as compared with a 2.5d difference in IQ. The best interpretation of the

results is that approximately a quarter of the African-European difference in intelligence may be explicable by the speed of neurological processing, while the remainder must be attributed to other processes.

Although reaction times have a significant heritability of around 50 percent (Deary, 2000), they are also affected by nutrition. An Italian study found that children aged 6-10 in iodine deficient villages had slower reaction times as well as lower IQs (Vitti et al., 1992). Slow reaction times in children from iodine deficient villages have also been reported by Bleichrodt et al. (1987).

Table 4.9. Correlations between reaction times and IQ and differences between Africans and Europeans in reaction times.

Variable	Jensen		Lynn & Holms-haw	
	<i>r</i>	<i>d</i>	<i>r</i>	<i>d</i>
SRT	0.053	-0.003	0.11*	- 0.40*
SMT	0.042	0.114	0.15*	0.01
SRT: SD	0.174*	-0.167*	0.09	-1.17*
SMT: SD	0.114*	-0.097	0.10*	-0.60*
CRT	0.116*	0.053	0.14*	-0.12
CMT	0.072	0.063	0.20*	0.47*
CRT: SD	0.132*	-0.086	0.02	-1.50*
CMT: SD	0.072	0.063	0.16*	-0.62*
OMRT	0.203*	-0.189*	0.09	-0.38*
OMMT	0.090	-0.057	0.21*	0.49*
OMRT: SD	0.203*	-0.258*	0.07	-0.49
OMMT: SD	0.187*	0.009	0.15*	-0.18*
* = statistically significant				

Sonke (2000) has reported a study of three groups consisting of 26 illiterate Africans in South Africa aged 16, with "only a few years of schooling," 29 African university students at Venda University in the Northern Transvaal, and 30 European Dutch university students at Tilberg university. The three groups were given an intelligence test (Raven's Progressive Matrices) and simple and complex reaction time tasks, and an EEG measure was taken of the latency of the evoked potential (P3) to the presentation of the reaction time stimuli, a measure of the speed with which the stimulus is registered in the brain. There were equal numbers of males and females in all three groups.

The results are shown in Table 4.10. Row 1 gives the IQs of the three groups. Row 2 gives the mean simple reaction times showing slowest reaction times in the African illiterates and fastest in the European students. Row 3 gives complex reaction times showing the same group differences. Row 4 gives the evoked potential latencies for task B1, showing longest latencies

in the African illiterates, and the shortest latencies in the European university students. All the group differences are statistically significant.

Table 4.10. Reaction times and EEGs of Africans and Europeans

	Test	African Illiterates	African Students	Europeans
1	IQ	68	82	105
2	RT-S	420	400	350
3	RT-C	1,950	1,650	1,220
4	EEG	534	526	506

There are six points of interest in this study. First, the South African illiterate sample's Progressive Matrices IQ of 68 is closely similar to that of a large number of samples of Africans in South Africa and in other countries of sub-Saharan Africa. Second, the African university students have a somewhat higher IQ of 82, again similar to that of other African South African university student samples. Third, there are significant differences between the three groups in reaction times, confirming other studies summarized in this chapter. Fourth, there are significant African-European differences in the EEG evoked potential showing that in European students the brain reacts more rapidly to a stimulus than in African students. Fifth, there is a statistically significant correlation of 0.213 between the complex reaction times and the Progressive Matrices, confirming many other studies of this association. Six, the correlation between the Progressive Matrices and the EEG evoked potential is not statistically significant. The differences between the African illiterates and the African students on reaction times and evoked potentials are probably attributable to the students having higher IQs.

11. Brain Size of Africans and Europeans

Studies showing that Africans have smaller average brain size than Europeans are summarized in Table 4.11. The figures given in the table are in cubic centimeters (these figures have been converted from cubic inches given by Morton and Gould, and from grams given by Ho et al., 1980). It should be noted that estimates of cranial capacities are to some degree affected by the method of measurement. The cranial volume of skulls is measured by filling them with lead shot or mustard seed and measuring the volume of the shot or seed. Lead shot gives slightly larger volumes than mustard seed because it cannot be compressed so tightly. For living humans brain size is calculated from the length, breadth, and height of the head, or from the circumference. These different methods of measurement explain some of the differences obtained in the studies. Despite different methods of measurement, there is considerable consistency in the various studies.

In Table 4.11 the results are given of eight studies of the brain size of samples of Europeans and Africans and the difference between the two means. All the studies show that Europeans have a larger average brain size than Africans. Row 1 gives the results of the first study showing that there are African-European differences in brain size published in the nineteenth century by the American physician Samuel Morton (1849), who assembled a collection of skulls, categorized them by race, and calculated their average cranial capacities. His results were criticized by Gould (1996), who accused him of massaging the figures to demonstrate that

Europeans have larger brains than Africans. Gould recalculated Morton's skull sizes and his results were closely similar. It is Gould's figures that are given in the Table. He dismissed the 41cc difference as of no consequence. Gould characteristically failed to mention any of the other studies that all confirmed Morton's conclusions and found larger differences. Notice that the numbers of skulls in Morton's collection are quite low, consisting of 52 Europeans and 29 Africans, as compared with the other studies.

Row 2 gives the results of an analysis of a much larger collection of skulls held at Western Reserve University in Ohio, showing 50cc African-European differences in brain size. Row 3 gives results presented by Tobias, a committed equalitarian, who asserted that there is no race difference in brain size but whose results actually show a rather larger African-European brain size difference than those of Morton. Row 4 gives the results from autopsies in the United States showing a larger African-European difference, of 103cc, than in the other studies. Row 5 gives results from the largest collection of approximately 20,000 skulls from all over the world analyzed by the American anthropologist Kenneth Beals. Row 6 gives results calculated by Groves (1991) by combining estimates of cranial capacities of 36 samples of males from figures given by Coon, Molnar, and Martin and Sailer and again showing that Europeans have larger average brain size than Africans. Row 7 gives results for the United States for military personnel. These figures are adjusted for height and weight. The brain sizes of the Europeans are virtually identical to those found by Ho et al. given in row 4, but the brain size of the Africans is much greater, at 1,359 as compared with 1,267. The explanation for this is that the U.S. military screens applicants for intelligence and rejects those with IQs below 81 (Nyborg and Jensen, 2000). Flynn (1980) has estimated that military rejection rates for low IQ are 3.4 percent for Europeans and 30 percent for Africans, and that the result of this is that Africans in the military have an average IQ of 91.5. The effect of not accepting Africans with low IQs is to screen out many of those with low intelligence and small brains, making the African-European brain size difference much smaller than in other samples. Row 8 gives average brain size of six samples of male Europeans from North America and Europe and two samples from sub-Saharan Africa from data compiled by Jurgens, Aune, and Pieper (1990) and analyzed by Rushton (2000, p.124) showing a European advantage of 109cc. The results in the eight data sets all show greater brain size of Europeans than of Africans and are reasonably consistent considering that they were compiled using different methods and different kinds of samples, including autopsies (Ho et al., 1980), skull volumes (Reals et al., 1984), and external head measurements of living individuals.

These results are corroborated by a further large-scale study of children carried out by Broman, Nichols, Shaughnessy, and Kennedy (1987). They examined and followed up approximately 17,000 European and 19,000 African children in the United States from conception to the age of 7 years. At the age of 7 there was the typical gap of approximately 15 IQ points between the two groups. The head circumference of the two groups calculated from the published data are 50.9cm (sd 1.6) for Africans and 51.7cm (sd 1.6) for Europeans. This difference is statistically highly significant and provides an approximate measure of differences in brain size, since head circumference and brain size are correlated at about 0.8 (Brandt, 1978). The brain volumes have been estimated by Rushton (1997) at 1,134 for Africans and 1,150 for Europeans. The difference is much smaller than in the other samples, possibly because Europeans mature later than Africans. In this study the African children were slightly taller than the Europeans, suggesting that possible differences in nutrition are not likely to be responsible for the differences in head size.

Table 4.11. Brain size (cc) of Europeans and Africans

	Location	Sex	Europeans		Africans		Diff	Reference
			N	Mean	N	Mean		
1	World	mf	52	1,401	29	1,360	41	Morton, 1849
2	World	mf	1,840	1,364	880	1,314	50	Simmons, 1942
3	World	mf	-	1,427	-	1,363	64	Tobias, 1970
4	USA	mf	811	1,370	450	1,267	103	Ho et al, 1980
5	World	mf	-	1,369	-	1,283	86	Smith & Beals, 1990
6	World	m	-	1,476	-	1,416	60	Groves, 1991
"7	USA	mf	2,871	1,380	2,676	1,359	21	Rushton, 1992
8	World	mf	-	1,320	-	1,211	109	Rushton, 2000

12. IQs of African-European Hybrids

We now consider studies of the IQs of African-European hybrids. The prediction from the genetic theory of race differences is that the IQs of racial hybrids should fall approximately midway between those of Europeans and Africans. To examine this prediction, studies of African-European racial hybrids are summarized in Table 4.12. Row 1 gives results for Brazil showing that hybrids known as "browns" score intermediate between Europeans and Africans. Row-2 gives results from Germany from the Eyferth (1961) study showing the IQ of African-European hybrid children was 94 in relation to 100 for European children. The mean IQ of the African-European hybrids was 96.5 but is reduced in the table to 94 to allow for the secular increase of the IQ from the date of the standardization. Row 3 gives results from South Africa for Europeans, Africans, and Coloreds, who are largely African-European, and shows that the IQ of 83 of the Coloreds falls exactly half way between that of Europeans (100) and that of Africans (65). Row 4 gives results from a more recent study in South Africa collected approximately sixty years later and showing a sample of Coloreds with an IQ of 86 compared with an IQ of 100 for Europeans. Africans were not included in this study but the IQ of 86 is much higher than that of pure Africans in South Africa. Row 5 gives results from a further South African study showing an IQ of 80 for Coloreds.

Rows 6 through 9 give four results for hybrids in the United States.

Table 4.12. IQs of Europeans, African-European hybrids, and Africans

	Location	Age	Test	European		Hybrids		Africans		Reference
				N	IQ	N	IQ	N	IQ	
1	Brazil	10	SPM	735	95	718	81	223	71	Fernandez, 2001
2	Germany	5-13	WISC	1,099	100	170	94	-	-	Eyferth, 1961
3	South Africa	10-12	AAB	10,000	100	6,196	83	293	65	Pick, 1929

4	South Africa	13	GSAT	746	100	815	86	-	-	Claassen, 1990
5	South Africa	15	SPM	1,056	100	778	80	1,093	74	Owen, 1992
6	USA	17	WISC-R	16	102	55	94	17	85	Weinberg et al., 1992
7	USA	Adult	Otis	-	100	284	91	176	87	Codwell, 1947
8	USA	Adult	Vocab	1,245	100	304	92	146	85	Lynn, 2002
9	USA	Adult	Vocab	10,315	100	116	97	4,271	89	Rowe, 2002

Row 6 gives results from the Minnesota Transracial Adoption Study showing that hybrids score halfway between African Americans and Europeans. The numbers are very low, but the results are informative because all three groups were reared by European adoptive parents and this rules out any reasonable environmental interpretation of the differences. Row 7 gives a further result from the United States showing once again that hybrids score intermediate between Europeans and African Americans (results of this study are given by Loehlin, Lindzey, and Spuhler, 1975). Row 8 gives another result from the United States that divided African Americans into dark skinned and lighter skinned and showed that the lighter skinned African Americans, taken as an index of hybridization with Europeans, have an IQ of 92, halfway between the Europeans and Africans. Row 9 gives the last result, showing that African-American-European hybrids have an IQ of 97 and again score intermediate between African Americans and Europeans.

13. Heritability of Intelligence in Africans Americans

There have been three studies of the heritability of African Americans in the United States. They are all obtained from a comparison of identical (Mz) and non-identical twins (Dz). The results are given in Table 4.13.

This gives the age of the sample, the numbers of identical (Mz) and non-identical (Dz) twins, the correlations between the twin pairs, the heritability obtained by doubling the difference between the Mz and Dz correlations, and the corrected heritability, corrected for attenuation assuming a test reliability of 0.9. Row 1 gives data from Loehlin, Lindzey, and Spuhler (1975) obtained from a doctoral dissertation by P. L. Nichols for 4-year-olds tested with the Stanford-Binet. This shows a corrected heritability of 0.56, a little higher than that of Europeans of this age. Row 2 gives results of a further data set from Osborne (1980, p. 72) for general intelligence calculated as the average of twelve tests and showing a corrected heritability of 1.00. Row 3 shows data for the Progressive Matrices (Scarr, 1981, p. 282) giving a corrected heritability of 0.60. Taken together the three results show a heritability of 0.72 in African Americans and higher heritability in the two studies of adolescents than in the 4-year-olds. The heritabilities of the African Americans are virtually the same as those in Europeans given in Chapter 3.

14. Genetic and Environmental Explanations of the Low African IQ

The problem of the genetic and environmental contributions to the low IQ of Africans has been debated since the early decades of the twentieth century, particularly in regard to the problem of the low IQs obtained by African Americans in the United States. Many hundreds of papers and a number of books have been devoted to this problem and it is not possible to deal with it adequately. Three positions have been taken on this question:

1. The IQ difference between blacks and whites is wholly environmentally determined or at least there is no compelling evidence for any genetic contribution to the low black IQ. This position has been taken by Flynn (1980), Mackintosh (1998), Nisbett (1998), Fish (2002), Brody (2003), and many others.
2. The IQ difference is determined by some mix of genetic and environmental factors. This position has been taken by Loehlin, Lindzey, and Spuhler (1975), Vernon (1979), and Waldman, Weinberg, and Scarr (1994, p. 31), who conducted one of the most important studies of this question involving the IQs of black children adopted by white couples.
3. The IQ difference is largely genetically determined. This position has been taken by Garrett (1945, 1961); McGurk (1953a, 1953b), who showed that when blacks and whites were matched for socio-economic status, blacks scored 7.5 IQ points below whites; Kuttner (1962), who argued that black-white differences in intelligence were reflected in the differences in the building of early civilizations; Shuey (1966), who made the first compilation of black-white IQ differences, from 1916 up to 1965; Osborne and McGurk (1982), who made an updated compilation of Shuey's work covering the years 1966-1980; and Jensen (1969, 1974, 1980, 1998), who has made numerous contributions to this issue and concluded that about two thirds of the American black-white IQ difference is attributable to genetic factors. Others who have taken the largely genetic position are Shockley (1969), Eysenck (1971), Baker (1974), Levin (1997), Rushton (2003), and the writer (Lynn, 1994c, 2001).

There are six major arguments for the presence of some genetic determination of the intelligence difference between Africans and Europeans.

First, the two races have evolved independently in different environments over a period of approximately 100,000 years (Mellars and Stringer, 1989; Cavalli-Sforza, 2000). When two populations evolve largely in isolation from each other for this period of time genetic differences between them

Table 4.13. Heritability of intelligence of African Americans

	Age	Mz-N	r	Dz-N	R	h^2	$c-h^2$	Reference
1	4	60	0.77	84	0.52	0.50	0.56	Loehlin et al., 1975
2	15	76	0.80	47	0.34	0.92	1.00	Osborne, 1980
3	10-15	65	0.63	95	0.36	0.54	0.60	Scarr, 1981

inevitably evolve for all characteristics for which there is genetic variability. These differences evolve as a result of genetic drift, mutations, founder effects, and most important, adaptation to different environments. The extreme environmentalist position that there is no ge-

netic difference between the two races for intelligence defies this general principle of evolutionary biology and should be ruled out as impossible.

Second, the consistency with which Africans obtain low IQs in so many different locations can only be explained by the operation of a strong genetic factor. If only environmental factors were responsible for the different IQs of different populations, we should expect to find some countries where Africans had higher IQs than Europeans. The failure to find a single country where this is the case points to the presence of a strong genetic factor.

Third, the high heritability of intelligence found in twin studies of blacks and whites in the United States, in Europe, Japan, and India shows that intelligence is powerfully affected by genetic factors and makes it improbable that the differences between Africans and Europeans, or between any other pairs of races, can be solely environmentally determined.

Fourth, the brain size difference between blacks and whites points to a genetic difference, considering the high heritability of about 0.9 of brain size and the correlation of approximately 0.4 between brain size and intelligence.

Fifth, several egalitarians have proposed that white racism may be responsible for impairing the IQs of the blacks. Thus, Weinberg, Scarr, and Waldman write that their result that black children adopted by whites have low IQs "could indicate the results of environmental influences such as the pervasive effect of racism in American life" (1992, p. 41) and "the IQ results are consistent with racially based environmental effects in the order of group means" (p. 40). Mackintosh (1998, p. 152) also falls back on white racism in a final attempt to argue that the low IQ of the black adoptees can be explained environmentally and suggests that perhaps "it is precisely the experience of being black in a society permeated by white racism that is responsible for lowering black children's IQ scores." These egalitarians do not explain how hypothetical white racism could impair the IQs of black children reared by middle class white parents. There is no known or plausible mechanism by which supposed white racism could impair the IQs of blacks. Nor do they attempt to explain how it is that Africans throughout sub-Saharan Africa, who are not exposed to white racism, except in South Africa, have IQs of approximately 67.

Furthermore, if racism lowers intelligence, it is remarkable that Jews in the United States and Britain should have IQs of around 108, as shown in Lynn (2004), since Jews have been exposed to some degree of racism for many centuries. The high IQ of American Jews has been well known since the 1930s and has been extensively documented by Storfer (1990), MacDonald (1994), and Herrnstein and Murray (1994), yet it goes curiously unmentioned by environmentalists like Flynn (1980), Brody (1992, 2003), Neisser (1996), Mackintosh (1998), Jencks and Phillips (1998), Nisbett (1998), Montagu (1999), and Fish (2002).

Sixth, the Minnesota Transracial Adoption Study carried out by Waldman, Scarr, and Weinberg (1994) was designed to show that when black infants are adopted by white parents they would have the same IQs as whites. The authors of this study examined groups of black, white, and interracial babies all adopted by white middle class couples. In the event it turned out that at the age of 17 the IQs were 89 for the blacks, 98 for the interracial, and 106 for the white. Thus, a 17 IQ point difference between blacks and whites remains when they are reared in the same conditions. Being raised by white adoptive parents had no beneficial effects on the intelligence of the black children because their IQ of 89 is the same as that of blacks in the north central states from which the infants came. The interracial group with its IQ of 98 falls midway between the black and the white, as would be predicted from the genetic cause of the

difference. A full analysis and discussion of this study has been given by Levin (1994) and Lynn (1994c), together with an unconvincing reply by Waldman, Weinberg, and Scarr (1994, p. 43) in which they assert "we feel that the balance of the evidence, although not conclusive, favors a predominantly environmental etiology underlying racial differences in intelligence and that the burden of proof is on researchers who argue for the predominance of genetic racial differences". Notice that their use of the term "predominantly environmental etiology" concedes that accept that genetic factors are also present. While the results of this study show that differences in family environment cannot explain the low black IQ, it remains possible that blacks provide an inferior prenatal environment as a result of poorer nutrition of pregnant black women or possibly of the greater use of cigarettes that might impair the growth of the fetal brain. These possibilities are rendered improbable by studies showing that the nutrition of American blacks throughout the twentieth century was not inferior to that of whites (see Chapter 13, Section 7). Another possibility is that black babies might suffer greater impairment of the brain because pregnant black women might smoke cigarettes more, since there is some evidence that smoking retards fetal growth, but this is rendered improbable by numerous studies showing that blacks smoke cigarettes less than whites.

Despite their commitment to the egalitarian position, it is interesting to note that Waldman, Scarr, and Weinberg conclude that their evidence shows that both genetic and environmental differences contribute to the black-white IQ difference: "We think it is exceedingly implausible that these differences are either entirely genetically based or entirely environmentally based" (p. 31). Thus, while there is nothing in their data that can justify this conclusion, because they provide no evidence for any environmental contribution to the low black IQ, their final position is not greatly different from that advanced by Jensen (1969), that both genetic and environmental factors are responsible for the low black IQ, but where Jensen proposed that the relative contributions are about two thirds genetic and one third environmental, Waldman, Scarr, and Weinberg have concluded that both factors are involved, although they do suggest a quantification of the magnitude of the respective contributions.

In fact, the results of the Minnesota Interracial Adoption Study show that both conclusions are incorrect. The conclusion to be drawn from this study is that rearing black children in a white middle class environment has no effect at all on their IQs at age 17.

15. Estimation of the Genotypic African IQ

The IQs of approximately 67 of the African populations of sub-Saharan Africa shown in Table 4.1 are a function of both genetic and environmental factors. We now undertake the task of estimating the genotypic African IQ. This is the IQ that Africans would have if they were raised in the same environment as Europeans. The starting point of this analysis is the Minnesota Transracial Adoption Study, the results of which are summarized in section 14 and which showed that a 17 IQ point difference between African Americans and Europeans is still present when they are reared in the same family environments. The conclusion to be drawn from this is that the African-American-European IQ difference in the United States is wholly genetically determined. Although this study showed a 17 IQ point African-European IQ difference, it is reasonable to assume that the true African-American-European difference is 15 IQ points, as shown by the numerous studies summarized in Table 4.4, and that the 17 IQ point difference obtained in this study is a sampling error. We conclude therefore that the genotypic IQ of African Americans is 15 IQ points below that of American Europeans. A further argument for believing that the IQ of African Americans is wholly genetically determined is that it

has remained constant over a period of approximately 80 years despite the great improvements in the environment of African Americans relative to that of Europeans.

The conclusion that African Americans have a genotypic IQ of 85 does not mean that Africans in sub-Saharan Africa also have a genotypic IQ of 85. African Americans are not pure Africans but are a hybrid population with a significant amount of European ancestry. This has been estimated at 25 percent by Reed (1971) and by Chakraborty, Kamboh, Nwamko, and Ferrell (1992). We can estimate that pure Africans in Africa and in the United States have a genotypic IQ of 80 and that this IQ increases by 0.2 IQ points for every 1 percent of Caucasoid genes. Thus, the average African American will have an IQ of 85 ($80 + 25 \times 0.2 = 85$), a figure confirmed by numerous studies summarized in Table 4.4. In the Southeastern states the percentage of European genes among African Americans is quite low. For instance in South Carolina it has been estimated at 6 percent (Workman, 1968) and in Georgia at 11 percent (Reed, 1969). These admixtures of European genes should raise their IQ by 1.2 and 2.2 IQ points, respectively, giving them an IQ of 81.2 and 82.2. This prediction has been confirmed by the study of 1,800 African Americans in five Southeastern states by Kennedy, Van der Reit, and White (1963), which found their IQ on the 1960 Stanford-Binet was 80.7.

African Americans with 50 percent European genes will have an IQ of 90 ($80 + \{50 \text{ by } 0.2 = 10\} = 90$). This is about the mean IQ of African Americans in the Northern states, where the proportion of European ancestry approaches 50 percent. African Americans with 75 percent European genes will have an IQ 15 points higher at 95 ($80 + \{75 \times 0.2 = 15\} = 95$), which is very close to the IQ of 94 of the interracial children in the Minnesota Transracial Adoption Study. Europeans with 100 percent European genes will have an IQ at 100.

This estimate of the genotypic African IQ as 80 means that the average IQ that Africans would obtain if the environments in which they were raised were the same as those of Europeans would be 80. Throughout sub-Saharan Africa the mean IQ of Africans is approximately 67, so it can be inferred that adverse environmental conditions in sub-Saharan Africa impair the African IQ by around 13 IQ points.

Chapter 5. Bushmen and Pygmies

1. Intelligence of Bushmen
2. Brain Size of Bushmen
3. Pygmies

The bushmen, also sometimes called Khoisans, Sanids, or Capoids, and the Pygmies are two of the minor races of sub-Saharan Africa in the taxonomies of classical anthropology such as that of Coon, Garn, and Birdsell (1950). Cavalli-Sforza, Menozzi, and Piazza (1994) in their genetic analysis of human populations have confirmed that these two peoples have distinctive but closely related genetic characteristics and form two related "clusters." The Bushmen together with the Pygmies and Africans evolved from the original *Homo sapiens* peoples of equatorial East Africa. The ancestors of the Bushmen migrated south and by about 100,000 years ago occupied most of southern Africa. Extensive human bones and artifacts have been found in the Border Cave in present day Swaziland and have been dated at about 100,000 years old. The morphology of the bones indicates that these peoples were a mix of Africans and Bushmen (Beaumont, deVilliers, and Vogel, 1978).

Until around 1,500 years ago the Bushmen occupied most of southern Africa and the Pygmies occupied the rain forests of west and central Africa. From about 500 AD Africans (Negroids) from the north began to encroach on their lands, killed large numbers of them, and drove most of the surviving Bushmen into the Kalahari desert and the Pygmies into the dense rain forests of central Africa. Related to the Bushmen are the Hottentots, small groups of whom survive in a few locations in southern Africa. Although the two groups are genetically closely similar there are some genetic differences, such as the low incidence of the B blood group in the Bushmen and the high incidence in the Hottentots.

Many of the Hottentots are racial hybrids with Bushmen and European ancestry, which has given them lighter skin color and taller stature than the Bushmen (Cole, 1965). The Bushmen survive principally in the Kalahari Desert, where they number about 50,000. There are about the same number of Hottentots. The largest surviving group is the Nama in Southwest Africa, where they are around 24,000 (Cole, 1965), and there are a few other smaller groups north of the Orange River.

The Bushmen have a number of physical characteristics that distinguish them from Negroid Africans. They have peppercorn hair that grows in spirals with open spaces between tufts, whereas most Africans have helical woolly hair that forms a tight mat. It is believed that the peppercorn hair of the Bushmen evolved as an adaptation in hot and damp forests in which they lived for many millennia because it affords protection from strong sunlight but at the same time the open spaces between the tufts allow sweat to evaporate. Pygmies who have remained in tropical rain forests have the same peppercorn hair. The mat woolly hair of Negroid Africans is a more advantageous adaptation in dry hot environments because it gives greater protection from strong sunlight and reduces sweating. The skin color of the Bushmen is yellowish brown, while that of Negroid Africans is black or dark. Some of the Bushmen have an epicanthic fold on the upper eyelid, similar to but less pronounced than that of East Asians and Arctic Peoples. The advantage of the epicanthic fold for Bushmen is probably that it reduces the dazzling effect of glare from strong sunlight reflected from the desert, as it does the glare from snow for the East Asians and Arctic Peoples. This characteristic must have arisen independently through convergent evolution.

A distinctive characteristic of Bushmen is the very large buttocks of the women, known as steatopygia. The adaptive advantage of these may have been to store food and water in times of famine and shortage. The genitalia of the Bushmen are unique among the human races. Bushmen have penises that stick out horizontally, while Bushwomen have prominent minor labia that descend about 3 inches below the vagina. The adaptive advantages of these characteristics are unknown.

1. Intelligence of Bushmen

There have been only three studies of the intelligence of the Bushmen. In the 1930s a sample of 25 of them were intelligence tested by Porteus (1937) with his maze test, which involves tracing the correct route with pencil through a series of mazes of increasing difficulty. The test has norms for European children for each age, in relation to which the Bushmen obtained a mental age of seven and a half years, representing an IQ of approximately 48. In the second study, Porteus gave the Leiter International Performance Scale to 197 adult Bushmen and concluded that their mental age was approximately 10 years, giving them an IQ of 62. In the third study, Reuning (1972), a South African psychologist, tested 108 Bushmen and 159 Afri-

cans with a pattern completion test involving the selection of an item to complete a pattern. In the light of his experience of the test, Reuning concluded that it "can be used as a reliable instrument for the assessment of intelligence at the lower levels of cognitive development and among preliterate peoples" (1968, p. 469). On this test the Bushmen scored approximately 15 IQ points below the Africans, and since it is known that Africans have a mean IQ of approximately 67 (see Chapter 4), this would give the Bushmen an IQ of approximately 52.

Reuning also gave a figure drawing test involving the drawing of a man to the Bushmen and the Africans. This test is the same as the Goodenough Draw-a-Man test (DAM), which is a reasonably good measure of intelligence. The drawings produced in the Goodenough Test are scored for detail and sophistication, which improve as children grow older. Young children typically draw stick men with little detail, while older children draw full-bodied men with many details such as eyebrows, thumbs, and so on. Reuning (1968, p. 476) recorded that the Bushmen's drawings were significantly less advanced than those of Negroid mineworkers, whom he also tested and 76 percent of whom were illiterate. He described the Bushmen's drawings as characterized by "extreme simplicity...the majority were stick figures...no details of fingers, toes, hair, eyes, etc...." The simplicity of the Bushmen's drawings "contrasts with the tendency of the blacks to include much small detail in their drawings (buttons, hair, fingers, toes, a pipe, etc.)." The difference between Bushmen and Africans in the sophistication of drawings provides further corroboration of the lower intelligence of Bushmen.

Reuning noted that there was considerable variability in intelligence between individuals among the Bushmen, just as there is among other peoples, and that they themselves recognize that some individuals are intelligent while others are dull. Their languages have the word "clever" to describe this attribute. He records that "When the tester at the end of a test) had praised a good performance, they let us know, through the interpreter: : 'We could have told you so, he (or she) is clever' (1968, p. 479). There is, furthermore, a general factor (*g*) among the Kalahari Bushmen shown by the positive intercorrelation of a number of tests and the correlation between test performance and the general consensus of who is intelligent.

In addition to administering a test of intelligence, Reuning tested Bushmen and comparison groups of Africans and whites for size constancy. This is the ability to estimate the size of an object at a distance. He found that Bushmen had more accurate size constancy than Africans and Europeans and attributed this to the need for this ability for using the bow and arrow for hitting an animal at a distance. He found that Bushwomen also have good size constancy although they do not hunt. He suggests that the development of this ability is probably attributable to its advantage for efficient hunting. If this is correct, it implies that the ability may have deteriorated in European and East Asian peoples who gave up hunting about 8,000 years ago and adopted agriculture.

The three studies of Bushmen by Porteus and Reuning give IQs of 48, 62, and 52 and can be averaged to give an IQ of 54. It may be questioned whether a people with an average IQ of 54 could survive as hunter-gatherers in the Kalahari desert, and therefore whether this can be a valid estimate of their intelligence. An IQ of 54 is at the low end of the range of mild mental retardation in economically developed nations. This is less of a problem than might be thought. The great majority of the mildly mentally retarded in economically developed societies do not reside in hospitals or institutions but live normal lives in the community. Many of them have children and work either in the home or doing cognitively undemanding -jobs. An IQ of 54 represents the mental age of the average European 8-year-old child, and the average European 8-year-old can read, write, and do arithmetic and would have no difficulty in learning and performing the activities of gathering foods and hunting carried out by the San Bush-

men. An average European 8-year-old can easily be taught to pick berries, put them in a container and carry them home, collect ostrich eggs and use the shells for storing water, and learn to use a bow and arrow and hit a target at some distance. Before the introduction of universal education for children throughout North America and Europe in the second half of the nineteenth century, the great majority of 8-year-old children worked productively on farms and sometimes as chimney sweeps and in factories and mines. Today, many children of this age in Africa, India, Pakistan, Bangladesh, through out much of Latin America, and in other economically developing countries work on farms and some of them do semi-skilled work such as carpet weaving and operating sewing machines. There is a range of intelligence among the Bushmen and most of them will have IQs in the range of 35 to 75. An IQ of 35 represents approximately the mental age of the average European five-and-a-half-year-old and an IQ of 75 represents approximately the mental age of the average European eleven-and-a-half-year-old. The average five-and-a-half-year-old European child is verbally fluent and is capable of doing unskilled jobs and the same should be true for even the least intelligent Bushmen.

Furthermore, apes with mental abilities about the same as those of human 4-year-olds survive quite well as gatherers and occasional hunters and so also did early hominids with IQs of around 40 and brain sizes much smaller than those of modern Bushmen. For these reasons there is nothing puzzling about contemporary Bushmen with average IQs of about 54 and a range of IQs mainly between 35 and 75 being able to survive as hunter-gatherers and doing the unskilled and semi-skilled farm work that a number of them took up in the closing decades of the twentieth century.

2. *Brain Size*

The brain size of the Bushmen was estimated at 1,250cc by Drennan (1937) and a little higher at 1,270cc by Smith and Beals (1990). The Smith and Beals data set also includes Negroid Africans whose brain size is 1,282cc and therefore a little larger than that of Bushmen. This is consistent with the higher average IQ of Africans at 67, as compared with the 54 of Bushmen, although the brain size difference of this magnitude can only explain a small fraction of the intelligence difference. The smaller brain size and lower intelligence of the Bushmen compared with the Africans implies that the brain size of the Africans increased over the last 100,000 years or so, since contemporary Africans and Bushmen came from the same ancestral stock. Their brain sizes must have originally been the same and that of the Africans must have increased either as a result of stronger selection pressure or advantageous mutations.

3. *Pygmies*

The Pygmies inhabit the equatorial rain forests of Zaire, now called the Congo, and the Central African Republic. At the close of the twentieth century they were thought to number around 100,000 to 200,000. The purest Pygmies are the Mbuti who live in the Ituri forest of northeastern Congo and are thought to number somewhere between 30,000 and 60,000. The other Pygmies are more interbred with Africans. Mbuti Pygmies average around 4' 7" in height. Pygmy children up to the age of puberty have normal height, but when they become adolescents they do not have the growth spurt of other peoples because of their low output of the insulin-like growth factor 1. Most of the Pygmies have remained hunter-gatherers. Typically they live in small groups of around 30 and move from place to place. They have made

no progress in the domestication of either animals or plants. In the early twenty-first century the Pygmies in the Congo were described by Cheung (2003) as living "deep in the forests, eking out an existence by hunting and gathering food."

Only one study has been made of the intelligence of Pygmies. This was carried out by Woodworth (1910) using the Sequin Form Board test, which consists of a set of blocks of various shapes that have to be fitted into the appropriate holes. He found that Pygmies performed much worse than other peoples including Eskimos, Native Americans, and Filipinos but he did not quantify their abilities. Judging from their life-style, their intelligence appears to be lower than that of Negroid Africans. Most of them still retain a primitive hunter-gatherer existence while many of the Negroid Africans became farmers during the last few hundred years. In the twentieth century a number of Pygmies worked for Negroid African farmers and these "are always the lower caste, being the farmers' hereditary servants," according to Cavalli-Sforza, Menozzi, and Piazza (1994, p. 178). The term "hereditary servants" appears to be a euphemism for slaves. The enslavement of Pygmies by Negroid Africans is consistent with the general principle that the more intelligent races typically defeat and enslave the less intelligent, just as Europeans and South Asians have frequently enslaved Africans but not vice versa.

Chapter 6. South Asians and North Africans

1. Intelligence of Indigenous South Asians and North Africans
2. South Asians and North Africans in Britain and Australia
3. South Asians and North Africans in Continental Europe
4. Indians in Africa, Fiji, Malaysia, and Mauritius
5. High School and University Students
6. Brain Size
7. Heritability of Intelligence in South Asians and North Africans
8. Genetic and Environmental Determinants of the Intelligence of South Asians and North Africans
9. Intelligence in Israel

The south asians and North Africans are the indigenous peoples of southern Asia from Bangladesh in the east through India, Pakistan, Iraq, Iran, the Gulf states, the Near East, and Turkey, and of North Africa, north of the Sahara desert. They are closely related to the Europeans and in some of the taxonomies of classical anthropology, such as that of Coon, Garn, and Birdsell (1950), the two peoples have been regarded as a single race designated the Cauca-soids. But Cavalli-Sforza, Menozzi, and Piazza (1994) in their genetic analysis of human differences have shown that the South Asians and North Africans form a distinctive genetic "cluster" that differentiates them from the Europeans. They are therefore treated here as a separate race.

1. Intelligence of Indigenous South Asians and North Africans

Studies of the intelligence of indigenous South Asians and North Africans are summarized in Table 6.1. The figures are only for general intelligence (g) because there are virtually no data

for verbal or visualization abilities. Rows 1 through 13 give twelve results for various locations in India lying in the range between 78 and 88 and with a median of 82. Rows 14 through 17 give IQs of 84, 83, 89, and 80 for four samples of school children in Iran, all taken from the city of Shiraz. Rows 18 and 19 give IQs of 87 for children and adults in Iraq. Row 20 gives an IQ of 86 for Arabs in Israel obtained in the standardization sample of the WISC-R as compared with Jews (IQs of Jews in Israel are in the range of 90-97 and are discussed in section 9). Row 21 gives an IQ of 84 for Jordan calculated from the standardization sample of the KABC. Row 22 gives an IQ of 86 for Kuwait obtained from a standardization of the Progressive Matrices on school children. Row 23 gives an IQ of 82 for school children in various locations in Lebanon. Row 24 gives an IQ of 78 for Nepal obtained from children in 34 schools in towns, villages, and the jungle area. Row 25 gives an IQ of 84 for adolescents at schools in Pakistan in the region of Islamabad. The comparison group is 707 European children in Canada reported in the same study. Row 26 gives an IQ of 84 for children in Pakistan obtained from nine schools around Karachi representing poor and affluent areas. Row 27 gives an IQ of 78 for school children in Qatar. Row 28 gives an IQ of 79 for young children attending a village school in Sri Lanka. Row 29 gives an IQ of 83 for young children in first grade in schools in Syria compared with a sample of 200 of the same age in Germany. Rows 30 through 32 give IQs of 84, 90, and 96 for three samples of school students in Turkey. Row 33 gives an IQ of 85 for Yemen derived from a standardization of the CPM on a sample of 6-11-year-olds.

Rows 34 through 38 give IQs for North African samples. Row 34 gives an IQ of 84 obtained from a mixed sample of North Africans from Algeria, Morocco, and Tunisia. Rows 35, 36, and 37 give IQs of 77, 81, and 83 for school children in Egypt. The thirty-eight IQs of the South Asians and North Africans show reasonable consistency. With the exception of Turkey, all the IQs lie in the range between 77 and 89. The median IQ of the entire set of results is 84 and is considered the best estimate for the IQ of South Asians and North Africans. The median IQ of 90 derived from the three studies for Turkey is higher than that in the remainder of South Asia and North Africa. The most likely explanation for this is that Turkey has straddled Europe and Asia for many centuries and the geographical proximity of Turkey and southeast Europe will have brought about a mixing of Turkish and European genes to produce a European-South Asian cline or genetically hybrid mixed population, with the result that contemporary Turks and Greeks are genetically quite similar, as shown by Cavalli-Sforza, Menozzi, and Piazza (1994) and noted in Chapter 3.

Table 6.1. IQs of South Asians and North Africans

	Location	Age	N	Test	g	Reference
1	India	5-11	1,339	CPM	88	Gupta & Gupta, 1966
2	India	14-17	1,359	SPM	87	Chopra, 1966
3	India	12-14	5,607	CPM	81	Sinha, 1968
4	India	5-10	1,050	CPM	82	Rao & Reddy, 1968
5	India	15	3,536	SPM	84	Majumdar & Nundi, 1971
6	India	10-16	180	SPM	79	Mohanty & Babu, 1983
7	India	13	100	SPM	78	Agrawal et al., 1984
8	India	9-12	748	WISC-	79	Afzal, 1988

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9	India	5-12	500	CPM	86 Bhogle & Prakash, 1992
10	India	11-15	569	SPM	82 Raven et al, 1996
11	India	7-11	828	CPM	80 Barnabus et al., 1995
12	India	7-15	8,040	SPM	88 Raven et al., 2000
13	India	11-15	569	SPM	81 Raven et al., 2000
14	Iran	15	627	SPM	84 Valentine, 1959
15	Iran	14	250	AH4	83 Mehryar et al., 1972
16	Iran	6-11	1,600	BG	89 Yousefietal., 1992
17	Iran	6-10	1,195	DAM	80 Mehryer et al., 1987
18	Iraq	14-17	204	SPM	87 Abul-Hubb, 1972
19	Iraq	18-35	1,185	SPM	87 Abul-Hubb, 1972
20	Israel-Arabs	6-16	639	WISC-R	86 Liebllich & Kugelmas, 1981
21	Jordan	6-12	210	KABC	84 El-Mneizel, 1987
22	Kuwait	6-15	6,529	SPM	86 Abdel-Khalek & Lynn, 2005
23	Lebanon	5-10	502	DAM	82 Dennis, 1957
24	Nepal	4-16	807	DAM	78 Sundberg & Ballinger, 1968
25	Pakistan	15	349	GEFT	84 Alvi et al., 1986
26	Pakistan	6-8	140	SPM	84 Rahman et al., 2002
27	Qatar	10-13	273	SPM	78 Bart et al., 1987
28	Sri Lanka	8	46	CTMM	79 Strauss, 1954
29	Syria	7	241	CPM	83 Guthke & Al-Zoubi, 1987
30	Turkey	11-12	92	D48	84 Kagitcibasi, 1972
31	Turkey	6-15	2,272	SPM	90 Sahin & Duzen, 1994
32	Turkey	7-9	180	DAM	96 Ucman, 1972
33	Yemen	6-11	1,000	CPM	85 Al-Heeti et al., 1997
34	North Africa	Adults	90	SPM	84 Raveau et al., 1976
35	Egypt	6-10	206	DAM	77 Dennis, 1957
36	Egypt	12-15	111	CCF	81 Sadek, 1972
37	Egypt	6-12	129	SPM	83 Ahmed, 1989

2. South Asians and North Africans in Britain and Australia

IQs of South Asians in Europe and Australia are given in Table 6.2. Row 1 gives an IQ of 87 for Indian children in London collected in the mid-1960s by the Inner London Education Authority (ILEA) and calculated by Vernon (1969, p. 169). Row 2 gives an IQ of 93 for a sample of Pakistani children in London. Row 3 gives an IQ of 91 for Indian children at a comprehensive school in Essex in a study in which Afro-Caribbean children at the same school obtained

an IQ of 85. Rows 4 and 5 give IQs of 94 and 89 for Indian and Pakistani children in a town in the British Midlands. Afro-Caribbean children at the same schools obtained an IQ of 86, confirming the result in row 3 finding higher IQs of South Asians than of Africans. Rows 6 and 7 give IQs of 83 and 97 for Indians nation wide and rows 8 and 9 give IQs of 93 and 96 of Pakistani children nationwide..

Rows 10 through 12 give results from a study in which Pakistani, Indian, and Bangladeshi children obtained IQs of 93, 92, and 92, and therefore there were no IQ differences between these three groups from the Indian sub-continent. These IQs are relative to 100 for white children attending the same schools and are likely to be somewhat inflated because 7 percent of white children, mainly middle class with higher IQs, attend private schools and white middle-class par-ents who send their children to state schools typically tend to avoid sending them to schools with large numbers of immigrants. The effect of this will have been that the IQs of the South Asians will be inflated relative to national norms. There are no national norms for the tests used, so the amount by which the IQs are

Table 6.2. IQs of South Asians in Britain and Australia

	Location	Ethnicity	Age	N	Test	<i>g</i>	Reas	Verb	Viz	Reference
1	Britain	Indian	11	43	VR	87	87	-	-	ILEA, 1967
2	Britain	Pakistani	9-10	173	CPM	93	93	93	-	Dickenson et al, 1975
3	Britain	Indian	10	149	VR	91	91	-	-	Black Peoples, 1978
4	Britain	Indian	11	173	NFER	94	94	-	-	Scarr et al., 1983
5	Britain	Pakistani	11	32	NFER	89	89	-	-	Scarr et al., 1983
6	Britain	Indian	11	37	NFER	83	83	82	-	Mackintosh et al., 1985
7	Britain	Indian	11	25	NFER	97	97	99	-	Mackintosh et al., 1985
8	Britain	Pakistani	10	91	BAS	93	93	88	-	Mackintosh et al, 1985
9	Britain	Pakistani	10	170	BAS	96	96	90	-	Mackintosh et al., 1985
10	Britain	Pakistani	7-15	560	AH	88	88	82	-	West et al. ,1992
11	Britain	Indian	7-15	330	AH	87	87	86	-	West et al., 1992
12	Britain	Bangladeshi	7-11	177	AH	87	87	82	-	West et al., 1992
13	Australia	Mixed	Adults	111	SPM	89	89	-	-	De Lemos, 1989

inflated cannot be determined but is probably around 5 IQ points. Row 13 gives an IQ of 89 for South Asian immigrants in Australia.

The range of IQs of South Asian Europeans in Britain is quite large, from 83 to 97. One reason for this considerable range is that the IQs increase with length of residence in Britain. This is shown in two of the studies. First, rows 6 and 7 give non-verbal reasoning IQs of 83 for Indian children resident for fewer than four years in Britain and 97 for those resident in Britain for four or more years, indicating a gain of 14 IQ points arising from residence in

Britain. It is interesting to note that the IQ of 83 of Indian children resident for fewer than four years in Britain is almost the same as the IQ of 82 for Indians in India given in Table 6.1. Second, rows 8 and 9 give non-verbal reasoning IQs of 93 for Pakistani children resident for fewer than four years in Britain and 96 for Pakistani children resident for four or more years in Britain, indicating a gain of 3 IQ points with longer residence in Britain.

The median IQ of the studies of South Asians in Britain is 89 and the IQ of South Asian immigrants in Australia given in the last row is the same. This is a little higher than the IQ of 84 of indigenous South Asians, consistent with the results showing that IQs improve with length of residence in Britain and Australia. These IQ gains may be due to a variety of factors. Recent immigrants will have had difficulty in speaking and understanding English and this will have impaired their performance even on non-verbal tests because of difficulty in understanding the instructions given in English. In addition, those who had been born in Britain may have benefited from better nutrition and education than comparable children received in their own countries.

3. South Asians and North Africans in Continental Europe

IQs of South Asians and North Africans in Continental Europe are given in Table 6.3. Row 1 gives an IQ of 86 for Turkish immigrants in Germany. Rows 2 through 17 give results of 16 studies of the IQs obtained by South Asians and North Africans immigrants in the Netherlands. A useful review, of a number of these studies has been given by Te Nijenhuis and van der Flier (2001). Row 2 gives an IQ of 78 for a sample of the children of first-generation immigrants from Turkey and Row 3 an IQ of 79 for a sample of the children of second-generation immigrants from Turkey. Both IQs are low and indicate no significant improvement in the intelligence of second-generation immigrants. Row 4 gives an IQ of 75 for a sample of children of first-generation immigrants from Morocco and row 5 an IQ of 79 for a sample of children of second-generation immigrants from Morocco.

Table 6.3. IQs of South Asians and North Africans in Continental Europe

	Location	Ethnicity	Age	N	Test	<i>g</i>	Reas	Verb	Vis	Reference
1	Germany	Turkish	10-17	330	SPM	86	86	-	-	Taschinski, 1985
2	Netherlands	Turkish	Children	177	RAKIT	78	-	-	-	Resing et al., 1986
3	Netherlands	Turkish	Children	1'04	RAKIT	79	-	-	-	Resing et al., 1986
4	Netherlands	Moroccan	Children	177	RAKIT	75	-	-	-	Resing et al., 1986
5	Netherlands	Moroccan	Children	76	RAKIT	79	-	-	-	Resing et al., 1986
6	Netherlands	Mixed	Children	106	GALO	83	-	-	-	De Jong &, van Batenburg, 1984
7	Netherlands	Turkish	11	815	CITO	85	85	85	-	Piecke, 1988
8	Netherlands	Moroccan	11	720	CITO	84	84	85	-	Piecke, 1988
9	Netherlands	Indian	11	338	CITO	88	88	88	-	Piecke, 1988
10	Netherlands	Mixed	10	47	Otis/Cito	93	-	-	-	Van de Vijver & Willemse, 1991

11	Netherlands Turkish	5-17	33	Son-R	84	-	-	-	Laros & Tellegren, 1991
12	Netherlands Moroccan	5-8	194	LPTP	85	-	-	-	Hamers et al., 1996
13	Netherlands Turkish	5-8	194	LPTP	84	-	-	-	Hamers et al., 1996
14	Netherlands Moroccan	Adults	167	GATE	84	74	-	87	te Nijenhuis, 1997
15	Netherlands Turkish	Adults	275	GATE	88	81	-	85	te Nijenhuis, 1997
16	Netherlands Mixed	6-12	1,315	Arith	92	-	92	-	Driessen, 1997
17	Netherlands Mixed	6-12	474	RAKIT	94	94	80	95	Helms-Lorenz et al., 2003
18	Slovakia Gypsies	5-8	728	CPM	83	83	-	-	Raven et al., 1995

Again, both IQs are low but there appears to be some improvement in the intelligence of second-generation immigrants, as has been found in the studies of immigrants in Britain.

Row 6 gives an IQ of 83 for children of immigrants from Morocco and Turkey. Rows 7 and 8 give IQs of 85 and 84 for further samples of Moroccan and Turkish immigrant children. Row 9 gives an IQ of 88 for a sample of Indians, 6 IQ points higher than the median IQ of 82 in India. Row 10 gives an IQ of 93 for Moroccan and Turkish children, the average of 92 obtained on the Otis and 94 on the Cito, both of which are largely verbal tests. Row 11 gives an IQ of 84 for Turkish (n=24) and Moroccan (n=9) children obtained on the standardization sample of the Snijders-Oomen Non-Verbal Test; IQs of those born in the Netherlands were the same as those who had only been in the country from 1 to 6 years. Rows 12 and 13 give IQs of 85 and 84 for samples of Moroccan and Turkish children. Rows 14 and 15 give IQs of 84 and 88 for Moroccan and Turkish adults on the General Ability Test Battery (GATE); this is a Dutch test with eight subtests measuring vocabulary, arithmetical ability, perceptual speed, etc. The Turkish and Moroccan immigrants performed poorly on vocabulary because they had not learned Dutch well and this test has therefore been omitted in the calculation of the IQs. The figures for g are the average of the remaining seven subtests. Row 16 gives an IQ of 92 for Muslims in the Netherlands from Turkey and Morocco compared with approximately 69,000 Dutch Europeans; this figure is obtained from a test of arithmetic entered as verbal IQ. The mean vocabulary IQ of this sample was 85 but this is not entered because most of these children did not speak Dutch as their first language. Row 17 gives an IQ of 94 for second-generation immigrant children of whom 72 percent were from Turkey and Morocco and 10 percent from Surinam and the Netherlands Antilles. Their verbal IQ was 80 but this has been omitted on the grounds that most of them did not speak Dutch as their first language. The results of the studies from the Netherlands are closely similar to those from Britain. The median IQ of the first eight studies of first generation immigrants is 84, the same as that of indigenous South Asians and North Africans. Row 18 gives an IQ of 83 for gypsies in Slovakia. The result is given here because gypsies, or Roma as they are coming to be called, are of South Asian stock who migrated from northwest India between the ninth and fourteenth centuries. This has been shown by linguistic analysis of their Romani language, which has been found to have an Indian origin, and by genetic analysis (Pearson, 1985; Fraser, 1995). They have remained largely isolated from Europeans and their IQ is typical of South Asians.

4. Indians in Africa, Fiji, Malaysia, and Mauritius

There are Indian populations in several countries in Africa. In South Africa they number about one million, of whom approximately 84 percent are in Natal and 14 percent are in the Transvaal. There are also Indians in Kenya and Tanzania, whose ancestors were brought in by the British and Germans under colonial rule to do work of various kinds including building railways. Studies of the IQs of Indians in Africa are summarized in Table 6.4. Row 1 gives an IQ of 77 for the first study of the IQ of Indians in South Africa, compared with 65 for Africans. Row 2 gives an IQ of 88 for Indian computer programming students compared with an IQ of 100 for a comparable sample of 243 whites. Row 3 gives an IQ of 86 calculated from the standardization samples of the Junior South African Individual Scales. This test resembles the Wechsler. The norms for Indians have been calculated in relation to the South African white standardization sample. The test contains a scale for numerical ability, on which the Indians obtained an IQ of 86, which contributes to the overall IQ. Row 4 gives an IQ of 91 in relation to British 1979 norms. White South Africans obtained an IQ of 98; hence Indians scored 7 IQ points below South African whites. Row 5 gives an IQ of 83 in relation to South African whites on the South African Junior Aptitude Test. This test also has two memory subtests on which the Indians obtained an IQ of 89; in the same study Africans in South Africa obtained an IQ of 63, showing again that Indians in South Africa obtain much higher IQs than Africans.

The median IQ of Indians in South Africa derived from the five studies is 86. This is a little higher than the median IQ of 82 of Indians in India and a little lower than the IQ of approximately 89 of Indians born in Britain. Possibly a reason for these differences is that standards of living are lowest in India, higher in South Africa, and highest in Britain, and these have had some effect on intelligence levels. There may also have been differences in the intelligence of the migrants from whom the Indians in South Africa and Britain are descended. The ancestors of the Indians in South Africa were largely recruited to work in the sugar and tobacco plantations and may not have had such high IQs as those who migrated to Britain in the second half of the twentieth century.

Row 6 gives an IQ of 91 for Indians in Tanzania. The sample consisted of secondary school students who had to pass an entrance examination for entry to their schools and the IQ is therefore somewhat inflated. The IQ of this sample is probably about 8 IQ points higher than that of the general population of Indians in Tanzania, which can therefore be estimated at approximately 83,

Table 6.4. IQs of Indians in Africa, Fiji, Malaysia, and Mauritius

	Location	Age	N	Test	<i>g</i>	Reas	Verb	vis	Reference
1	S. Africa	10-12	762	AAB	77	-	-	-	Pick, 1929
2	S. Africa	18	284	GFT	88	-	-	-	Taylor & Radford, 1986
3	S. Africa	6-8	600	JSAIS	86	-	85	83	Landman, 1988
4	S. Africa	15	1,063	SPM	91	-	-	-	Owen, 1992
5	S. Africa	15	1,063	JAT	83	85	85	79	Lynn & Owen, 1994
6	Tanzania	13-18	727	SPM	91	91	-	-	Klingelhofer, 1967

7	Fiji	8-13	140	QT	82	-	-	-	Chandra, 1975
8	Malaysia	7-12	555	SPM	88	88	-	-	Chaim, 1994
9	Mauritius	11	1,093	WISC	89	-	89	89	Liu et al., 2003

closely similar to the IQ of 82 of Indians in India given in Table 6.1. In the same study Africans at the same selective schools obtained an IQ of 78. This difference confirms a number of studies in South Africa and Britain showing that when Indians and Africans are in the same environment, Indians obtain substantially higher IQs than Africans.

Row 7 gives an IQ of 82 for Indians in Fiji, in which there are approximately the same number of Indians and indigenous Fijians. The Fijians obtained a mean IQ of 84 in the same study. Row 8 gives an IQ of 88 for Indians in Malaysia obtained from a standardization of Raven's Standard Progressive Matrices. Row 9 gives an IQ of 89 for 11-year-olds in Mauritius described as "a community sample," of which 69 percent were Indians and the remainder Creoles of mixed European and sub-Saharan African descent, whose IQ is 2.5 points lower than that of the Indians (Raine, Reynolds, Venables, and Mednick 2002). The studies summarized in Table 6.4 lie in the range between 77 and 91 and have a median IQ of 88, a little higher than that in India and about the same as that of Indians in Europe. This is probably because Indians outside India generally enjoy higher living standards and possibly because those who have emigrated from India have had above average intelligence.

5. *High School and University Students*

Studies of the intelligence of South Asian and North African students in high school, colleges, and universities are summarized in Table 6.5. It would be expected that these would be somewhat higher than the intelligence of general population samples and it will be seen that this is the case. Row 1 gives an IQ of 85 for students at the University of Alexandria and is only fractionally higher than the IQ of 83 on the same test of a general population sample given in Table 6.1. Row 2 gives an early study of 1926 in which second year students at the University of Calcutta obtained an IQ of 95. The test used was the Stanford, on which American students at the University of Stanford obtained a mean IQ of 113. Row 3 gives an IQ of 93 for 14-year-old students at St. Xavier's School in Delhi described as coming from upper-class families. Rows 4 and 5 give IQs of 90 and 88 for students at the Punjab University. Row 6 gives an IQ of 88 for women students at various colleges in the Indian city of Amritsar. Row 7 gives an IQ of 90 for university students in engineering, economics, and the liberal arts in Tehran. Row 8 gives an IQ of 92 for high school students in Baghdad described by the author of the study as "a highly selected group, since education is not compulsory at the high school level and students who do reach this level have to pass rigid examinations" (Alzohaie, 1966, p. 476).

Rows 9 and 10 give IQs of 98 and 102 for engineering students at the University of the Witwatersrand in South Africa. In this study European students in the same faculty obtained IQs of 106 and 113, and black African students IQs of 93 and 99. Row 11 gives an IQ of 106 for a further sample of engineering students at the University of the Witwatersrand in South Africa. In this study European students in the same faculty obtained an IQ of 116, and black African students an IQ of 101. Thus in these three studies of students the IQs of the Indians fall midway between those of whites and blacks, as they do in general population samples. Also, in these studies the IQs of the Indians are somewhat higher than those in South Asia and North

Africa. This is probably attributable to the IQs of Indians in South Africa being higher and because the engineering department of the University of the Witwatersrand takes relatively talented students.

Rows 12 and 13 give IQs of 92 and 101 for university students in Turkey.

Table 6.5. IQs of South Asian and North African high school and university students

	Location	Age	N	Test	IQ	Reference
1	Egypt	23	452	SPM	85	Abdel-Khalek, 1988
2	India	21	32	Stanford	95	Maity, 1926
3	India	14	45	SPM	93	Mehrotra, 1968
4	India	18-25	165	SPM	90	Mohan, 1972
5	India	19-25	400	SPM	88	Mohan & Kumar, 1979
6	India	16-20	800	CCF	88	Gupta, 1991
7	Iran	19-26	143	SPM	90	Amir, 1975
8	Iraq	16-18	103	CCF	92	Alzobaie, 1964
9	S. Africa	19	58	SPM	98	Rushton et al., 2002
10	S. Africa	20	40	APM	102	Rushton et al., 2003
11	S. Africa	17-23	57	APM	106	Rushton et al., 2004
12	Turkey	18-26	103	CCF	101	Tan et al, 1999
13	Turkey	19	39	CCF	92	Dayi et al., 2002

Row 12 gives an IQ of 92 for 15 women and 24 men students of dentistry at Attaturk University in the city of Ezurum. Row 13 gives an IQ of 101 for medical students at the same university.

The median of the studies is an IQ of 92, eight points higher than that of general population samples of South Asians and North Africans. The interest of these studies is that they show that South Asian and North African university students with extensive education and from upper and middle class families have lower IQs than average Europeans. This indicates that lack of education is unlikely to be a major factor responsible for the low IQs of general population samples. The IQs of South Asian and North African students are also lower than the median of 105 for European college students (Table 3.3). Thus the 15 IQ point difference between Europeans and South Asians and North Africans in general population samples is closely similar to the 14 IQ point difference between college students.

6. Brain Size of South Asians

Four sets of data on the brain size of South Asians compared with that of Europeans are shown in Table 6.6. Row 1 gives data assembled by Smith and Beals (1990) from approximately 20,000 crania collected worldwide

Table 6.6. Brain size (cc) of Europeans and South Asians

	Europeans	South Asians	Difference	Reference
1	1,368	1,284	84	Smith & Beals, 1990
2	1,467	1,404	63	Groves, 1991
3	1,319	1,185	134	Jurgens et al., 1990
4	1,470	1,356	114	Rushton, 2000

and shows a European advantage of 84cc. Row 2 gives data assembled from various sources by Groves, who contends that there are no racial differences in brain size, but which nevertheless show a European advantage of 63cc. Row 3 gives average brain size of six samples of Europeans from North America and Europe and two samples from India from data compiled by Jurgens et al. (1990) and analyzed by Rushton (2000, p. 124) showing a European advantage of 126cc. Row 4 gives data compiled by the U.S. National Aeronautics and Space Administration (NASA) for the average of 19 European male military samples and for a male Iranian military sample showing a European advantage of 114cc. The figures in the four data sets all show greater brain size of Europeans and are reasonably consistent, considering that they were compiled using different methods. The Smith and Beals data are derived from measurements of the volume of skulls, the Groves data come from various sources, while the data sets in rows 3 and 4 have been calculated from external measurements of the heads of living individuals. The average of the four data sets is a European Caucasoid advantage of 97cc.

7. Heritability of Intelligence in South Asians

There have been two studies of the heritability of intelligence in India, both of which have used the method of comparing the IQs of identical (MZ) and non-identical (DZ) twins. Pal, Shyam, and Singh (1997) have reported a study of 30 MZ and 30 same-sex DZ adult twins and calculated the heritability at 0.81. If this is corrected for attenuation, assuming a test reliability of 0.9, the heritability becomes 0.90. In a second study, Nathawat and Puri (1995) obtained a heritability of 0.90, which corrected for attenuation assuming a test reliability of 0.9 becomes 1.0. Thus, the heritability of intelligence in India is marginally higher than that of 0.83 in Europeans.

8. Genetic and Environmental Determinants of the Intelligence of South Asians and North Africans

We saw in Table 6.1 that the median IQ of the studies of indigenous South Asians and North Africans is 84. This IQ is depressed environmentally because of the low standard of living of these peoples. A report on malnutrition in South Asia and North Africa in the early 1990s published by UNICEF (1996) estimated prevalence rates of stunting of 24 percent of children in the Middle East and North Africa and 60 percent of children in South Asia, indicating the effect of sub-optimal nutrition. There is little doubt that this has an adverse effect on intelli-

gence. Nevertheless, it seems likely that genetic factors are also involved. First, the very high heritabilities of intelligence in both South Asians and Europeans show that genetic factors are largely responsible for differences in intelligence within the two populations, and this makes it likely that these contribute to the differences between the two populations. Second, it has been shown that South Asians and North Africans living in the affluent European environments of Britain, Australia, and the Netherlands have median IQs of 89, 89, and 94. All of these are higher than the average IQ of 84 of those in their indigenous homelands and poorer environments. These figures show that when South Asians and North Africans are reared in European environments their IQs increase but they do not increase to the same level as those of Europeans. This suggests the presence of genetic factors. Third, the IQ of Indians in South Africa is 86. This is higher than the IQ of 82 in India and is attributable to the better living standards, but it is substantially below the IQ of Europeans. The Indians were brought to Natal in the 1850s to work on the sugar plantations (Johnston, 1930). They have had some four to six generations to adapt to life in South Africa, live in the same country and in approximately the same environment as Europeans, yet a large IQ difference remains and suggests a genetic difference between the two populations. Fourth, the average brain size of South Asians is about 8 percent smaller than that of Europeans and may be partly due to sub-optimal nutrition but is likely also to have some genetic basis and contribute to the intelligence difference.

9. *Intelligence in Israel*

Intelligence in Israel is higher than in the other countries of South Asia and North Africa. Eight studies of intelligence in Israel are summarized in Table 6.7. The IQs lie in the range of 89-97 with a median of 95. This is substantially higher than the median of 84 for the remainder of South Asia, showing that Jews have higher IQs than other South Asians. In Israel approximately 20 percent of the population are Arabs, whose IQ of 86 (see Table 6.1, row 20) is virtually the same as that of other South Asians in the Near East. Forty percent of the population are European Jews (mainly Ashkenazim from Russia and Eastern Europe) and 40 percent are Oriental Jews (Mizrahim) from Asia and North Africa. Three studies carried out in Israel have found that the Ashkenazim have a mean IQ approximately 12 IQ

Table 6.7. Intelligence in Israel

	Age	N	Test	<i>g</i>	Reference
1	13-14	200	WISC	95	JDrtar, 1952
2	11-15	267	SPM	95	Moyles & Wolins, 1973
3	10-12	180	LT	97	Miron, 1977
4	10-12	268	SPM	95	Globerson, 1983
5	11	2,781	SPM	89	Lancer & Rim, 1984
6	5	52	CPM	96	Tzurriel & Caspi, 1992
7	9-15	1,740	SPM	90	Lynn, 1994a
8	13	-	SPM	96	Kozulin, 1998

points higher than the Oriental Jews (Zeidner, 1987a; Burg and Belmont, 1990; Liebliich, Ninio, and Kugelmass, 1972). The IQ of 95 for Israel is the weighted mean of the IQs of 103 of the Ashkenazim Jews, 91 of the Oriental Jews (12 IQ points lower), and 86 of the Arabs. The lower IQ of Arabs in Israel compared with Jews is confirmed by Zeidner (1987a), who has reported that Arab applicants for admission to university obtain an IQ 15 IQ points lower than that of Jewish applicants.

There are two questions concerning the Jewish IQ that require explanation. The first is why the Ashkenazim Jews in Israel have an IQ of 103. This is not particularly surprising because there is considerable evidence that Ashkenazim Jews in the United States and Britain have substantially higher IQs than Gentiles. In the United States, a study published in the 1920s reported that Jewish 10-year-olds had an IQ 13 points higher on the Stanford-Binet test than European Gentiles (Ns=110 and 689, respectively) (Bere, 1924). In the 1940s Nardi (1948) reported an IQ of 110 on the Stanford-Binet test for Jewish 12-year-olds (N=1,210), and in the 1950s Levinson (1957) found an IQ of 109 for Jewish 12-year-olds (N=2,083), also on the Stanford-Binet test. Herrnstein and Murray (1994) reported an IQ of 112.6 for Jewish adolescents in their study of the National Longitudinal Study of Youth, and the latest study has found an IQ of 107.5 in a nationally representative sample (N=150) of adults (Lynn, 2004). Similarly high IQs for Jewish children have been reported in Britain. In the 1920s Davies and Hughes (1927) found that Jewish 8-14-year-olds in London had an IQ of 110 (N=1,081), compared with 100 for British children. In the 1960s Jewish 10-year-olds in Glasgow had an IQ of 117.8 (N=907) compared with Scottish children in the same city (Vincent, 1966). However, this figure for the Jewish IQ is too high for a comparison with British children as a whole because the IQ of children in Glasgow is 93.7 in relation to 100 for the national average (Lynn, 1979). To compare the mean IQ of Jewish children in Glasgow with that of British non-Jewish whites we have therefore to subtract 6.3 IQ points from their score, giving them a mean IQ of 111.5. Thus, the IQs of Jews in the United States and Britain average between around 107 to 115 and are therefore higher than the 103 estimated for Ashkenazim Jews in Israel. Some possible explanations for this are that few American and British Jews have emigrated to Israel. Most of the Ashkenazim Jews in the United States and Britain fled persecution in Russia and Eastern Europe between 1880 and 1914 and in Germany between 1933 and 1939. It seems likely that these would have been the more intelligent who foresaw the dangers of staying and were able to organize emigration. Those who remained in Russia and Eastern Europe would likely have been a little less intelligent. These are the ones who emigrated to Israel after World War II to escape persecution and poverty and whose IQs are a little lower than those of Ashkenazim Jews in the United States and Britain. A further factor is that many of these supposedly European Jews are not Jews at all but pretended to be Jews in order to get permission to leave the Soviet Union (Abbink, 2002).

A second problem concerning the intelligence of Jews is that all Jews were originally from the same stock, so why is the intelligence of Ashkenazim Jews approximately 12 IQ points higher than that of Oriental Jews? There are probably two answers to this question. The first is that despite strict Jewish prohibitions on exogamy, there has always been some inter-marriage and inter-mating between Jews and non-Jews living in the same localities. Even a small amount of exogamy over many generations is sufficient to introduce significant proportions of non-Jewish genes into the Jewish gene pool. The effects of this are visible in European Jews, a number of whom have fair hair and blue eyes. The result of this will have been that Ashkenazim Jews in Europe will have absorbed a significant proportion of the genes for higher intelligence possessed by the Europeans, while the Oriental Jews in the Near East and North Africa will have absorbed a significant proportion of the genes for lower intelligence from the South Asians and North Africans. The second factor that has probably operated to increase the

intelligence of Ashkenazim Jews in Europe and the United States as compared with Oriental Jews is that the Ashkenazim Jews have been more subject to persecution. Jews were less persecuted over the course of many centuries in Southwest Asia and North Africa. Oriental Jews experienced some persecution sufficient to raise their IQ of 91, as compared with 84 among other South Asians and North Africans, but not so much as that experienced by Ashkenazim Jews in Europe.

The 12 IQ point difference between Ashkenazim Jews and Oriental Jews in Israel is almost certainly to some degree a genetic difference. Genetic analysis by Hammer, Redd, and Wood (2000) has shown that all Jews have some genetic affinity (except for the Ethiopian Jews) arising from their common original stock in the Near East but that European and Oriental Jews form two genetic families, the European Jews with some genetic affinity with gentile Europeans and the Oriental Jews with some genetic affinity with Southwest Asians and North Africans.

Chapter 7. Southeast Asians

1. Intelligence of Indigenous Southeast Asians
2. Southeast Asians in the United States and the Netherlands
3. Brain Size of Southeast Asians
4. Genetic and Environmental Determinants of the IQ of Southeast Asians

The southeast asians are the indigenous peoples of Burma, Thailand, Cambodia, Vietnam, Malaysia, Indonesia, the Philippines, and Borneo. In classical anthropology they were designated the Malays (Morton, 1849; Coon, Garn, and Birdsell, 1950) or the Indonesian-Malays (Cole, 1965). Their distinctive racial identity has been confirmed by the genetic analysis made by Cavalli-Sforza, Menozzi, and Piazza (1994) in which these peoples constitute a genetic "cluster." They have some genetic affinity with the East Asians with whom they are to some degree interbred, but the flattened nose and epicanthic eye-fold are less prominent.

1. Intelligence of Indigenous Southeast Asians

IQs for samples of Southeast Asians from five countries are given in Table 7.1. Rows 1 through 4 give IQs for Indonesia. Row 1 gives an IQ of 86 for children in the city of Bandung in Java. Row 2 gives an IQ of 87 for children and adolescents in two villages in central Java. Row 3 gives an IQ of 87 for children of families working on a tea plantation. Row 4 gives an IQ of 87 for children in northern Jakarta. Row 5 gives an IQ of 90 for Lao children living in a village and "not from families living in abject poverty." Row 6 gives an IQ of 88 for mothers of the children given in row 5. Row 7 gives an IQ of 89 for Malays in Malaysia obtained in the standardization of the Standard Progressive Matrices. Row 8 gives an IQ of 85 for Malay college students at the International Islamic University in Kuala Lumpur in relation to college students at universities in Germany, Russia, and the United States. Row 9 gives an IQ of 86 for the Philippines obtained from school children in Manila. Row 10 gives an IQ of 93 for 13-year-old Malays at school in Singapore. Row 11 gives an IQ of 91 for school children in Thailand obtained from Chon Buri province, an agricultural area on the east coast. The IQs lie in the range between 86 and 93 and the median is 87.

Table 7.1. IQs of Southeast Asians

	Location	Age	N	Test	<i>g</i>	Reference
1	Indonesia	5-12	1,149	DAM	86	Thomas & Shah, 1961
2	Indonesia	5-20	163	CPM	87	Bleichrodt et al., 1980
3	Indonesia	4	139	PPVT	87	Soewondo et al., 1989
4	Indonesia	6-8	483	CPM	87	Hadidjaja et al., 1998
5	Laos	8	22	KABC	90	Boivin et al., 1996
6	Laos	30	22	KABC	88	Boivin et al., 1996
7	Malaysia	7-12	3,151	SPM	89	Chaim, 1994
8	Malaysia	20	175	EFT	85	Kuhnen et al, 2001
9	Philippines	12-13	203	SPM	86	Flores & Evans, 1972
10	Singapore	13	190	SPM	93	Lynn, 1977b
11	Thailand	8-10	2,268	SPM	91	Pollitt et al, 1989

2. Southeast Asians in the United States and the Netherlands

IQs of Southeast Asians in the United States and the Netherlands are summarized in Table 7.2. Row 1 gives an IQ of 96 for an early study of a sample of Filipino children in Hawaii tested with the Porteus Mazes. Row 2 gives an IQ of 89 for a sample of Filipinos in Honolulu collected by Smith (1942) in 1924 and 1938. Row 3 gives an IQ of 91 for Filipino children on the Hawaiian island of Kauai. Row 4 gives an IQ of 93 for a sample of Filipinos in Hawaii obtained from the mathematics subtest of the STAS. Row 5 gives an IQ of 87 for a sample of Filipinos in the United States calculated by Flynn (1991). Row 6 gives an IQ of 92 for a sample of second-generation Indonesian immigrants in the Netherlands. Row 7 gives an IQ of 94 for a sample of mainly Vietnamese high school students in an American city calculated by Flynn (1991). This sample obtained a verbal IQ of 87 measured by the Mill Hill Vocabulary Scale. This is probably slightly depressed in relation to their non-verbal reasoning IQ because many of them had not acquired fluency in English. The median of the seven studies is an IQ of 93 and is a little higher than the IQ of 87 of indigenous Southeast Asians. It is possible that a selective element in migration to the United States and the Netherlands may be part of the explanation for this, and a further possible factor is that Southeast Asians in the United States and the Netherlands enjoy a higher standard of living and of nutrition than indigenous Southeast Asians.

Table 7.2. IQs of Southeast Asians in the United States and the Netherlands

	Ethnicity	Age	N	Test	<i>g</i>	Reference
1	Filipino	6-14	140	PM	96	Porteus, 1937
2	Filipino	10-14	305	NV	89	Smith, 1942
3	Filipino	10	138	PMA	91	Werner et al., 1968

4	Filipino	16	4,147	STAS	93	Brandon et al., 1987
5	Filipino	9-25	263	Various	87	Flynn, 1991
6	Indonesian	6-10	84	NV	94	Tesser et al., 1999
7	Vietnamese	12-16	39i	SPM	94	Flynn, 1991

3. Brain Size of Southeast Asians

Studies of differences in brain size between Europeans and Southeast Asians are summarized in Table 7.3. Row 1 gives the results calculated by Gould (1981) from the collection of skulls assembled in the nineteenth century by the American physician Samuel Morton (1849). The number of skulls was quite low, consisting of 18 Southeast Asians and 52 Europeans, and not a great deal of weight can be attached to the results. They are given here largely for historical interest. Row 2 gives results from six populations of Southeast Asians compared with nine populations of Europeans showing a difference of 37cc. The standard deviations are given by Beals et al. (1984). The numbers of individuals are not given but are part of a total collection of approximately 20,000 and can be assumed to be several thousand. Despite the small size of Morton's sample and Gould's accusation that Morton massaged his results to give a larger brain size for Europeans, the results agree closely with the later study of Smith and Beals. Row 3 gives a much larger difference based on average brain sizes for 190 samples of Europeans and 20 samples of Southeast Asians. Thus, all three data sets show smaller brain size in Southeast Asians than in Europeans, consistent with their lower IQs.

Table 7.3. Brain size (cc) differences of Europeans and Southeast Asians

	Europeans	Southeast Asians	Difference	Reference
	Mean (Sd)	Mean (Sd)		
1	1,426	1,393	33	Gould, 1981
2	1,369 (35)	1,332 (49)	37	Smith & Beals, 1990
3	1,319	1,217	102	Jurgens et al., 1990

4. Genetic and Environmental Determinants of the IQ of Southeast Asians

The IQ of Southeast Asians in the United States is higher at 93 than that of indigenous Southeast Asians, 87. This difference is attributable to the better environment with higher living standards in the United States, with better nutrition, education, and welfare. The effect of these is that the IQ gap between Southeast Asians and Europeans is approximately halved. Nevertheless, a 7 IQ point difference remains when Southeast Asians and Europeans are raised and live in approximately the same environments. This suggests that genetic factors contribute to the difference in intelligence between the two races. The smaller average brain size of Southeast Asians compared with Europeans also suggests a genetic difference.

Chapter 8. Australian Aborigines

1. Intelligence of Australian Aborigines
2. Aboriginal-European Hybrids
3. Piagetian Intelligence
4. Spatial Memory
5. Brain Size
6. Genotypic Intelligence
7. Intelligence of New Guineans
8. Conclusions

The Australian "aborigines" are the indigenous people of Australia. They are also known as the Australids, have long been recognized as a race in classical anthropology, and are one of the seven major races in the taxonomy proposed by Coon, Garn, and Birdsell (1950). They have a distinctive profile of blood groups, about 73 percent of them having O group as compared with a little fewer than 50 percent among Europeans; the remaining 27 percent are A, and there are virtually none with the B group. Their distinctive racial identity has been confirmed by the genetic analysis made by Cavalli-Sforza, Menozzi, and Piazza (1994) in which the Australian Aborigines together with the original New Guineans constitute a genetic "cluster." The reason that the Australian Aborigines and the original New Guineans are closely related genetically is that the ancestors of the Australian Aborigines migrated from New Guinea to Australia about 60,000 years ago (Bradshaw, 1997). Those who migrated split from those who remained in New Guinea and today inhabit the interior highlands. Also closely related to the Australian Aborigines are the now extinct Tasmanians. The last pure Tasmanian died in 1876, but there are still a few mixed-race Tasmanians.

It has been estimated that before the Europeans arrived there were around 300,000 Aborigines in Australia. Their numbers were considerably reduced following the colonization of Australia by Europeans, partly as a result of diseases contracted from Europeans from which they lacked immunities, and partly as a result of Europeans killing them. In the second half of the twentieth century, the numbers of Aborigines in the censuses of 1961, 1971, and 1981 were recorded as approximately 106,000, 139,000, and 171,000. The rapid increase in numbers has been a result of high birth rates and a reduction of infant and child mortality.

In the second half of the twentieth century there were three groups of Australian Aborigines. The first lived on government reserves principally in the north and center of Australia. The second group lived on the outskirts of country towns and stations. The third lived in larger towns and cities. Both the second and third groups typically attended schools with Europeans. Many of the second and third groups have some European ancestry while those on the reservations are largely pure Aborigines.

1. Intelligence of Australian Aborigines

The first attempt to estimate the intelligence of the Australian Aborigines was made by Galton (1869). On the basis of travelers' accounts of their accomplishments he estimated their intelligence was approximately three "grades" below that of the English. In Galton's metric, a grade was equivalent to 10.4 IQ points. Hence in terms of the IQ scale, he estimated the Australian Aborigine IQ at 68.8. Subsequent studies of the intelligence of Australian Aborigines assessed by intelligence tests have shown that this was a fairly accurate assessment. These studies are

summarized in Table 8.1. Row 1 shows the results of the first study, giving an IQ of 66 obtained by Porteus with his Maze Test, a series of paper and pencil mazes of increasing complexity from which mental age is measured as the success rate of the average child of the corresponding chronological age. The Maze Test was later incorporated into the Wechsler tests and provides a measure of *g* and of visualization. The mean mental age of his sample adults was 10.5, the approximate equivalent of an IQ of 66. Row 2 gives results for the next study that used the Porteus Mazes on a sample of Aborigines at La Grange Bay in northwest Australia. The men obtained a mental age of 10.5 and the women of 8.6. The average mental age of the two sexes was 9.55, equivalent to an IQ of 59. Row 3 gives a closely similar result obtained by Porteus for adults at the Beagle Bay Mission in the Kimberley region; the Aborigines obtained a mental age of 9.35, equivalent to an IQ of 58. Row 4 gives an IQ of 69 obtained from two visualization tests (Alexander passalong and Fergusson Form Boards). Row 5 gives an IQ of 70 from a study of the Wailbiri Aborigines of Central Australia carried out by Porteus and Gregor in the 1960s. Row 6 gives an IQ of 58 for a sample at a primary

Table 8.1. IQs of Australian Aborigines

	Age	N	Test	<i>g</i>	Reas	Verb	Vis	Reference
1	Adults	56	PM	66	66	-	66	Porteus, 1931
2	Adults	24	PM	59	66	-	59	Piddington & Piddington, 1932
3	Adults	268	Various	58		-	-	Porteus, 1933a, 1933b
4	Adults	31	AA/PF	69		-	69	Fowler, 1940
5	Adults	87	PM	70		-	70	Porteus & Gregor, 1963
6	11	101	QT	58		-		Hart, 1965
7	Adults	103	PM	74		-	74	Porteus et al., 1967
8	5	24	PPVT	62		62	-	De Lacey, 1971 a, 1971b
9	6-12	40	PPVT	64		64	-	De Lacey, 1971a, 1971b
10	Adults	60	CPM	53	53	-	-	Berry, 1971
11	3-4	22	PPVT	64	-	64	-	Nurcombe & Moffit, 1973
12	6-14	55	PPVT	52	-	52	-	Dasen et al., 1973
13	9	458	QT	58	-		-	McElwain & Kearney, 1973
14	13	42	SOT	62		-	-	Waldron & Gallimore, 1973
15	6-10	30	PPVT	59		59	-	De Lacey, 1976
16	25	22	CPM/ KB	60	60	-	67	Binnie-Dawson, 1984
17	4	55	PPVT	61	-	61	-	Nurcombe et al., 1999

school in Maningrida in the Northern Territories. Row 7 gives an IQ of 74 for a sample of adults who obtained a mental age of 11.8. Rows 8 and 9 give IQs of 62 and 64 for two samples of Aboriginal children attending schools with white children in a town in New South Wales.

Row 10 gives an IQ of 70 for a sample of Aboriginal adults tested with the Colored Progressive Matrices. Row 11 gives a verbal IQ of 67 for 3-and 4-year-old Aboriginal children at-

tending pre-school with whites in Bourke. Row 12 gives a verbal IQ of 52 for children attending schools at the Hermannsburg Mission in central Australia. Row 13 gives an IQ of 58 for Aborigines calculated in relation to the norms for European children in New Zealand. Row 14 gives an IQ of 62 on the Spiral Omnibus Reasoning Test for a sample of 13-year-old Aboriginal children attending school on an Aboriginal reserve in Queensland. Row 15 gives a verbal IQ of 59 for a sample of 6-10-year-old Aboriginal children in Alice Springs in central Australia. Row 16 gives a reasoning IQ of 60 for a sample of adults with an average age of 25. Row 17 gives a vocabulary IQ of 61 for a sample of 4-year-olds.

The IQs range between 52 and 74. The median IQ of the seventeen studies is 62 and represents the best estimate of the average intelligence of Australian Aborigines. Verbal ability is a little weaker than visualization ability with median IQs of 62 and 68, respectively. The low intelligence of Australian Aborigines has been confirmed by a study showing that they have slow reaction times (Davidson, 1974).

2. *Aboriginal-European Racial Hybrids*

A number of studies have been made of the intelligence of Aboriginal-European hybrids. These are summarized in Table 8.2. Row 1 gives an IQ of 95 for the first of these, which was carried out by Porteus at the Mission Station in Port MacLeay, South Australia. Rows 2 and 3 give results of a study that compared 19 Aboriginal-European hybrids with European 5-year-olds attending the same schools in New South Wales. In relation to IQs of 100 of the European children, the Aboriginal-European hybrids obtained IQs of 79 on the PPVT (Peabody Picture Vocabulary Test) and 77 on the ITPA (Illinois Test of Psycholinguistic Abilities). Row 4 gives a verbal IQ of 69 for 13 part-Aborigines aged 6-12 years, a little higher than the IQ of 64 of 40 full-Aborigines obtained in the same study. The visualization IQ of 95 shown in row 1 is much higher than the verbal IQs of 79, 77, and 69 shown in rows 2, 3, and 4. All the IQs of Aboriginal-European hybrids shown in Table 8.2 are higher than the median of the full-blooded Aborigines given in Table 8.1. This could be due to an admixture of genes from European raising the intelligence of Aborigines. Alternatively, Aborigine-European hybrids tend to be reared in better environments as regards standards of living and nutrition. None of these studies gives estimates of the proportion of European ancestry in these part-Aborigines.

Table 8.2. IQs of hybrid Australian Aborigines and Europeans

	Age	N	Test	<i>g</i>	Reas	Verb	Vis	Reference
1	10	28	PM	95	-	-	95	Porteus, 1917
2	5	19	PPVT	79	-	79	-	Teasdale & Katz, 1968
3	5	19	ITPA	77	-	77	-	Teasdale & Katz, 1968
4	6-12	13	PPVT	69	-	-	-	De Lacey, 1976, 1971a, 1971b

3. Piagetian Intelligence

The intelligence of Australian Aborigines has been assessed by "Piagetian" tests in addition to conventional intelligence tests. This work has been carried out in the framework of the theory of the development of intelligence in children formulated by the Swiss psychologist Jean Piaget. This theory states that children progress through four stages of cognitive development. The first of these is the *sensorimotor* stage of infancy in which the child learns about the properties of objects, space, time, and causality. At about the age of two, children make the transition to the *pre-operational* stage in which they acquire language and abstract concepts but are not yet able to understand logical principles. This stage lasts until the age of about six years. In Western societies children at around the age of seven make the transition to the stage of *concrete operations* when they can grasp logical principles but only in concrete terms. At around the age of 12 years European children progress to the fourth and final stage of *formal operations* when they become able to think logically in terms of general principles divorced from concrete examples. A number of studies have found that the ability to understand the concepts measured in Piagetian tasks is highly correlated with IQs measured by standard intelligence tests (Jensen, 1980).

The method adopted by those who have examined the Piagetian intelligence of Australian Aborigine children is to ascertain whether they reach the stages of cognitive development at the same ages as European children. These studies have generally examined the ages at which Aboriginal children attain the *concrete operational* and *formal operational* stages of thinking. The *concrete operational stage*, has most frequently been measured by tests of whether a child has acquired the concept of "conservation." This is the understanding of the principle that the volume and weight of a substance remain the same (i.e., is "conserved") when its shape changes. The standard test of the ability to understand the principle of the conservation of quantity is that the tester pours water or some other substance (such as beads) from a glass tumbler into a long thin glass. The child is asked whether the amount of water or other substance remains the same. Young children typically believe that there is more water or other substance in the long thin glass, apparently focusing on its greater height and ignoring its lesser width. When children grasp that the volume remains the same whatever the shape of the container they have achieved understanding of the concept of conservation.

The first studies of the ability of Australian Aboriginal adults to understand the principle of conservation were carried out by de Lemos (1969, 1979). She showed 12 Aboriginal women two glasses of sugar. One was long and thin and was filled with a cup of sugar, while the other was wide and short and was filled with half a cup of sugar. The women were offered a choice between the two glasses and eight of them chose the wide and short glass with less sugar. She concluded "According to Piaget's theory this concept is basic to all logical thinking, and this retardation would therefore indicate a lower level of intellectual functioning than is normally achieved in European culture" (1969, p.15). The lack of understanding of the principle of conservation among two thirds of these adult women suggests they are at about the same mental level as white 8-year-olds. This indicates that they would have had an IQ of about 50. De Lemos (1969) also found that mixed-race Aboriginal-white hybrids performed better on the test of conservation than pure Aborigines although not so well as whites.

In the second study, De Lemos (1969) gave Piagetian conservation tasks to 38 pure Aboriginal children and to 34 who had approximately one eighth European ancestry. She described the environment in which they lived as follows: "there were no apparent differences in the present environment of part-Aboriginal and full-Aboriginal children...who formed a single integrated community and the children were brought up under the same mission conditions

and attended the same school" (p. 257). The part-Aboriginal children scored significantly higher on the tasks than the pure Aboriginals but it is not possible to quantify the results as IQs. De Lemos concluded that as the two groups were living in the same environment only a genetic hypothesis could explain the difference.

A study by Dasen (1973) produced similar results. He gave Piagetian conservation tasks to two samples of 55 and 90 Aboriginal children and adults in central Australia and to 80 white children in Canberra. All the Aboriginal children were attending schools. The white children had reached this stage at an average age of 8, while the Aboriginal children reached it at about the age of 15. Twenty-three percent of the Aboriginal adults attained the stage that is attained by European children at an average age of about 7-8 years. Dasen (1973, p. 92) concluded that "a large proportion of Aborigines do not develop these concrete operational concepts at all, even as adults." The results indicate that the Aborigines had an IQ of around 55. In a further component of the study, Dasen compared about 30 full-blooded and 30 part-Aboriginal children. He found the part-Aboriginal performed slightly but not significantly better than the pure Aborigines.

A further study of the attainment of the Piagetian concept of conservation by Australian Aboriginal children has been carried out by Seagrim and Lendon (1980). They found that 10 percent of 7-8-year-olds, 35 percent of 9-10-year-olds, and 70 percent of 12-year-olds grasped the concept. Thus, 12-year-old Aborigines are at about the same mental level as 7-8-year-old white children. This would give them an IQ of approximately 60.

Piaget concluded on the basis of his work on Swiss children that everyone except the mentally retarded attains all the stages of cognitive development by the time they are adults. The studies of Australian Aborigines have shown that this is incorrect and that many of them never reach the last stage of logical thought. These studies showing retarded development of Piagetian intelligence provide further confirmation of the low intelligence of the Australian Aborigines.

4. *Spatial Memory*

A remarkable study by Kearins (1981) found that Aboriginal children had much stronger spatial memory than Europeans. In this study 132 Aboriginal children aged 7-16 and the same number of white Australian children were given various tests of spatial memory. The general format of the tests was that 20 objects were laid out and the child was asked to look at them for 30 seconds and try to remember their position. The objects were then removed and the child was asked to re-assemble them in the same positions. In all the tasks Aboriginal children performed better than whites. Their overall advantage is represented by a Spatial Memory IQ of 119. Kearins argued that the most probable explanation for this high spatial memory ability is that it evolved in the Aborigines because the deserts of central Australia have few landmarks and the nomadic Aboriginal peoples needed to note and remember the location of such landmarks as exist to construct mental spatial maps of their environments to find their way home after going out on hunting expeditions. In support of this argument, she tested a sample of Aborigines living in a town whose families had been living in the town for several generations. This group performed just as well on spatial memory as those from the desert. She argued that this indicated that the environment is not responsible for the high spatial memory ability of the Aborigines and supported her view that it has an evolved genetic basis.

Kearins's results have, however, been challenged. Drinkwater (1976) compared 22 Aboriginal and 22 white 12-year-olds on similar tasks and found the two groups performed at the same level, but his Aborigines came from a coastal area where the strong spatial memory required according to Kearins's theory would not have been necessary and would not have evolved. Nevertheless, considering the low general intelligence of Aboriginals, it is remarkable that they should have performed as well as whites on spatial memory. Harris (1977) in an unpublished Ph.D. thesis found that desert Aborigines performed worse than whites on this task. Knapp and Seagrim (1981) also found that desert Aborigines performed worse than whites, but unfortunately they did not present the data in such a way that the magnitude of the white advantage can be calculated. Despite these negative results Kearins's findings on the Aboriginal spatial memory remain impressive and deserve further research by Australian psychologists. The strong spatial memory of the Aborigines, if it can be confirmed, has a parallel in the strong visual memory of the Eskimos reported by Kleinfeld (1971) and explained as an adaptation to living in the frozen tundra, which contains few landmarks and is similar in this regard to the deserts of Australia (see Chapter 11).

5. Brain Size

Seven studies of the brain size of Australian Aborigines compared with Europeans are summarized in Table 8.3. Row 1 gives Morton's figures refined by Gould (1996). All the studies show smaller brain size in Australian Aborigines than in Europeans. These results are corroborated by a study of 281 Aboriginal primary school children aged 6-11 by Edwards and Craddock (1973) that found their average head circumference was at the 10th percentile of whites in the United States and Australia. Head circumference is an approximation for brain size. As brain size is a significant determinant of intelligence (Vernon et al., 2000), the smaller average brain size of the Aborigines can be regarded as partly responsible for their lower IQ. Klekamp, Reidel, Harper, and Kretschmann (1987) have reported that Australian Aborigines have a larger right visual cortex than Europeans. The right hemisphere deals with spatial abilities and the left hemisphere with verbal abilities, so the relatively larger right hemisphere of Aborigines is consistent with their good spatial memory found by Kearins (1981), summarized in Section 4, and for which she has proposed the theory that Aborigines have evolved a relatively larger right brain and visual cortex in order to solve the visual and spatial problems encountered by nomadic peoples in a featureless desert environment.

Table 8.3. Brain size (cc) of Australian Aborigines and Europeans (sample sizes in parentheses)

	Europeans	Aborigines	Difference	Reference
1	1,426	1,229 (8)	197	Morton, 1849
2	-	1,217 (325)	-	Morant, 1927
3	-	1,198 (109)	-	Wagner, 1937
4	-	1,206 (29)	-	Klekamp et al., 1987
5	1,369	1,225	144	Smith & Beals, 1990
6	1,319	1,240	79	Jurgens et al., 1990
7	-	1,178 (73)	-	Freedman et al., 1991

6. Genotypic Intelligence of Australian Aborigines

That there is some genetic component to the low intelligence of the Australian Aborigines is indicated by eight lines of evidence.

First, the most satisfactory method for assessing the extent to which genetic factors are involved in the low intelligence of the Aborigines would be a cross-racial adoption study in which Aboriginal infants are adopted by white families. Environmental theory predicts they will have the same average IQ as whites, while genetic theory predicts their IQ will remain the same as that of Aborigines. If their average IQ is intermediate between that of Aborigines and whites it can be inferred that both genetic and environmental factors are involved. The only study of this kind that has been carried out is by Dasen, de Lacey, and Seagrim (1973) and concerned 35 Aboriginal children adopted by white couples in and around Adelaide. Seventeen of these children were half Aborigine and the remainder were 7 full-blooded, 2 three-quarter, 4 one-quarter, one one-eighth and 4 unknown. On average they were about half Aborigine. The average age of adoption was 18 months. Between the ages of 5 and 13 years they were given six tests, of which four were Piagetian, one was the Nixon test of "reclassification," and the other was the Peabody Picture Vocabulary Test. The results are given for the adopted Aborigines, and for comparison groups of Europeans and full-blooded Aborigines in central Australia. None of the test results can be accurately quantified because they are given in graph format. It can be discerned from these that on two of the Piagetian tests (conservation of quantity and weight) the Aborigines performed about mid-way between Europeans and full-blooded Aborigines. As the adopted Aborigines were half-blooded, this is where they would be expected to fall and the results suggest that the adoptive experience had no advantageous effect. On the third test (conservation of horizontality) the adopted Aborigines performed somewhat below the European comparison group but substantially better than the full-blooded Aborigines. On the fourth, fifth, and sixth tests, described as measures of "sedation of lengths," "reclassification" (neither of these terms is explained), and the PPVT, the Aborigines performed about the same as the European comparison group. Thus, while the performance of these adopted part-Aboriginal children varied on the different tests, on the tests considered as a whole they scored below European children. This is consistent with the authors' observation that "the majority of the children were reported, by their parents, to be below average in school work; most were reported to experience particular difficulty in mathematics" (p. 98). While these adopted part-Aborigines performed at a lower level than Europeans they seem to have performed somewhat better than part-Aborigines reared by their biological parents. The results therefore suggest that both genetic and environmental factors are responsible for the low intelligence of Aborigines. It should be noted that the average age of the children when they were tested was about 8 years and that the American study by Weinberg, Scarr, and Waldman (1992) of black children adopted by white parents found that at the age of 7 years they had an average IQ of 95 but by the age of 17 this had deteriorated to 89, showing young black children secure IQ gains from adoption but these fade by late adolescence (see Chapter 4).

Second, the median IQ of Aborigines obtained from the 16 studies summarized in Table 8.1 is 62, while the median IQ of the four studies of Aboriginal-European hybrids summarized in Table 8.2 is 78. The higher IQ of the hybrids is consistent with the genetic hypothesis of the low Aboriginal IQ, which predicts that the IQ of the hybrids should be intermediate between the IQs of the two parent races. However, it may be that the hybrids enjoyed better living standards and their higher IQ can be explained environmentally.

Third, all the Aboriginal children in the studies listed in Tables 8.1 and 8.2 attended schools and in three of the studies (rows 6, 7, and 9 in Table 8.1) the Aboriginal children attended schools with white children, so their low IQs cannot be attributed to lack of opportunity to acquire the mental skills tested in intelligence tests or to radically different environments.

Fourth, the low IQs of Aborigines are present in children aged 4 (Table 8.1, rows 11 and 17), confirming that they cannot be attributed to inadequate schooling.

Fifth, the low IQs of Aborigines appear in a wide range of abilities including reasoning, verbal comprehension, vocabulary, spatial ability measured by the Porteus Mazes, and Piagetian conservation tasks, showing that their low IQs cannot be explained by bias of any particular test.

Sixth, there is no tendency for the IQs of Aborigines to increase over the period of approximately half a century from the first two studies carried out around 1930 that produced IQs of 66 and 59, and the last two studies carried in the 1980s and 1990s that produced IQs of 60 and 61 (see Table 8.1), despite improvements in the environmental conditions of Aborigines arising from increased welfare and medical attention.

Seventh, if the intelligence of some Aborigines is impaired by adverse environmental conditions the most probable factor is likely to be poor nutrition. The prevalence of malnutrition among Aborigines has been investigated in two studies. In the first, Edwards (1970) in a study of 82 preschool Aboriginal children in New South Wales found that 31 percent were malnourished and in a subsequent study of 281 Aboriginal children that 21 percent were malnourished (Edwards and Craddock, 1973). Malnourishment in infancy has an adverse effect on intelligence, but these two studies taken together found that only approximately 25 percent of Aborigines are affected. Edwards and Craddock (1973) administered an intelligence test to 29 malnourished and 29 well-nourished Aboriginal children aged 6 to 10 years and found that the malnourished children had a mean IQ 8 IQ points lower than the well nourished. As approximately 25 percent of Aborigines are malnourished, the effect of malnutrition on the total Aboriginal population would be to reduce the IQ by about 2 IQ points. This suggests that inadequate nutrition has only a negligible effect on the low IQ of Aborigines.

Eighth, the low brain size of Aborigines is a major neurological and genetic determinant of their low intelligence. Brain size affects intelligence and has a substantial heritability. Brain size can be reduced by malnutrition, but as only about 25 percent of Aborigines are malnourished, the low brain size of Aborigines must be largely genetic and a substantial determinant of their low intelligence.

7. Intelligence of New Guineans

The Aborigines of New Guinea inhabit the interior highlands, into which they were pushed by Melanesian Pacific Islanders and Southeast Asians from Indonesia during the last 3,000 years or so. Today the population consists of the Aborigines, Pacific Islanders, Southeast Asians, and hybrids. Generally researchers do not describe to which of these groups their samples belong and this has to be inferred from their location. There have been two studies of the intelligence of the Aborigines of New Guinea assessed by intelligence tests. The first reported by McElwain and Kearney (1970) of 26 men aged 20-29 tested with the non-verbal Queensland Test found an IQ of 65, compared with white Australians. The second has been reported

by Berry (1971) for a sample of 70 adults tested with the Colored Progressive Matrices. Their score was well below the first percentile of British adults and their IQ can be estimated at approximately 62, the same as that of Australian Aborigines.

There have been three studies of the Piagetian intelligence of the New Guinean Aborigines. The first of these was carried out by Prince (1968) on a large sample of 2,700 school students and teacher-training college students. He concluded that the New Guineans "show the expected pattern of Piagetian stages, though conservation is not achieved until much later than in Western European culture" (p. 65). Even the college students showed "significantly poorer development in all test items requiring the concept of conservation" (p. 64). While the principle of conservation is understood by approximately 85 percent of European 8-year-olds and by virtually all 12-year-olds, conservation of substance was understood by 22 percent of New Guinean 8-year-olds and 85 percent of 18-year-olds, while conservation of area was understood by no 8-year-olds and 50 percent of 18-year-olds. These results suggest that the 18-year-old New Guinean Aborigines have a European mental age of about 8 years, equivalent to an IQ of approximately 50.

A second study of 432 children and adolescents aged 6-19 and with a mean age of 11 years was carried out by Kelly (1977). The results were that 31 percent of them had attained the concept of the conservation of quantity and none of them had attained the stage of formal operations. Because approximately 70 percent of European children attain the concept of conservation by the age of 7 years and all except the mentally retarded attain the stage of formal operations by the age of twelve years, the finding that 31 percent of the New Guinean sample achieved the stage of concrete operations at the age of seven and that none of them attained the stage stone-age culture of the Aborigines, but went on to assert that "this material poverty was not the result of low intelligence but of the conditions of existence. The brain size of the Aborigines falls within the European range and there is no evidence to suggest that this is not true of their intelligence." The use of the phrase "falls within the European range" for the brain size of Aborigines suggests that the author was well aware that their average brain size falls at the low end of the European range but was apparently anxious to gloss this over, while the assertion that the Aborigines are as intelligent as Europeans is probably attributable to sheer ignorance.

Jared Diamond goes even further in his book *Guns, Germs, and Steel*. He begins by describing how when he was working in New Guinea a tribesman named Yali asked him: "Why is it that you white people developed so much cargo and brought it to New Guinea, but we black people have little cargo of our own?" (p. 14). "Cargo" in the lingo of New Guinea means goods. Diamond says that he wrote his book to answer this question. He contends that the answer does not lie in differences in the intelligence of different peoples and that the "New Guineans impressed me as being on average more intelligent than the average European or American" (Diamond, 1998, p. 20). He makes no mention of the studies showing the low IQs of these peoples on intelligence and Piagetian tests.

8. Conclusions

The results of intelligence tests showing a low level of intelligence in the Australian Aborigines confirm the observations of anthropologists who described these peoples in the late nineteenth century and the first half of the twentieth century and who considered that the Australian Aborigines had poor mental abilities and were a primitive survival of stone-age people.

Thus, Wake (1872, p. 80) wrote that "the Australian Aborigines are still but children in their general mental development." In the first decade of the twentieth century Klaatsch (1908, p. 164) published the first of a number of studies showing that the Aboriginal brain is smaller than that of Europeans and concluded that "the Australian Aborigines are a relic of the oldest type of mankind." Some years later the anthropologist Sir Arthur Keith (1922, p. xi) wrote that the Australian Aborigines "represent the original stock from which the three great modern races—the Negroids, Europeans and the Mongoloids—have developed." But in the second half of the twentieth century anthropologists came to assert that the Aborigines are just as intelligent as Europeans. Thus, A.R.E. (1960, p. 714), writing in the *Encyclopaedia Britannica*, described the primitive

Chapter 9. Pacific Islanders

1. Intelligence of New Zealand Maoris
2. Other Pacific Islanders
3. Hawaiian Islander Hybrids
4. Brain Size
5. Environmental and Genetic Determinants of the Intelligence of Pacific Islanders

The Pacific Islanders are the indigenous peoples of the numerous Pacific islands, the principal of which are New Zealand, the groups of islands of Micronesia, Melanesia, Polynesia, and Hawaii, and the isolated Easter Island. These islands were uninhabited by humans until about BC 6,000-1,000, when Micronesia, Melanesia, and western Polynesia began to be settled by Southeast Asian peoples. It was not until about 650 AD that all the major islands of Polynesia were settled. The last of the Pacific islands to be colonized was New Zealand, which was settled about 800 AD by Polynesians who were the ancestors of the contemporary Maori. In classical anthropology the Pacific Islanders were recognized as one of the seven major races by Coon, Garn, and Birdsell (1950). This was confirmed by Cavalli-Sforza, Menozzi, and Piazza (1994) in their genetic classification, in which Micronesians, Melanesians, and Polynesians appear as a "cluster." The Pacific Islanders are one of the minor races, numbering about 1.5 million. At the end of the twentieth century there were about 350,000 Maoris in New Zealand. The population of the Solomon Islands is about 380,000, and there are about the same number in Fiji. The population of Western Samoa is about 170,000, and of Tonga about 100,000.

1. Intelligence of New Zealand Maoris

The Pacific Islanders whose intelligence has been studied most are the Maoris of New Zealand. Studies of their IQs are summarized in Table 9.1. Row 1 gives a general IQ of 91 and verbal and visualization IQs of 92 and 94. Row 2 gives IQs for 13-year-olds of 90 for *g* and reasoning, 94 for verbal ability, and 87 for visualization. Row 3 gives an IQ of 82 for a sample of 15-year-olds derived from the Otis, a largely verbal test of general intelligence. Rows 4 through 13 give IQs in the range between 81 and 95. Row 14 gives an IQ of 92 from a national cohort study. Row 15 gives a verbal reasoning IQ of 92 for applicants for positions in a government organization compared with 55 European applicants. Neither of the groups can be regarded as representative of the respective populations, but the intelligence difference remains approximately in the middle of the range of the other studies.

Table 9.1. IQs of New Zealand Maoris

	Age	N	Test	K	Reas	Verb	Vis	Reference
1	12-41	53	WB	91	-	92	94	Adcocketal., 1954
2	13	214	PMA	90	90	94	87	Walters, 1958
3	15	98	OTIS	82	-	-	-	Ausubel, 1961
4	11	18	WB	81	-	79	84	Ritchie, 1966
5	8-12	238	OTIS	85	-	-	-	Lovegrove, 1966
6	13-14	236	OTIS	SI	-	-	-	Du Chateau, 1967
7	14	77	OTIS	84	-	-	-	Martin, 1969
8	5-7	80	Verbal	90	-	90	-	Clay, 1971
9	14	55	SPM	88	-	-	-	Codd, 1972
10	4-6	151	PIPS	96	-	-	-	St. George & St. George, 1975
11	9	211	SPM/VC	91	91	91	-	Harker, 1978
12	8-14	303	QT	95	-	-	-	St. George, 1983
13	10-12	130	TOSCA	90	-	-	-	St. George & Chapman, 1983
14	8-9	22	WISC-R	92	1	-	-	Fergusson et al., 1991
15	Adults	103	VR	92	-	-	-	Guenole et al., 2003

All the studies give broadly similar results, with IQs in the range between 81 and 96 with a median IQ of 90. The Maori IQs are consistently around 90 for reasoning, verbal, and non-verbal tests.

2. Other Pacific Islanders

Studies of the intelligence of Pacific Islanders other than the New Zealand Maoris are summarized in Table 9.2. Row 1 gives an IQ of 85 for native Hawaiian primary school children, obtained in the mid-1920s. Rows 2 and 3 give IQs of 90 and 82 for native Hawaiian school children, obtained in 1924 and 1938; these IQs are in relation to 100 for European children tested at the same time. Row 4 gives an IQ of 81 for children attending school in the Mariana Islands. Row 5 gives an IQ of 84 for adolescents in the Marshall Islands. Row 6 gives an IQ of 90 derived from tests of vocabulary and verbal understanding for a sample of school children in Samoa. Row 7 gives an IQ of 82 for a sample of Pacific Islanders in Papua New Guinea. This sample had an average of 9 years of education and were applicants for entry to the Australian Navy. Their IQ is calculated in relation to 100 for white Australian applicants also with 9 years of education. Row 8 gives an IQ of 89 for preschool children ages 4 to 6 years in the Cook Islands. Row 9 gives an IQ of 84 for 12-year-old school children in Fiji. Row 10 gives an IQ of 86 for primary school children in Tonga. Row 11 gives an IQ of 83 for primary school children in Papua New Guinea; the children were largely Pacific Islanders rather than aboriginals and were attending schools with white Australian children. Row 12 gives an IQ of 89 for a large sample of Filipinos in Hawaii obtained from the mathematics subtest of the STAS. Row 13 gives an IQ of 85 for a sample of children tested with Kohs Blocks from the French dependency of New Caledonia. Row 14 gives an IQ of 88 for a sample of Pacific Is-

lander adolescents attending schools in New Zealand. The median IQ of the Pacific Islanders other than New Zealand Maoris is 85 and is therefore slightly lower than the median of 90 of the Maoris. The explanation for the higher intelligence of the Maoris is that many of them interbred with Europeans and that they enjoy higher living standards and health care than other Pacific Islanders. It is therefore considered that the IQ of 85 of the other Pacific Islanders is the best estimate of the intelligence of the Pacific Islanders.

Table 9.2. IQs of Pacific Islanders

	Location	Age	N	Test	<i>g</i>	Reference
1	Hawaii	6-12	105	Binet	85	Porteus & Babcock 1926
2	Hawaii	10-14	302	NV	90	Smith, 1942
3	Hawaii	10-14	319	NV	82	Smith, 1942
4	Mariana Islands	6-16	200	Arthur	81	Joseph & Murray, 1951
5	Marshall Islands	12-18	407	CF	84	Jordheim & Olsen, 1963
6	Samoa	5-7	80	Verbal	90	Clay, 1971
7	Papua N. Guinea	17-18	152	SOP	82	Waldron & Gallimore, 1973
8	Cook Islands	4-6	110	PIPS	89	St. George, 1974
9	Fiji	12	76	QT	84	Chandra, 1975
10	Tonga	8-9	80	PAT	86	Beck & St. George, 1983
11	Papua N. Guinea	7-10	241	BG	83	Robin & Shea, 1983
12	Hawaii-Filipinos	16	3,507	STAS	89	Brandon et al, 1987
13	New Caledonia	5-10	96	KB	85	Cottureau-Reiss & Lehalle, 1988
14	Pacific Islands	9-17	65	SPM	88	Reid & Gilmore, 1989

3. Hawaiian Islander Hybrids

IQs of children with one Hawaiian Islander and one European parent, and with one Hawaiian Islander and one Chinese parent, were obtained by Smith (1942) in his studies carried out in Honolulu in 1924 and 1938. The IQs are summarized in Table 9.3. The IQs of the two hybrid groups are slightly higher than the average of the two parent races. The average IQ of the Europeans and Hawaiians is 90.5, while the IQ of the children is 93. Similarly, the average IQ of the Chinese and Hawaiians is 90, while the IQ of the children is 91. The slightly higher than expected IQs of the children of the mixed-race parents may be a hybrid vigor or heterosis effect that is frequently present in crosses between two strains. The same phenomenon has been found in Hawaii in a study of the children of Asian-European parents, whose IQs were 4 IQ points higher than those of the children of Asians and Europeans (Nagoshi and Johnson, 1986) In this study all three sets of parents had the same education and socioeconomic status, suggesting that this is a genetic effect.

Table 9.3. IQs of Europeans, Chinese, and Pacific Islander Hybrids

Group	N	IQ
European	1,110	100
Chinese	2,704	99
European-Hawaiian	842	93
Chinese-Hawaiian	751	91
Hawaiian	621	81

4. Brain Size of Pacific Islanders

It has only proved possible to find one study of the brain size of Pacific Islanders. Smith and Beals (1990) give brain sizes for six populations of which the mean is 1,317cc. They give a brain size for Europeans of 1,369cc. The difference of 52cc is reasonably substantial and goes some way toward accounting for the intelligence difference between the two peoples.

5. Environmental and Genetic Determinants of the Intelligence of Pacific Islanders

There are no heritability studies of the intelligence of Pacific Islanders, but it is probable that both environmental and genetic factors contribute to their lower IQ, as compared with Europeans. The Maoris in New Zealand and the Hawaiians in Hawaii have approximately the same environment as Europeans in so far as they enjoy the environmental advantages of living in affluent European societies with high standards of nutrition, education, and welfare. The IQ of 90 of the Maoris is higher than the 85 of the other Pacific Islanders, suggesting a beneficial effect of living in an affluent European environment, but it remains well below the IQ of Europeans. The average IQ of the four studies of the native Hawaiians is 84, virtually the same as the 85 of other Pacific Islanders, suggesting that the affluent environment of Hawaii does not improve their intelligence. The brain size of the Pacific Islanders is about 4 percent smaller than that of Europeans and probably has some genetic basis, contributing to the intelligence difference.

Chapter 10. East Asians

1. Intelligence of Indigenous East Asians
2. East Asians in the United States
3. Further Studies of East Asians Outside East Asia
4. East Asians Adopted by Europeans
5. East Asian-European Hybrids
6. Reaction Times
7. Visual Memory
8. Brain Size
9. Heritability of Intelligence in East Asians
10. Environmental and Genetic Explanations of the East Asian IQ

The east asians are the indigenous peoples of present day China, Japan, Korea, Mongolia, and Tibet. They have frequently been described as Mongoloids and have been recognized as one of the major races in classical anthropology from the first taxonomies of Linnaeus (1758) and Blumenbach (1776), and are one of the seven major races in the classification proposed by Coon, Garn, and Birdsell (1950). Their identity as a genetic "cluster" has been confirmed by Cavalli-Sforza, Menozzi, and Piazza (1994) in their classification, based on a number of genetic markers taken from samples of Samoyeds, Mongols, Tibetans, Koreans, and Japanese. The most distinctive features of East Asians are their straight black hair, flat nose, and yellowish skin color and the epicanthic eye-fold that gives their eyes a narrow appearance.

1. Intelligence of Indigenous East Asians

Studies of the intelligence of indigenous East Asians have been made in China, Japan, Hong Kong, South Korea, Taiwan, and also Singapore, where ethnic Chinese make up 76 percent of the population. The results of these studies are summarized in Table 10.1. Rows 1 to 10 give results for the People's Republic of China. Row 1 gives an IQ of 107 from a standardization of the WISC-R in Shanghai. This figure is probably a little high for China because the IQ in Shanghai is likely to be higher than in China as a whole. Row 2 gives an IQ of 103 for several reasoning tests for 14- and 15-year-olds obtained in the mid-1990s. Row 3 gives an IQ of 101 calculated from a standardization of the Standard Progressive Matrices in China for the age range from 6 to 15. Row 4 gives an IQ of 104 for 12- and 18-year-olds in Shanghai compared with Americans in Missouri and Georgia. On 10 arithmetic tests of computation and arithmetical reasoning the Chinese scored higher by an average of $1.37d$, the equivalent of 20 IQ points. This study also reports a comparison of the performance of elderly Chinese ($N=56$, age=66) and Americans ($N=47$, age=70) in which the Chinese obtained a lower mean IQ than the Americans by 8 IQ points. No information is given of how representative the sampling was and the result is not considered sufficiently reliable for entry in the table. Row 5 gives an IQ of 109 for a test of arithmetical reasoning for sample of 4-year-old pre-school children in Beijing, compared with a sample of 156 American children. Row 6 gives an IQ of 103 for a drawing test of a person and a horse resembling the Draw-a-Man test; the Chinese children were at school in Beijing and were compared with a sample of 489 British children. Row 7 gives an IQ of 107 for a combined sample of urban and rural children. Row 8 gives an IQ of 103 for a sample of 17-year-olds at high school in Shanghai compared with a sample of 55 American high school students in Columbia, Missouri. Row 9 gives an IQ of 113 for a sample of college students at the East China Normal University in Shanghai compared with a sample of 239 American college students at the University of Missouri. Row 10 gives an IQ of 107 for a sample of 7-8-year-olds at school in Beijing.

Rows 11 through 19 give nine results from Hong Kong. Row 11 gives an IQ of 105 obtained from the Culture Fair Test for a representative sample of Chinese 9-11-year-olds attending five primary schools. Row 12 gives an IQ of 106 obtained for a large sample of 16-year-olds on the AH4 test. There are no satisfactory British norms for this age for this test, so the comparison group is a sample of Canadian 16-year-olds (MacLean and McGhie, 1980). Rows 13 through 16 give IQs of 109, 103, 110, and 108 obtained from the Standard Progressive Matrices. Row 16 gives results for 10-year-olds in which reasoning ability was measured with the SPM, spatial ability with the space relations test from the Primary Mental Abilities Test, and verbal ability by word fluency. This study shows an exaggerated version of the typical East Asian pattern of high reasoning IQ (108), higher spatial IQ (114), and weaker verbal IQ (92). Row 17 gives an IQ of 104 obtained from the Culture Fair Test. Row 18 gives the unusually

high IQ of 122 for a sample of 9-year-olds. Row 19 gives a closely similar IQ of 120 for the Advanced Progressive Matrices Hong Kong standardization sample, which appears to have been exceptionally well drawn.

Rows 20 through 42 give IQs for studies in Japan. Row 20 gives a Japanese IQ of 102 calculated from the Japanese standardization sample of the WISC and based on five performance tests and digit span (the remaining verbal tests were altered in the Japanese version of the test and therefore not used); the visualization IQ of 102 is calculated from the block design and mazes subtests. Row 21 also gives a Japanese IQ of 102, calculated from the standardization sample of the WAIS and based on digit symbol, block design, and digit span, the only tests that were unaltered in the Japanese version of the test. Row 22 gives a Japanese IQ of 107 for 5-10 year olds on the MFFT calculated from error scores compared with an American sample numbering 2,676. Row 23 gives a Japanese IQ of 106 for 10 year olds obtained on the Japanese Kyoto Test compared with British children. Row 24 gives an IQ of 108 for a sample of children in Hiroshima for the arithmetic subtest of the WRAT. Row 25 gives an IQ of 112 for Japanese children in Nagoya and Hamamatsu. Row 26 gives an IQ of 107 obtained from the Japanese standardization sample of the Columbia Mental Maturity Scale.

Row 27 gives results of the study by Stevenson and his colleagues that compared 6- and 11-year-olds of samples drawn from the cities of Minneapolis in the United States, Sendai in Japan, and Taipei in Taiwan. While Sendai and Taipei may be acceptable as broadly representative of urban children in Japan and Taiwan, the same cannot be said of Minneapolis as representative of American cities. Minneapolis is the principal city in Minnesota and there is considerable evidence that the intelligence level is higher in Minnesota than in the United States as a whole. In the military draft in World War I, the whites from Minnesota obtained the highest score on the Army Beta Test of all American states (Montagu, 1945b). In the military draft for the Korean War the percentage found unacceptable in Minnesota for military service on account of low intelligence was the second lowest among the American states

Table 10.1. IQs of indigenous East Asians

	Location	Age	N	Test	g	Reas	Verb	Vis	Reference
1	China	6-16	660	WISC-R	107	-	-	-	Li et al., 1990
2	China	6-15	5,108	SPM	101	101	-	-	Lynn, 1991c
3	China	14-15	297	Various	103	103	-	-	Li et al., 1996
4	China	6-12	269	SPM	104	-	-	-	Geary et al., 1997
5	China	4	60	Arithmetic	109	109	-	-	Ginsburgetal., 1997
6	China	6-13	463	DAM	103	-	-	-	Cox et al., 1998
7	China	6-8	160	SPM	107	107	-	-	Goaetal., 1998
8	China	17	218	SPM	103	103	-	-	Geary et al., 1999
9	China	19	218	SPM	113	113	-	-	Geary et al., 1999
10	China	6-8	300	BTBC-R	107	-	-	-	Zhou & Boehm, 2001
11	Hong Kong	9-11	1,007	CCT	105	-	-	-	Godman, 1964
12	Hong Kong	16	5,209	AH4	106	-	-	-	Vernon, 1982

13	Hong Kong	10	1,000	SPM	109	109	-	-	Chan & Vernon, 1988
14	Hong Kong	6-13	13,822	SPM	103	103	-	-	Lynn, Pagliari & Chan, 1988
15	Hong Kong	6-15	4,500	SPM	110	110	-	-	Lynn, Pagliari & Chan, 1988
16	Hong Kong	10	197	SPM/PMA	108	108	92	114	Lynn, Pagliari & Chan, 1988
17	Hong Kong	9	376	CCF	104	-	-	-	Lynn, Hampson & Lee, 1988
18	Hong Kong	9	479	SPM	122	122	-	-	Chan et al., 1991
19	Hong Kong	15	341	APM	120	120	-	-	Lynn & Chan, 2003
20	Japan	5-15	1,070	WISC	102	-	-	102	Lynn, 1977a
21	Japan	35	316	WAIS	102	-	-	-	Lynn, 1977a
22	Japan	5-10	760	MFFT	107	-	-	-	Salkind et al., 1978
23	Japan	10	212	Kyoto	106	-	-	-	Lynn & Dziobon, 1980
24	Japan	8-11	97	WRAT-A	108	-	108	-	Tarnopol & Tarnopol, 1980
25	Japan	9	223	GEFT	112	-	-	112	Bagley et al., 1983
26	Japan	4-9	347	CMMS	107	107	-	-	Misawa et al., 1984
27	Japan	6-11	480	Various	105	-	99	111	Stevenson et al., 1985
28	Japan	6-16	1,100	WISC-R	103	-	100	104	Lynn & Hampson, 1986a
29	Japan	4-6	600	WPPSI	105	-	97	109	Lynn & Llampson, 1987
30	Japan	14	2,100	Kyoto	104	103	103	107	Lynn et al., 1987a
31	Japan	13-15	178	DAT	104	-	-	114	Lynn et al., 1987b
32	Japan	2-8	548	McCarthy	103	-	102	105	Ishikuma et al., 1988
33	Japan	6-12	142	K-ABC	101	-	99	103	Kaufman et al., 1989
34	Japan	16	175	A, MR, M	113	110	-	-	Mann et al., 1990
35	Japan	9	444	SPM	110	109	121	-	Shigehisa & Lynn, 1991
36	Japan	5-7	454	CCAT	109	-	121	109	Takeuchi & Scott, 1992
37	Japan	6-12	451	MAT	105	105	-	-	Tamoaka et al., 1993
38	Japan	14-15	239	Various	103	-	100	-	Li et al., 1996
39	Japan	6-17	93	Gen Info	100	-	-	102	Chen et al., 1996
40	Japan	19	72	GMRT	102	-	-	-	Flaherty, 1997
41	Japan	7-11	60	DAM	102	-	105	-	Cox et al., 2001
42	Japan	17	1,119	Gen Info	105	-	-	-	Evans et al., 2002
43	Singapore	13	147	SPM	107	107	-	-	Lynn, 1977b

44	Singapore	15	459	APM	114	114	-	-	Lim, 1994
45	South Korea	2-12	440	KABC	113	110	106	120	Moon, 1988
46	South Korea	9	107	SPM/PMA	109	109	98	111	Lynn & Song, 1994
47	South Korea	4	56	Numerical	103	103	-	-	Ginsburg et al., 1997
48	South Korea	6-16	2,231	WISC-3	100	-	98	102	Georgas et al., 2003
49	Taiwan	6-8	1,865	CPM	102	102	-	-	Hsu, 1971
50	Taiwan	9-10	1,384	SPM	110	-	-	-	Hsu et al., 1973
51	Taiwan	6-7	43,825	CPM	105	-	-	-	Hsu, 1976
52	Taiwan	8-11	193	WRAT-A	107	-	107	-	Tarnopol & Tarnopol, 1980
53	Taiwan	6-11	480	Various	104	104	100	-	Stevenson et al., 1985
54	Taiwan	6-8	764	CPM	105	105	-	-	Rabinowitz et al., 1991
55	Taiwan	6-11	169	Gen Info.	100	-	100	-	Chen et al., 1996
56	Taiwan	9-12	2,476	CPM	105	105	-	-	Lynn, 1997
57	Taiwan	6-15	118	SPM	105	105	-	-	Lai et al., 2001
58	Taiwan	17	1,469	Gen Info	107	-	107	-	Evans et al., 2002

(Jensen, 1973, p.107), indicative of a high average intelligence level. In the NAEP (National Assessment of Educational Progress) math test of 8th grade students in 2003, Minnesota achieved the highest score of all the American states (National Center for Education Statistics, 2003). Flynn (1980, p. 107) has calculated that the mean IQ of whites in Minnesota is 105. This is accepted as the best estimate. Hence for a comparison with an American white IQ of 100, 5 IQ points need to be added to the samples from Japan and Taiwan, giving them an IQ of 105 consistent with the results of numerous other studies.

Row 28 gives a general (full scale) IQ of 103 derived from the Japanese standardization samples of the WISC-R, a verbal IQ of 100 based on the five verbal subtests, and a visualization IQ of 104 based on the block design subtest. Row 29 gives a general (full scale) IQ of 103 derived from the Japanese standardization sample of the WPPSI, a verbal IQ of 97 based on five verbal subtests, and a visualization IQ of 109 based on four performance subtests.

Row 30 gives IQs of 103 for reasoning, 103 for verbal, and 107 for visualization ability obtained from the administration of the Kyoto Test to a representative sample of British children; the three IQs have been averaged to give an IQ of 104 for general IQ. Row 31 gives IQs of 104 for reasoning and 114 for visualization ability obtained from the administration of the DAT to a sample of Japanese 13-15-year-olds. Row 32 gives a general IQ of 103, IQs of 102 for "sequential processing" (approximately equivalent to verbal ability), and 105 for "simultaneous processing" (approximately equivalent to visualization ability), calculated from the Japanese standardization sample of the McCarthy test. Row 33 gives an IQ of 103 derived from Kaufman et al.'s (1989) analyses of the Japanese WISC-R standardization sample for Kaufman's sequential and simultaneous factors. "Sequential processing" (an approximate measure of verbal ability) correlated 0.44 with the Wechsler verbal IQ, and "simultaneous

processing" (an approximate measure of visualization ability) correlated 0.73 with the Wechsler performance IQ. The two IQs are averaged to give a measure of g. In addition, the test contains a matrix analogies test similar to the Progressive Matrices, the results of which are entered in the table under reasoning. Row 34 gives an IQ of 113 for a sample of adolescents in school in Keio compared with 121 American students in school in Florida; the verbal IQ of 116 is calculated from a test of arithmetic and the visualization IQ of 110 from tests of mental rotation and mazes. Row 35 gives an IQ of 110 for a sample of 9-year-old children in Tokyo. Row 36 compares Japanese children in the city of Nagoya with Canadian norms on the Canadian Cognitive Abilities Test (CCAT). The mean Japanese reasoning IQ of 106 is typical of a number of other studies, but the Japanese verbal IQ of 121 is an unusually high figure for Japanese children. This study also found a quantitative IQ of 112 for Japanese children. The children's age range was 5 to 7 years and the advantage of the Japanese 5-year-olds was as great as that of the 6-7-year-olds. The 5-year-olds were at kindergarten. The high IQs obtained by Japanese 5-year-olds makes it improbable that the Japanese advantage can be an effect of more efficient schooling, as proposed by Stevenson et. al (1985). Row 37 compares Japanese children in the medium-sized city of Matsuyama with American norms on the Matrix Analogies Test and gives the Japanese children a mean IQ of 105.

Row 38 gives an IQ of 103 for reasoning and 109 for visualization obtained for 14-15-year-olds as averages of several tests in the mid-1990s. This result is part of the same study that found an IQ of 103 for children of the same age in China, suggesting that by the mid-1990s the IQs of Chinese and Japanese children were the same. Row 39 gives a verbal IQ of 100 derived from a general knowledge test given to 6- and 17-year-olds in the Japanese city of Sendai compared with the American city of Minneapolis. Because the mean IQ of whites in Minneapolis is estimated at 105, as explained in the comment on row 27, the Japanese mean has been raised by 5 IQ points. Row 40 gives a visualization IQ of 102 obtained by comparing a sample of Japanese high school and university students with a sample of 52 European students at University College, Dublin. Row 41 gives an IQ of 102 obtained for Japanese 7- and 11-year-olds compared with a matched sample of 60 British children. Row 42 gives a verbal IQ of 105 derived from a general knowledge test comparing Japanese 17-year-olds with Americans in Minneapolis; the Japanese mean has been raised by 5 IQ points for the reason given in the comment on row 38.

Rows 43 and 44 give results for Singapore. Row 43 gives an IQ of 107 for a sample of 13-year-olds. Row 44 gives an IQ of 114 for 15-year-olds obtained from the Advanced Progressive Matrices and is substantially higher, although it is not so high as the two last studies from Hong Kong.

Rows 45 through 48 give four results for South Korea. Row 45 gives an IQ of 113 derived from the standardization sample of the Kaufman K-ABC test, an exceptionally well-constructed and standardized American test. This study shows the typical East Asian pattern of high reasoning IQ (110) obtained from a matrix analogies test, high spatial IQ (120), and weaker verbal IQ (106). Row 46 gives an IQ of 109 and a similar pattern of lower verbal than visualization abilities. Row 47 gives an IQ of 103 for a socially representative sample of 4-year-olds at pre-school in the region of Busan compared with 156 American children. Row 48 gives an IQ of 100 based on the standardization sample of WISC-III.

Rows 49 through 59 give eleven results for Taiwan. Row 49 gives an IQ of 102 obtained from an early result in the 1950s. Rows 50, 51, and 52 give IQs of 102, 110, and 105 obtained by primary school children. Row 53 gives an IQ of 107 for a sample of children in Taipei for the arithmetic subtest of the WRAT. Row 54 gives an IQ of 104 obtained from a comparison of

Taiwanese children with an American sample in Minneapolis, where the mean IQ of whites is estimated at 105 (as explained in the comment on row 27) so the Taiwanese mean has been raised by 5 IQ points. Row 55 gives an IQ of 105 for 6-8-year-old primary school children in Taipei and country towns and villages. Row 56 gives an IQ of 100 for a general information or knowledge test given to samples from the United States (N=1,052) and Taipei in Taiwan. General knowledge is a component of verbal intelligence, as shown in numerous factor analyses of the Wechsler tests (see also Carroll, 1993), and the results are entered under verbal IQ. Rows 57 and 58 give IQs of 105 for non-verbal reasoning. Row 59 gives an IQ of 107 for a general knowledge test given to samples in the United States (N=1,052) and Taipei. The Taiwanese sample scored 2 IQ points higher than the American, but the American sample was taken from the city of Minneapolis where the mean IQ of whites is estimated at 105 (as explained in the comment on row 27) so the Taiwanese mean has been raised by 5 IQ points to 107. The median IQ of the eleven studies from Taiwan is 105.

Two conclusions can be drawn from the studies summarized in Table 10.1. The first is that all the East Asian IQs are a little higher than those of Europeans, except for the Chen et al. (1996) studies of general information in Japan and Taiwan, and the Georgas et al. (2003) result for South Korea, all of which give East Asians an IQ of 100. The range of IQs is between 100 and 122. The median IQ of the studies is 105 and should be taken as the best estimate of the IQs of indigenous East Asians. Second, eleven of the studies contain measures of verbal and visualization abilities and in ten of these the visualization IQ is greater than the verbal IQ (the study in row 36 is the exception). The mean and median differences between the two abilities are both 12 IQ points. This difference appears in a variety of tests. The finding of the stronger visualization abilities and weaker verbal abilities of East Asians as compared with Europeans is so consistently present and is so large that it appears to be a real phenomenon.

2. East Asians in the United States

East Asians have settled in a number of countries, including the United States, Canada, Europe, Brazil, and Malaysia. By far the greatest number of studies of the intelligence of East Asians outside East Asia have been made in the United States. These have been summarized and discussed by Vernon (1982) and Flynn (1991). Vernon concluded that American ethnic East Asians have a verbal IQ of 97 and an IQ of 110 on non-verbal and spatial tests (p. 28). His analysis is flawed on two accounts. First, there is no generally accepted meaning of "non-verbal" intelligence. This imprecise concept is unsatisfactory because it can include any ability that is not verbal, including abstract reasoning, visualization, spatial, and perceptual abilities. Second, Vernon took no account of the secular increase of test norms that have the effect that groups tested with a test normed at some earlier date have inflated IQs. Flynn's analysis is better in so far as he adjusts IQs for secular increases in norms, but he also analyzes intelligence in terms of verbal and "non-verbal" IQs and averages these to produce an "overall IQ." Flynn's (p. 65) conclusions are that American ethnic Chinese and Japanese have a verbal IQ of 95.3 and a "non-verbal IQ" of 99.6, and he averages these to give an "overall IQ" of 97.6. This is not a satisfactory analysis because "non-verbal IQ" is not accepted today as a meaningful concept. Furthermore, his use of the two concepts of verbal and non-verbal intelligence gives verbal ability the same weight as all other abilities in calculating general intelligence, and as East Asians are relatively weak this spuriously reduces their IQ. General intelligence or *g* is best measured either from a test of non-verbal reasoning or from the average of verbal, reasoning, and visualization abilities. Despite this conceptual weakness Flynn has performed a

useful literature review and analysis and in general I have adopted his estimates in the summary that follows.

There is a problem with the studies of ethnic East Asians in the United States and elsewhere, in that many of the samples have continued to speak Japanese, Chinese, or Korean as their first language and have consequently performed poorly on verbal tests in English. In many cases it is impossible to tell the extent of this handicap.

Studies of ethnic East Asians in the United States are summarized in Table 10.2. Row 1 gives an IQ of 97 for Chinese children in San Francisco. They were tested with the Binet, which is a largely verbal test, and this probably handicapped the children, a number of whom will have spoken English as a second language. Row 2 gives a non-verbal reasoning IQ of 99 and a word knowledge IQ of 95 for Chinese children in Hawaii. Row 3 gives an IQ of 101 for Chinese and Japanese obtained in the standardization sample of the Draw-a-Man test. Rows 4 and 5 give IQs of 100 and 103 for Chinese and Japanese in Hawaii tested with the Porteus Mazes. Rows 6, 7, and 8 give IQs of 99, 101, and 102 for non-verbal reasoning for ethnic Chinese, Japanese, and Koreans in Honolulu compared with whites in the same location. The Chinese, Japanese, and Koreans scored substantially lower than whites on verbal tests (89, 86, and 88). It is impossible to determine how far the low verbal IQs of the Chinese, Japanese, and Koreans were due to their speaking their own languages at home and consequently being handicapped on verbal tests in English, and how far they were due to the typical East Asian pattern of weaker verbal than reasoning abilities. Probably both factors were involved. Row 9 gives a verbal IQ of 96 for Japanese 18-year-olds interned during World War II calculated by Flynn (1991); 91 percent of the sample were second-generation immigrants and 8 percent third generation immigrants. As with the Honolulu study, it is uncertain what percentage of these would have spoken Japanese in the home as their first language and hence have been handicapped on verbal tests in English. Row 10 gives a verbal IQ of 97 and a visualization IQ of 106 for a sample of ethnic Chinese 6-year-olds in New York. It is not certain whether some of these children spoke Chinese at home and were therefore handicapped on the verbal test. It is assumed that half of them were, and hence the verbal IQ is given only half the weight of the visualization IQ to estimate the general intelligence of 103.

Row 11 gives IQs of 100 for reasoning and 97 for verbal ability for ethnic Chinese, Japanese, and Koreans from the nationwide Coleman study calculated by Flynn. The reasoning IQ is adopted as the figure for *g*. Row 12 gives a verbal IQ of 96 for ethnic Chinese and Japanese in Hawaii calculated by Flynn. Row 13 gives results for Japanese children in the island Kauai in the Hawaiian archipelago. The mean IQs were verbal, 107; spatial, 105; reasoning, 112; perception, 105; and number, 106. Flynn (1991) estimates that the norms of the test were obsolescent by 33 years and therefore that 10 points need to be deducted from the IQs. He arrives at a verbal IQ of 97 and a non-verbal IQ of 99 calculated as the average of the remaining four tests, and therefore a general overall IQ of 98. The results are unusual in showing a relatively low IQ of 95 for spatial (visualization) IQ. Row 14 gives an IQ of 99 and a verbal IQ of 95 for 17-year-olds in Los Angeles in 1969-1970 calculated by Flynn. Row 15 gives an IQ of 103 for ethnic Chinese in San Francisco matched for socio-economic status to whites, tested with a map understanding test described as a measure of spatial reasoning. In the same study blacks also matched with whites for socio-economic status obtained an IQ of 90.

Row 16 gives IQs of 101 for vocabulary and 102 for block design tests measured by the WISC in a nationwide survey and averaged to 101 for *g* (this study was missed by Flynn in his survey). Row 17 gives a non-verbal reasoning IQ of 98 and a verbal IQ of 99 derived from tests of information and English language obtained from a nationwide survey and calculated

by Flynn. The higher verbal than reasoning IQ is unusual and so contrary to the usual East Asian higher reasoning than verbal pattern that the result may be unreliable. Row 18 gives a WISC performance nonverbal IQ of 101 and a WISC verbal IQ of 91 for a small sample of 9-year-olds in San Francisco's Chinatown calculated by Flynn (1991). The children attended Chinese private schools and their low verbal IQ is probably attributable to many of the children speaking Chinese both at school and at home. The performance IQ is therefore adopted as the best measure of their general intelligence. Row 19 gives an IQ of 101 for a Chinese sample in California.

Row 20 gives an IQ of 99 from various studies collected by Sowell and synthesized by Flynn. The tests given are not identified and are entered as measures of *g*. Row 21 gives an IQ of 107 obtained from the test of mathematical skills for a large sample of Japanese adolescents in Hawaii compared with a sample of 3,722 Europeans also in Hawaii.

Row 22 gives an IQ of 101 for Chinese children in California, collected by Jensen in 1975 and analyzed by Flynn. Half the children were foreign born, coming mainly from Hong Kong, which probably accounts for their low verbal IQ of 89.

Row 23 gives results collected by Jensen from an affluent district in Berkeley, California, calculated by Flynn. Both the Chinese and Japanese and the white children scored high. The figures entered in the table are Flynn's estimates for the East Asian children scored against national norms. In relation to white children ($n=1506$) in the same district, the East Asian children obtained IQs of 98 for reasoning and 95 for verbal IQ. The sample is not representative or satisfactory. Row 24 gives results for a Californian Chinese sample. Row 25 gives an IQ of 103 for a small but nationally representative sample of adolescents. Row 26 gives an IQ of 104 for American Asians from the standardization sample of the Differential Ability Scale. The 1980 American census showed that approximately half of American Asians are East Asians, consisting of ethnic Chinese, Japanese, Koreans, and some Vietnamese. The remainder are mainly Filipinos, Vietnamese, Thais, Cambodians, and other Southeast Asians. Southeast Asians have IQs below Europeans, so the results shown in the table understate the intelligence of American East Asians. Row 27 gives an IQ of 109 for a small sample

Table 10.2. IQs of East Asians in the United States

	Location	Ethnicity	Age	N	Test	g	Reas	Verb	Vis	Reference
1	California	Chinese	6-12	97	Binet	97	-	-	-	Yeung, 1922
2	Hawaii	Chinese	9-13	513	Pintner	99	-	95	-	Symonds, 1924
3	National	NE Asian	6-8	67	DAM	101	-	-	-	Goodenough, 1926B
4	Hawaii	Mixed	12	408	PM	100	-	-	-	Porteus & Babcock, 1926
5	Hawaii	Mixed	7-12	770	PM	103	-	-	-	Porteus, 1930
6	Honolulu	Chinese	10-14	2,704	NV	99	99	-	-	Smith, 1942
7	Honolulu	Japanese	10-14	3,312	NV	101	101	-	-	Smith, 1942
8	Honolulu	Korean	10-14	509	NV	102	102	-	-	Smith, 1942
9	National	Japanese	18	669	OSUT	96	-	96	-	Portenier, 1947
10	New York	Chinese	6	80	Hunter	103	-	97	106	Lesser et al., 1965

11	National	NE Asian	6-17	4,994	Various	100	100	97	-	Coleman, 1966
12	Hawaii	NE Asian	16	554	SCAT	96	-	96	-	Stewart et al., 1967
13	Kauai	Japanese	9-10	253	PMA	98	102	97	95	Werner et al., 1968
14	Los Angeles	NE Asian	17	390	Various	99	99	95	-	Flaughter, 1971
15	California	Chinese	11-15	90	Maps	103	-	-	103	Feldman, 1971
16	National	NE Asian	6-11	32	WISC	101	-	101	102	United States, 1971
17	National	NE Asian	18	150	Various	98	98	99	-	Backman, 1972
18	California	Chinese	9	53	WISC	101	-	91	101	Yee & La Forge, 1974
19	California	Chinese	6-11	478	Various	101	-	-	-	Jensen & C Inouye, 1980
20	National	NE Asian	-	929	Various	99	-	-	-	Sowell, 1986
21	Hawaii	Japanese	16	4,024	STAS	107	-	-	-	Brandon et al., 1987
22	California	Chinese	6-11	254	Lorge-T	101	101	89	-	Flynn, 1991
23	California	NE Asian	10-12	234	Lorge-T	110	110	-	106	Flynn, 1991
24	California	Chinese	10	155	SPM	104	104	-	-	Jensen & Whang, 1994
25	National	E Asian	14-22	42	AFQT	103	-	-	-	Herrnstein & Murray, 1994
26	National	Asian	6-17	48	DAB	104	106	100	105	Lynn, 1996
27	National	E Asian	7	63	WISC	109	-	-	-	Rushton, 1997

of East Asians obtained from the National Collaborative Perinatal Project collected in approximately 1966.

The median IQ of the nine studies in the first half of the twentieth century is 101 and is a little lower than the median of 104 of the nine studies obtained from 1980 onwards, when it is almost exactly the same as the 105 of indigenous East Asians. There are three possible explanations for the increase in the intelligence of East Asians in the United States during the twentieth century. The first is that many of those in the early studies spoke Chinese or Japanese as their first language and would have been handicapped on tests in English. Second, there may have been a tendency for the East Asians who migrated to the United States to have been a little below the average intelligence of those who remained in East Asia. The Chinese and Japanese who emigrated to the United States in the second half of the nineteenth century were largely peasants who came to do unskilled work on the construction of the railways and other building work. This would probably not seem an attractive option for the more intelligent who would generally have been doing sufficiently well in their own countries. Once these early migrants had settled in the United States their children would have shown some regression upwards towards the East Asian mean of 105.

Third, five of the studies contain measures of verbal and visualization abilities and in four of these the visualization IQ is greater than the verbal IQ (the study in row 13 is the exception). The mean difference between the two abilities is 4.4 IQ points and is present in studies using

a variety of tests. This confirms the pattern found in the samples of indigenous East Asians given in Table 10.1.

3. Further Studies of East Asians outside Northeast Asia

Studies of the intelligence of East Asians in locations outside Northeast Asia and the United States are summarized in Table 10.3. Row 1 gives an IQ of 99 for ethnic Japanese in Brazil. Row 2 gives an IQ of 107 for Japanese children in London; the actual IQ of this sample was 115 but the children's parents were largely businessmen, diplomats, and professional people of various kinds, so the IQ will be inflated. There are typically about 15 IQ points between the top and bottom socio-economic classes (e.g. Nettle, 2003), so the IQ of average Japanese children should be about 107. Rows 3 and 4 give IQs of 104 and 95 for early studies of Japanese and Chinese in Vancouver. According to Vernon (1982), the Chinese immigrants were of poor peasant stock while the Japanese were from the skilled working class and middle class, and this explains why the Japanese performed better. Row

Table 10.3. Further Studies of East Asians outside Northeast Asia

	Location	Ethnicity	Age	N	Test	<i>g</i>	Reas	Verb	Vis	Reference
1	Brazil	Japanese	10	186	SPM	99	99	-	-	Fernandez, 2001
2	Britain	Japanese	9	42	GEFT	107	-	-	107	Bagley et al. ,1983
3	Canada	Japanese	6-12	274	Pintner	104	-	-	-	Sandiford & Kerr, 1926
4	Canada	Chinese	6-12	224	Pintner	95	-	-	-	Sandiford & Kerr, 1926
5	Canada	Chinese	6-8	40	WISC	101	-	97	105	Peters & Ellis, 1970
6	Canada	Chinese	6-8	85	WISC	101	-	99	103	Kline & Lee, 1972
7	Canada	Chinese	15	182	Various	103	105	97	106	Vernon, 1984
8	Malaysia	Chinese	7-12	1,459	SPM	99	99	-	-	Chaim,1994
9	Netherlands	Chinese	11	150	CITO	102	102	85	-	Pieke,1988

5 gives an IQ of 101 for a later study of Chinese in Vancouver. Rows 6 and 7 give results of two further studies of Chinese in Canada with IQs of 101 and 103. Row 8 gives an IQ of 99 for ethnic Chinese in Malaysia and is 10 IQ points higher than that of Malays (see Table 7.1). The reason the IQ of the ethnic Chinese in Malaysia is a little lower than that of other East Asians in East Asia may be that they are relatively recent immigrants recruited to do unskilled work and these immigrants may have been a little below the Chinese average. Row 9 gives a numerical reasoning IQ of 102 for the children of Chinese immigrants in the Netherlands. On verbal comprehension their IQ was 85, but since they spoke Chinese as their first language this cannot be regarded as valid. The median IQ of the nine studies is 101, exactly the same as that of East Asians in the United States.

Three conclusions can be drawn from the studies of East Asians summarized in Table 10.3. First, their average IQs are a little higher than those of Europeans in similar environments. In Brazil the IQ of 99 of ethnic Japanese is 4 IQ points higher than that of Europeans (see Table 3.2). The ancestors of these were recruited to work as agricultural laborers in the late nineteenth century and these immigrants may have been a little below the Japanese average. In addition, their IQ and the IQ of 95 of Europeans in Brazil (see Table 3.2) are both slightly depressed, probably partly because of the low living standards in Brazil (\$6,625 in 1998 as compared with \$20,336 in Britain). The median IQ of the four Canadian studies is 101. The median IQ of all the studies in the United States is 101. This is slightly higher than Flynn's estimate of 97.6, because Flynn omits the studies by Symonds (1924), Goodenough (1926b), Feldman (1971), United States (1971), and the four last studies published after his analysis. Thus, the IQ of East Asians in the United States is a little lower than the 105 of East Asians in their own native habitats in East Asia. There are four possible reasons for this.

The first is that those who migrated to the United States could have had slightly lower than average IQs than those who remained in Asia. This is possible because the East Asians in the United States and elsewhere outside East Asia are the descendants of immigrants who migrated to take unskilled laboring jobs and may well have been a little below the average intelligence of the populations from which they came.

The second is that many of the Chinese and Japanese spoke Chinese and Japanese as their first language and this would have handicapped their performance in some of the tests.

Third, it may take two generations for immigrants from impoverished countries to overcome the effects of poor nutrition and reach their full potential. The mean IQ of the last six studies in Table 10.2, published from 1990 onwards, is 105, the same as that of East Asians in East Asia.

Fourth, three of the studies contain measures of verbal and visualization abilities and in all of these the visualization IQ is greater than the verbal IQ. The mean difference between the two abilities is 7 IQ points. This confirms the low verbal-high visualization pattern of abilities found in East Asia and the United States. A further study finding this ability pattern has been reported by Rushton (1992a) in a sample of university students in Canada in which East Asian students had a mean verbal IQ of 112.8 and a mean performance (mainly visualization) IQ of 120.6, while European students had a mean verbal IQ of 117.7 and a mean performance (mainly visualization) IQ of 118.8.

4. East Asians Adopted by Europeans

There have been six studies of the intelligence of East Asian infants adopted by European families in Europe and the United States. These are summarized in Table 10.4. Rows 1 through 3 give IQs of Korean children reared by white American adoptive parents. The sample was divided into three groups consisting of those who had been severely undernourished as infants (Row 1), those who were poorly nourished (Row 2), and those who were well nourished (Row 3). The IQs of the three groups were related to their nutritional history. The severely undernourished group did not score significantly differently from American whites, but the other two groups scored higher. No details are given of the intelligence tests used to measure the IQs, which were obtained from school records and probably inflated by obsolete

norms. Row 4 gives a verbal IQ of 115 for 25 largely East Asians, consisting of 12 from Vietnam (largely ethnic Chinese), 10 from Korea, 3 from Cambodia, and 2 from Thailand.

Rows 5 and 6 give the results of similar studies in Europe. Row 5 gives an IQ of 110 for Korean children adopted as infants in Belgium and shows the usual higher visualization than verbal ability profile typically characteristic of East Asians. Row 6 gives an IQ of 108 for 36 Korean children who were adopted by Dutch families in the Netherlands.

The mean of the six studies is an IQ of 109 and if the two first studies of malnourished infants is excluded the mean is 111. One reason for this high figure is probably that these were young children adopted by largely middle class families. It is known from the Weinberg, Scarr, and Waldman (1992) study that middle class adoptive parents boost the IQs of their adopted children in early and middle childhood but the effect fades away in late adolescence and adulthood. In this study black infants adopted by white middle class parents obtained a mean IQ of 95 at age seven but this fell to 89 at age 17, indicating that being reared in white middle class families boosts the childhood IQ by 6 IQ points (Levin, 1994; Lynn, 1994c).

Table 10.4. IQs of East Asian children adopted by Europeans

	Location	Ethnicity	Age	N	Test	<i>g</i>	Reas	Verb	Vis	Reference
1	USA	Korean	6-14	37	Various	102	-	-	-	Winick et al., 1975
2	USA	Korean	6-14	38	Various	106	-	-	-	Winick et al., 1975
3	USA	Korean	6-14	37	Various	112	-	-	-	Winick et al., 1975
4	USA	Various	3-4	25	PPVT	115	-	115	-	Clark & Hamsee, 1982
5	Belgium	Korean	10	19	WISC	110	-	104	111	Frydman &c Lynn, 1989
6	Netherlands	Korean	7	36	RACIT	108	-	-	-	Stams et al., 2000

Applying this result to the IQ of 112 of adequately nourished adopted East Asian children suggests that by adulthood their IQ would have declined by 6 IQ points bringing it down to 106, virtually the same as that of East Asians in East Asia and of the most recent studies of East Asians in the United States.

The results for the adopted children in Belgium given in row 5 show once again the low verbal-high visualization ability pattern of East Asians present in East Asia, the United States, and elsewhere. This racial pattern has been found so consistently in such a variety of locations that it appears to be a genetic difference.

5. East Asian-European Hybrids

In Chapter 4 we saw considerable evidence that the intelligence of African-European hybrids is intermediate between that of Africans and Europeans. It might be expected that the intelligence of East Asian-European hybrids would likewise be intermediate between that of the two parent races. The only study on this issue is that of Rushton (1997) in an analysis of the data

of the American National Collaborative Perinatal Project. This consists of a study of 53,043 infants for whom information of various kinds was collected at birth, in infancy, and at the age of seven years when data were collected for IQ measured by the WISC and head circumference. The IQs and brain size of East Asians, East Asian-European hybrids (of the 37 cases, 5 were black but these were not disaggregated), Europeans, and African Americans at age 7 are shown in Table 10.5. Row 1 gives the numbers of children. Row 2 gives the mean IQs as reported. Row 3 gives the IQs adjusted for the secular increase of test norms from 1949, the year of the standardization of the WISC, to 1966, the median year of the collection of the data and requiring the deduction of 5 IQ points from the reported IQs. Row 4 gives the brain size in cubic centimeters estimated from head circumference. Notice that for all three measures, the East Asian-European hybrids fall intermediate between the East Asians and the Europeans. The fact that they fall closer to the Europeans is explicable because 5 of the cases were East Asian-African hybrids.

Table 10.5. IQs and brain size (cc) of East Asian-European hybrids

	East Asian	Hybrid	European	African
1 Number	63	37	17,432	19,419
2 IQ-Raw	114	103	102	90
3 IQ-Adjusted	109	98	97	85
4 Brain size	1,170	1,155	1,150	1,134

6. Reaction Times

Reaction times consist of the speed of reaction to a simple stimulus such as the onset of a light. Many studies have shown that reaction times are positively related to intelligence at a magnitude of around 0.2 to 0.3 (see Jensen, 1998, and Deary, 2000) and it has been argued by Jensen (1998) that reaction times are a measure of the neurological efficiency of the brain in processing information. We saw in Chapter 4 that Africans have slower reaction times than Europeans consistent with their lower IQ. We consider now whether East Asians have faster reaction times than Europeans consistent with their higher IQs.

Three studies of this issue are summarized in Table 10.6. In all three studies the reaction times (RT) shown are the average of three reaction time tasks consisting of simple reaction times (the speed of reaction to the onset of a single light), choice reaction times (the response to one of eight lights), and odd man reaction times (three lights appear in an array and the correct response is to switch off the one furthest from the other two). Row 1 compares Japanese and British 9-year-olds. The IQ of the Japanese children was 110 or 0.66*d* higher than that of the British children, while their reaction times were 0.50*d* higher than those of British children. Row 2 gives results for a similarly designed study comparing Chinese children in Hong Kong with white British children. The IQ of the Chinese children was 122 or 1.33*d* higher than that of the British children, while their reaction times were 0.96*d* higher than those of British children. Row 3 gives results for a further study of ethnic Chinese children in California compared with 77 European children. The Chinese scored 6 IQ points or 0.40*d* higher than the white children on intelligence and 0.25*d* higher on the average of the three reaction time tests. The results of all three studies show that the magnitude of the advantage of East Asian chil-

dren in reaction times representing the neurological efficiency of the brain in simple information processing is about two thirds of their advantage in intelligence. These studies also reported differences in reaction time variability and in movement times and these were of approximately the same magnitude as those of the reaction times. Jensen (1998) provides a more detailed description and discussion of these studies. Geary et al. (1997) have also reported faster reaction times and higher IQs in Chinese as compared with American children, but they do not give standard deviations so the difference cannot be expressed as a *d*.

Table 10.6. Differences between East Asians and Europeans in reaction times

	Sample	N	Age	IQ	<i>IQd</i>	RTJ	Reference
1	Japanese	444	9	110	0.66	0.50	Lynn & Shigehisa, 1991
2	Chinese	479	9	122	1.33	0.96	Chan et al., 1991
3	Chinese	155	11	106	0.40	0.25	Jensen & Whang, 1993

7. Visual Memory

Visual memory is not normally tested in intelligence tests. There have been four studies of the visual memory of the Japanese, the results of which are summarized in Table 10.7. Row 1 gives a Japanese IQ of 107 for 5-10-year-olds on the MFFT calculated from error scores compared with an American sample numbering 2,676. The MFFT consists of the presentation of drawings of a series of objects, e.g., a boat, hen, etc. that have to be matched to an identical drawing among several that are closely similar. The task entails the memorization of the details of the drawings in order to find the perfect match. Performance on the task correlates 0.38 with the performance scale of the WISC (Plomin and Buss, 1973), so that it is a weak test of visualization ability and general intelligence as well as a test of visual memory. Row 2 gives a visual memory IQ of 105 for ethnic Japanese Americans compared with American Europeans on two tests of visual memory consisting of the presentation of 20 objects for 25 seconds and then removed, and the task was to remember and rearrange their positions. Row 3 shows a visual memory IQ of 110 obtained by comparing a sample of Japanese high school and university students with a sample of 52 European students at University College, Dublin. Row 4 shows a visual memory IQ of 113 for the visual reproduction subtests of the Wechsler Memory Scale-Revised obtained from the Japanese standardization of the test compared with the American standardization sample. The test involves the drawing from memory of geometric designs presented for 10 seconds. The authors suggest that the explanation for the Japanese superiority may be that Japanese children learn kanji, the Japanese ideographic script, and this develops visual memory capacity. However, this hypothesis was apparently disproved by the Flaherty and Connolly study (1996) whose results are shown in row 2. Some of the ethnic Japanese American participants had a knowledge of kanji, while others did not, and there was no difference in visual memory between those who knew and those who did not know kanji, disproving the theory that the advantage of East Asians on visualization tasks arises from their practice on visualizing ideographic scripts.

Table 10.7. Differences between East Asians and Europeans in visual memory

	N	Age	Test	IQ	Reference
1	760	5-10	MFFT	107	Saikind et al., 1978
2	48	23	Vis. Mem	105	Flaherty & Connolly, 1996
3	72	19	Vis. Mem	110	Flaherty, 1997
4	316	16-74	Vis. Repr.	113	Sugishita & Omura, 2001

8. Brain Size

Studies of differences in brain size between East Asians and Europeans are summarized in Table 10.8. The means and standard deviations are for brain volume in cubic centimeters. Row 1 gives the results calculated by Gould (1981) from the collection of skulls assembled in the early nineteenth century by the American physician Samuel Morton (1849), who categorized them by race and calculated their average cranial capacities. Gould accused Morton of mistakes and re-measured the skulls, proving to his own satisfaction that the East Asians and Europeans had the same brain size. However, the number of skulls was very low, consisting of 10 East Asians and 52 Europeans, and is so few that little weight can be attached to it. They are given here largely for historical interest. Row 2 gives results from the largest collection of skulls ever collected, numbering approximately 20,000, and shows that the East Asians had a larger brain size than the Europeans by *1.2d* (standard deviation units). Row 3 gives a difference of 20cc from a study of American 7-year-old children carried out by Broman, Nichols, Shaughnessy, and Kennedy (1987). The brain sizes have been calculated from their data by Rushton (1997). Row 4 gives the results of data assembled by Jurgens, Aune, and Pieper (1990) for many thousands of 25-45-year-olds. The figures in the table have been adjusted for body size by Rushton (2000). Row 5 gives the results of a data set assembled by Groves (1991) by combining estimates of cranial capacities of 36 samples of males from figures given by Coon, Molnar, and Martin, and Sailer. The brain sizes are larger than in row 2 because they are for men but the European-Northeast Asian difference is similar, although slightly larger. Row 6 gives Rushton's results for brain size adjusted for body size for 6,325 United States military personnel. Row 7 gives Rushton's summary of a large number of data sets for brain size adjusted for body size. Thus, all the studies except Morton's, revised by Gould shown in row 1, have found that the East Asians have larger average brain size than Europeans.

Table 10.8. Brain size (cc) differences of Europeans and East Asians

	Europeans	East Asians	Difference	Reference
1	1,426	1,426	0	Gould, 1981
2	1,369	1,416	53	Smith & Seals, 1990
3	1,150	1,170	20	Broman et al. 1987
4	1,297	1,308	11	Jurgens et al., 1990

5	1,467	1,531	64	Groves, 1991
6	1,361	1,403	44	Rushton, 1992
7	1,347	1,364	17	Rushton, 2000

9. *Heritability of Intelligence in East Asians*

Only one study has been published on the heritability of intelligence in East Asians (Lynn and Hattori, 1990). This reports correlations of 543 identical and 134 non-identical twin pairs aged 12 years for a composite of 23 tests. The correlation was 0.782 for the identical twins and 0.491 for the non-identical twins. The heritability is obtained by doubling the difference between the two correlations and is 0.582. Corrected for test reliability and assuming a reliability coefficient of 0.9 (Bouchard, 1993), the heritability becomes 0.65. This is about the same as the heritability for Europeans at this age, as shown in Chapter 3, Section 4, and it can be reasonably assumed that the heritability of intelligence in Europeans and East Asians is approximately the same.

10. *Environmental and Genetic Explanations of the East Asian IQ*

The consistently high IQs obtained by East Asians in their indigenous habitats in East Asia and in Europe and the Americas have presented a problem for environmentalists. These have found it relatively easy to explain the low IQs of Africans that they could ascribe to poverty, poor education, test bias, and racism. None of these can explain the lower IQ of Europeans compared with East Asians. Environmentalists have adopted three strategies to deal with this problem. The first is to ignore it. This is the solution adopted in most general textbooks and in specialist books on race and intelligence by Fish (2002), Gould (1996), and Montagu (1999). The second strategy is to dispute or belittle it. Thus, shortly after the first study of the high IQ of the Japanese on the WISC-R was published, Stevenson and Azuma (1983) contended that the Japanese standardization sample under-represented lower IQ groups. Later, as more studies were published confirming the high IQ of the Japanese, it was no longer possible to dispute it, so environmentalists contended that the difference was only small. Thus, Brody (2000, p. 219) writes of the studies finding that intelligence in Japan is higher than in the United States, "there is little or no evidence that there are large differences in IQ between these groups." He does not specify what he means by large. In similar vein, Mackintosh (1998, p. 168) writes "there is no good reason to believe that Chinese or Japanese seriously outscore whites on intelligence tests." He does not specify what he means by seriously. The third strategy adopted by environmentalists is to contend that even if it is conceded that East Asians have higher IQs than Europeans "there is no evidence to decide whether such differences are environmental or genetic in origin" (Mackintosh, 1998, p. 168).

Contrary to this contention, the studies summarized in this chapter point to a strong genetic determination of the higher IQ of East Asians as compared with Europeans.

First, there is the consistency of the higher IQs of the East Asians than those of the Europeans in so many different locations, including China, Japan, Hong Kong, Singapore, South Korea, and Hong Kong (summarized in Table 10.1).

Second, the high IQs obtained by East Asians in their native lands are in general confirmed by studies of East Asians outside East Asia summarized in Table 10.2. In the United States, the median IQ of East Asians derived from all the studies is 101, a little lower than the 105 of indigenous East Asians in East Asia. There are two possible reasons for this. The first is that those who migrated to the United States could have had slightly lower than average IQs than those who remained in Asia. The second is that the first and second generations of immigrants generally continue to speak their own languages and English as a second language. This may handicap them in language tests. The mean IQ of the last six studies in Table 10.2 published from 1990 onwards is 105, the same as that of East Asians in East Asia.

In Table 10.3 we see that East Asians consistently obtain slightly higher average IQs than Europeans in similar environments. In Brazil, the IQ of 99 of ethnic Japanese is 4 IQ points higher than that of Europeans (see Table 3.2), although the Japanese were brought in to work as agricultural laborers after the abolition of slavery in 1888 and are unlikely to have had higher IQs than the general population in Japan. In Britain, East Asians obtained an IQ of 107, and in the Netherlands an IQ of 102. In Malaysia, they obtain an IQ of 99, 10 IQ points higher than that of the indigenous Malays.

Third, environmentalists do not offer any explanation for the consistently high IQ of East Asians, and it is doubtful whether any credible environmental explanation can be found. Intelligence is affected by living standards, but the living standards of a number of East Asians have been lower than those of Europeans. The East Asians of Japan, Hong Kong, and Singapore enjoy comparable living standards to those of Europeans in northern and western Europe, the United States, Canada, Australia, and New Zealand, but the living standards of those in China, South Korea, and Taiwan have been much lower, yet their IQs are about 5 IQ points higher than those of Europeans. The difference is consistently present and there is no plausible environmental explanation for the East Asian superiority.

Fourth, the six studies of the intelligence of Korean infants adopted by European families in Europe and the United States summarized in Table 10.4 all show that these children have higher IQs than those of the Europeans in whose environment they have been reared. It seems improbable that these infants given up for adoption were a selective sample with higher than average IQs. It should however be noted that these children were quite young and would probably have been adopted largely by middle class families that would have given them some environmental advantage. Just how large this effect is likely to have been is difficult to assess, but it is unlikely that it can have been as much as the 11 IQ point advantage of the four adequately nourished samples of adopted East Asians. In the Weinberg, Scarr, and Waldman (1992) study summarized in Section 13 of Chapter 4, it was shown that black infants adopted by white middle class families obtained an IQ of 95 at age 7 and of 89 at age 17, suggesting that the environmental advantage for the 7-year-olds was 6 IQ points. Applying the same rule of thumb to the adopted East Asian children, the mean IQ of the adequately nourished samples of 111 should be reduced by 6 IQ points to give a true IQ of 105, precisely the same as that of indigenous East Asians.

Fifth, the faster reaction times of East Asian children shown in Table 10.6 indicate that they have a more efficient neurological processing system that makes a significant contribution to their higher IQs, and again this superiority in reaction times cannot be plausibly explained environmentally.

Chapter 11. Arctic Peoples

1. Intelligence of Arctic Peoples
2. Visual Memory
3. Brain Size
4. Genotypic Intelligence of Arctic Peoples

The arctic peoples are the indigenous Inuit (formerly known as Eskimos) of Alaska, the north coast of Canada, and Greenland, the Aleuts of the Aleutian Islands, and the North Turkic and Chukchi peoples of the far northeast of Asia. They are identified as a distinctive genetic "cluster" by Cavalli-Sforza, Menozzi, and Piazza (1994) in their classification of peoples based on a number of genetic markers. The Arctic Peoples differ genetically from the Amerindians in having an appreciable percentage of the B blood group, which is absent in the Amerindians. They differ from the Amerindians and from the East Asians in that they are more highly cold adapted, with shorter legs and arms and a thick trunk to conserve heat, a more pronounced epicanthic eye-fold, and a nose well flattened into the face to reduce the risk of frostbite. The reason the Arctic Peoples have evolved into a distinctive race is that their ancestors were isolated from the East Asians by the Chersky mountain range in northeast Asia. The Inuit split off from the Chukchi people of northwest Russia when they migrated across the Bering Straits into North America about BC 11-10,000. Several of their prehistoric sites have been found in the Nenana river valley in Central Alaska, where their artefacts have been dated at between 11,300 to 10,000 years ago (Dixon, 1999). In the mid-twentieth century there were approximately 50,000 Inuit and approximately 5,600 Aleutians, 1

Intelligence of Arctic Peoples

Studies of the intelligence of Arctic Peoples are summarized in Table 11.1. Row 1 gives an IQ of 89 for the first study of a large sample of Inuit children tested with the Goodenough Draw-A-Man (DAM) Test. Row 2 gives an IQ of 92 for a sample of Aleutian children also tested with the DAM by the same author. This is the only study of the intelligence of Aleutian children. All the other studies are of Inuit. Rows 3 and 4 give results of a study of the IQs of representative samples of primary and secondary Inuit school children in the Yukon and Northwest Territories of Canada tested in 1962. The primary school children obtained an IQ of 94 and the secondary school children an IQ of 84. Row 5 gives the lowest IQ of the series of 78 for a sample of young adults and is so much out of line with the other results that it should be regarded as spurious. Row 6 gives Inuit adults a visualization IQ of 93. Row 7 gives an IQ of 91 for 10-year-olds. Row 8 gives an IQ of 90 obtained by Vernon from tests of matrices, vocabulary, and Koh's Blocks. The low IQ of 80 for vocabulary may be spuriously low because the children may have spoken their native language at home. The IQ of 90 for reasoning has been entered as the most reasonable figure for general intelligence. In this study Vernon also gave the DAM test, on which the Inuit children obtained an IQ of 95. This is broadly consistent with the results in Rows 1 and 2, in which Arctic children obtained DAM IQs of 89 and 92.

Row 9 gives an IQ of 91 for a substantial sample of 6-12-year-olds obtained from the performance scale of the WISC; these children obtained much lower verbal IQs but they did not speak English as their first language and their low verbal IQs cannot be regarded as valid. Row 10 gives a reasoning IQ of 96 for a sample of 9-12-year-olds. Row 11 gives verbal and performance IQs of 78 and 93 respectively for a small sample of 7-year-olds tested with the

WPPSI. The children spoke English as a second language, so the verbal IQ is spuriously low and the performance IQ of 93 is entered as the best measure of general intelligence. Row 12 gives a reasoning IQ of 95 for a sample of 7-10-year-olds. Row 13 gives an IQ of 91 for a substantial sample of 7-14-year-olds obtained from the performance scale of the WISC-R. The verbal scale was not given because the children did not speak English as their first language. Row 14 gives an IQ of 92 for Inuit 5-year-olds living in Arctic Quebec. The authors claim that the Inuit children scored higher than Americans, but this is because American norms are depressed by the inclusion of ethnic minorities and because they made no allowance for the secular increase of scores (the children were also given repeated testing at the ages of 6 and 7 in which they made gains attributable to practice effects). Row 15 gives a non-verbal reasoning IQ of 86 and a vocabulary IQ of 77 for Inuit 15-year-olds in Alaska.

Table 11.1. IQs of Arctic Peoples

	Age	N	Test	<i>g</i>	Reas	Verb	Vis	Reference
1	6-11	469	DAM	89	-	-	-	Eells, 1933
2	6-11	105	DAM	92	-	-	-	Eells, 1933
3	6-9	174	CPM	94	94	-	-	MacArthur, 1965
4	10-15	326	SPM	84	84	-	-	MacArthur, 1965
5	25	122	CPM	78	78	-	-	Berry, 1966
6	Adults	186	CPMT	93	-	-	93	Kunce et al., 1967
7	10	87	SPM	91	91	-	-	MacArthur, 1967
8	11	50	MVK	90	90	80	88	Vernon, 1969
9	6-12	380	WISC	91	-	-	91	Kaplan et al., 1973
10	9-12	69	CPM	96	96	-	-	Taylor & Skanes, 1976a
11	7	22	WPPSI	93	-	78	93	Taylor & Skanes, 1976b
12	7-10	63	CPM	95	95	-	-	Taylor & Skanes, 1977
13	7-14	366	WISC-R	91	-	-	91	Wilgosh et al, 1986
14	5	110	CPM	92	92	-	-	Wright et al., 1996
15	15	261	CCF/MH	86	86	77	-	Grigorenko et al., 2004

The median IQ of the studies is 91 and is proposed as the best estimate of the intelligence of the Arctic Peoples. The visualization IQs are somewhat higher than the verbal IQs as shown in Vernon's sample given in row 8, where the visualization IQ is 88 and the verbal IQ 80, and again in the Taylor & Skanes study given in row 11, where the visualization IQ is 93 and the verbal IQ 78. Averaging the two results gives a visualization IQ 11 points higher than the verbal IQ. This high visualization-low verbal pattern is also present in the related East Asian and Amerindian Peoples. It appears that there has been no tendency for the intelligence of Inuit to improve over the period of approximately 60 years from the early 1930s, when the first study by Eells (1933) found an IQ of 89, to the last study in the early 1990s, when Wilgosh et al. (1986) found an IQ of 91.

2. Visual Memory

The Inuit have an unusually strong visual memory ability that is not measured in standard intelligence tests. This was shown by Kleinfeld (1971) in a study of the visual memory of 125 Inuit village children in Alaska aged 9-16 compared with 501 white children in Anchorage and Fairbanks, the two principal towns in Alaska. The test consisted of the presentation of drawings for a brief period of time, after which the children were given the task of drawing them from memory. The Inuit children obtained a mean IQ of 106 in relation to a white mean of 100. Kleinfeld (p. 133) observes that this test result is consistent with the observations of travelers who have accompanied Inuit on long hunting expeditions. She writes that "Caucasians who have traveled with Inuit frequently remark on their extraordinary ability to travel through what seems to be a featureless terrain by closely observing the smallest landmarks and memorizing their spatial locations."

The strong visual memory of Inuit may explain why they are relatively good at spelling. In Vernon's (1969) study he found that Inuit 10-year-olds had a spelling IQ of 95, considerably higher than their verbal IQ of 80, of which spelling is generally considered a component (Carroll, 1993). Good visual memory helps spelling because it makes it possible to recall the shapes of words. This is probably why females are much better at spelling than males (Lynn, 1992): they have better visual memories (Halpern, 2000; Kimura, 2002).

It is likely that the strong visual memory of Inuit has a genetic basis. It has been found by Osborne and Gregor (1966) that visual memory has a high heritability. Even 9-year-old Inuit children had significantly better visual memory than Europeans, and it seems unlikely that children of this young age would have acquired this strong ability through training, even if this is possible. The most probable explanation for the strong visual memory of Inuit children is that this ability developed genetically through natural selection because of the need for Arctic Peoples to remember fine details of the landscape in order to find their way home after going out on long hunting expeditions. The landscape of the frozen tundra provides few distinctive cues, so hunters would need to note and remember such few features as do exist. The strong visual memory of the Inuit is also present in the East Asians (IQ 107) (Chapter 10, Section 7) and Native Americans, for whom Lombardi (1970) found an IQ of 104, very close to the IQ of 106 found by Kleinfeld for Inuit. Possibly the ancestral population of northeast Asia evolved strong visual memory before they diverged into the East Asians, Native Americans, and Arctic Peoples. The strong visual memory of the Inuit has a parallel with that in the Australian Aborigines reported by Kearins (1981) and explained as an adaptation to living in deserts with few landmarks and similar in this regard to the frozen tundra of the Arctic (see Chapter 8).

3. Brain Size

It has only proved possible to find one study of the brain size of Arctic Peoples. Smith and Beals (1990) give brain sizes for ten populations of which the mean is 1,444cc. They give a brain size for Europeans of 1,368cc. The difference of 76cc is substantial. Brain size is associated with intelligence among individuals and the same association would be expected to hold between groups. The larger brain size of the Arctic Peoples leads to the expectation that they would have higher IQs than Europeans, yet this is not the case.

There are two probable explanations for this anomaly. First, some of the large brain size of the Arctic Peoples is likely devoted to their strong visual memory found by Kleinfeld (1971) and summarized in Section 2. Second, brain size is not the sole determinant of intelligence. Some neurophysiological processes for higher intelligence may have evolved in the Europeans as a result of genetic mutations but failed to appear in the Arctic Peoples. The reason for this is probably that the Europeans were much more numerous so that the chances of favorable mutations for greater intelligence were greater.

4. *Genotypic Intelligence*

It seems probable that both genetic and environmental factors contribute to the low IQ of the Arctic Peoples. There are two lines of evidence suggesting some genetic determination. First, as noted in Section 1, the IQ of the Arctic Peoples has not shown any increase relative to that of Europeans since the early 1930s, although their environment has improved in so far as in the second half of the twentieth century they received improved welfare payments and education. If the intelligence of the Arctic Peoples had been impaired by adverse environmental conditions in the 1930s it should have increased by the early 1980s. Second, in all the studies summarized in Table 11.1 the Arctic children were at school and thus familiar with test taking procedures, so there is no reason to suppose that they were handicapped in this regard.

Chapter 12. Native Americans

1. Intelligence of Native Americans in North America
2. IQs Assessed by the Draw-a-Man Test
3. Latin America
4. Visual Memory
5. Native American Hybrids
6. Musical Ability
7. Brain Size
8. Hispanics
9. Genotypic Intelligence of Native Americans

The native americans, also known as American Indians, are the original indigenous peoples of the Americas whose ancestors migrated from the far northeast of Asia across the Bering Straits into present-day Alaska. They are one of the major races in the taxonomies of the classical anthropologists Linnaeus (1758), Blumenbach (1776), and Coon, Garn, and Birdsell (1950). Cavalli-Sforza, Menozzi, and Piazza (1994) have confirmed that the Native Americans form a distinctive genetic "cluster" that differentiates them from other peoples. The most distinctive features of Native Americans that distinguish them from East Asians are their darker and sometimes reddish skin, hooked or straight nose, and lack of the complete East Asian epicanthic eye-fold, although the inner eye-fold is sometimes present. In the United States there were about two million Native Americans enumerated in the 1990 census. About half of these lived on or near reservations. In Central and South America at the end of the twentieth century there were around 70 million Native Americans and around 140 million Mestizos, with mixed Native American and European ancestry.

1. Intelligence of Native Americans in North America

The intelligence of the Native Americans in the United States began to be studied in the 1920s and from the 1960s similar studies began to be published for Native Americans in Canada. The studies are summarized in Table 12.1. Row 1 gives an IQ of 86 from the first study of the intelligence of Native Americans in the United States published as early as 1922. Row 9 gives a non-verbal reasoning IQ of 91 obtained by 8-17-year-olds in the Coleman study, the largest study ever published of the ability of Native American school students. Their verbal IQ was a little lower at 87.

The median of the 21 studies is an IQ of 86. The Native Americans obtained higher visualization than verbal abilities in all of the six studies in which tests of the two abilities were given. The median visualization IQ in these studies is 89.5 and the median verbal IQ for the studies is 81. The same strong visualization-weak verbal profile of abilities is present among East Asians (see Chapter 10, Section 1) to whom the Native Americans are genetically closely related.

2. IQs Assessed by the Draw-a-Man Test

There have been several studies of the intelligence of Native Americans tested with the Goodenough Draw-a-Man Test (DAM). Because this is a non-verbal test and hence avoids the problem that some of the Native American samples did not speak English as their first language, it is useful to consider these separately. The DAM was devised by Florence Goodenough (1926a and 1926b) and involves the drawing of a man and a woman. The drawings are scored for the presence of detail such as ears, eyebrows, etc. The DAM correlates with other established intelligence tests at a magnitude of around 0.40 to 0.60. For instance, Abell, Wood, and Liebman (2001) report correlations on studies of 100 children of the DAM with the WISC-R and WISC-III of 0.46 and 0.35 for verbal IQ, 0.57 and 0.48 for performance IQ, and 0.54 and 0.45 for full-scale IQ. In a study in which the DAM was given to a sample of 217 10-year-olds together with a number of other tests of vocabulary, reasoning, spatial, and perceptual abilities, the DAM loaded 0.48 on the first principal component compared with loadings in the range of 0.58 to 0.70 for the other cognitive tests (Lynn, Wilson, and Gault, 1989). Thus, the DAM is an adequate although not a strong measure of *g* and appears to be more a measure of visualization than of verbal ability. The reason for this is probably that the child has to visualize the human body before drawing it. The results of the studies of the IQs of

Table 12.1. IQs of Native Americans in North America

	Location	Age	N	Test	<i>g</i>	Reas	Verb	Vis	Reference
1	USA	6-11	715	Otis	86	-	-	-	Hunter & Sommermier, 1922
2	USA	9-13	1,102	National	69	-	-	-	Garth, 1925
3	USA	5-9	961	Pinter/Nat	85	-	-	-	Haught, 1934

4	USA	9-14	1,000	Otis	70	-	-	-	Garth and Smith, 1937
5	USA	6-11	323	McArthur	88	-	-	-	Havighurst et al., 1944
6	USA	6-13	205	CPM	93	93	-	-	Turner & Penfold, 1952
7	USA	16-17	100	WAIS	86	-	82	91	Howell et al., 1958
8	USA	6-15	281	SPM	85	85	-	-	West & MacArthur, 1964
9	USA	8-17	4,994	-	91	91	87	-	Coleman, 1966
10	Canada	6-14	124	CF	76	-	-	-	Gaddesetal., 1968
11	Canada	12-14	137	SPM	94	94	-	-	Bowd, 1973
12	Canada	5-11	111	CPM	92	92	-	-	Cropley & Cardey, 1975
13	USA	6-20	160	WISC	90	-	70	90	St. John et al., 1976
14	Canada	6-13	177	WISC-R	82	-	80	85	Seyfort et al., 1980
15	USA	6-13	177	WISC-R	87	-	-	87	Teeter et al. ,1982
16	USA	6-12	236	WISC-R	94	-	88	100	McShane & Plas, 1984
17	USA	6-16	200	WISC-R	93	-	-	93	Browne, 1984
18	USA	13-15	124	SPM	87	87	-	-	Sidles ScMacAvoy, 1987
19	USA	6-16	1,129	SPM	93	93	-	-	Raven & Court, 1989
20	USA	6-16	240	WISC-R	86	-	73	86	Reynolds et al., 1999
21	USA	6-15	691	WISC-R	80	-	83	89	Beiser & Gotowiec, 2000

Native Americans in North America on the DAM are summarized in Table 12.2. The median IQ is 90. This is almost the same as the median visualization IQ of 89.5 for the studies summarized in Table 12.1 and is consistent with the interpretation of the DAM as predominantly a measure of visualization ability.

Table 12.2. IQs of Native Americans on the Draw-a-Man test

	Location	Age	N	IQ	Reference
1	California	6-8	79	86	Goodenough, 1926B
2	N. Dakota	5-11	225	88	Telford, 1932
3	Alaska	6-11	58	91	Eells, 1933
4	Oklahoma	6-8	125	99	Rohrer, 1942
5	N. Mexico	6-8	96	90	Norman & Midkiff, 1955
6	Vancouver	6-14	124	88	Gaddes et al., 1968
7	Canada	11	50	88	Vernon, 1969
8	Canada	5-11	111	99	Cropley & Cardey, 1975

3. Latin America

Studies of the intelligence of Native Americans in Latin America are summarized in Table 12.3. Row 1 gives an IQ of 84 obtained on a test of quantitative reasoning for 4-year-old children in Colombia described as "approximately equally divided among SES groups" (p. 172). These were compared with 156 American children described as representative of the United States. The population of Colombia is 75 percent Native American and Mestizo, 20 percent European, and 5 percent African. It is reasonable to assume that the higher IQ of the Europeans and the lower IQ of the Africans will approximately balance out and that the IQ of 84 represents the intelligence of the Native Americans. Rows 2 through 5 give four IQs for Ecuador (89, 88, 80, and 91). The IQ of 91 given in row 5 is for 8-year-old Quechua children in two villages, some of whom were pure Native American and others were of mixed racial identity. Row 6 gives an IQ of 79 for Guatemala. Rows 7 through 9 give three IQs for Mexico (87, 92, 83), the last of which is for Native Americans in Baja California. Rows 10 and 11 give IQs of 87 and 85 for Native Americans in Peru.

Table 12.3. IQs of Native Americans in Latin America

	Location	Age	N	Test	<i>g</i>	Reference
1	Colombia	4	120	QR	84	Ginsburg et al., 1997
2	Ecuador	6-7	48	DAM	89	Dodge, 1969
3	Ecuador	17	120	WISC-R	88	Fierro-Benitez et al., 1989
4	Ecuador	5-17	104	MAT	80	Proctor et al., 2000
5	Ecuador	8	41	CPM	91	Counter et al., 1998
6	Guatemala	6-12	256	DAM	79	Johnson et al., 1967
7	Mexico	6-13	520	DAM	87	Modiano, 1962
8	Mexico	6-12	197	DAM	92	Laosa et al., 1974
9	Mexico	7-11	194	SPM	83	Lynn et al., 2005
10	Peru	8-11	4,382	CPM	87	Raven et al., 1995
11	Peru	6-7	300	WISC	85	Llanos, 1974

The IQs lie in the range of 79 to 92 and are reasonably consistent, considering the range of countries from which the samples have been drawn. The median IQ of the studies is 86 and is the same as that of Native Americans in North America derived from the studies set out in Table 12.1. The best estimate of the IQ of Native Americans in both North and South America is therefore 86.

4. Visual Memory

Visual memory is an ability not generally assessed in intelligence tests. There is some evidence that Native Americans are strong on this ability. A study by Lombardi (1970) compared 80 Native American with 80 white 6-8-year-olds tested with the Illinois Test of Psycholinguistic Abilities and found that the Native Americans obtained a verbal IQ of 73 and a visualization IQ of 93. The visualization IQ is constructed as the sum of six subtests of visualiza-

tion abilities of which one is visual memory, and on this the Native Americans obtained an IQ of 104. This was the only subtest on which the Native Americans scored higher than the whites.

The strong visual memory of Native Americans may explain why they are relatively good at spelling. In a study of the academic achievement of approximately 13,000 Native American children in 11 states of the United States they were found to do poorest on reading vocabulary, probably because many of them spoke English as a second language, and best on spelling (Coombs, 1958). Good visual memory assists spelling because it makes it possible to recall the visual shapes of words. This is consistent with the fact that females have better visual memories than males (Halpern, 2000) and are better at spelling (Lynn, 1992).

5. Native American-European Hybrids

There have been a few studies that have compared the intelligence of pure blood Native Americans with mixed race Native American-European hybrids. These investigations show that the hybrids obtain higher average IQs than the pure Native Americans. The studies are summarized in Table 12.4. Row 1 shows a much lower IQ of 67 in pureblooded Native Americans than the 93 among hybrids, but the IQ of the pure bloods must be regarded as spuriously depressed because the Otis is a verbal test and the Native Americans spoke English as a second language. The study does not provide information on the first language of the hybrids. The study divided the hybrids into quarter, half, three-quarter, and full-blooded Native Americans and found a correlation of 0.41 between the amount of white ancestry and IQ. Row 2 gives IQs of 89 for hybrids and 86 for a small sample with 80-100 percent Native American ancestry. Row 3 gives IQs of 94 for Mestizo hybrids and 83 for a pure blood Native Americans in Mexico.

6. Musical Ability

Simple musical abilities such as identification of pitch changes and memory of tunes is correlated with intelligence and can be regarded as a component of intelligence (Carroll, 1993). It is therefore interesting to inquire whether Native Americans have low musical ability consistent with their low IQ. The only study of this issue is by Garth (1931), who reported results for pitch identification and memory for tunes for a sample of 757 school students. Their MQ (Musical Quotient) based on these two tests was approximately 92, somewhat higher than their IQ of 86 estimated in section 1. However, on a test of rhythm they performed better than white students, with an MQ of approximately 104. In this regard, Native Americans are like Africans, who also score higher than whites on rhythm, as shown in Chapter 4. It is not known whether the ability to identify rhythm is related to intelligence, and there is no apparent explanation for this aptitude in Native Americans and Africans.

7. Brain Size

Studies of the brain size of Native Americans in relation to those of

Table 12.4. IQs of Native American-European Hybrids

	Location	Age	Test	Europeans		Hybrids		Amerinds		Reference
				N	IQ	N	IQ	N	IQ	
1	Kansas	Adult	OTIS	-	100	536	93	179	67	Hunter & Sommermeir, 1922
2	South Dakota	10-15	QTIS	-	100	68	89	15	86	Fitzgerald & Ludeman, 1925
3	Mexico	7-10	SPM	155	98	571	94	194	83	Lynn et al., 2005

Europeans are given in Table 12.5. Row 1 gives the results calculated by Gould (1981) from the collection of skulls assembled in the early nineteenth century by the American physician Samuel Morton (1849). Gould accused Morton of massaging the data to give Europeans the largest brains, but it will be seen that the difference given by Morton is smaller than that in the two other studies. Row 2 gives the results obtained by the American anthropologists Smith and Beals from a collection of approximately 20,000 human crania. Row 3 gives the average of twenty populations of Native Americans from data assembled by Jurgens, Aune, and Pieper (1990) for many thousands of 25-45-year-olds. It is evident that although the three studies all show larger brain size in Europeans than in Native Americans, the magnitude of the difference varies quite considerably. The first two studies show very small differences, but the 79cc difference in the third study is considerable.

Table 12.5. Brain sizes (cc) of Native Americans and Europeans

	Europeans	Native Americans	Difference	Reference
1	1,426	1,420	6	Gould, 1981
2	1,369	1,366	3	Beals et al., 1984
3	1,319	1,240	79	Jurgens et al, 1990

8. Hispanics in the United States

In the United States the term *Hispanics* denotes individuals of Latin American and Caribbean Spanish-speaking origin. Hispanics can be pure white, black, white-black hybrids, Native American, or Mestizo with mixed white and Native American ancestry. There are five principal groups of Hispanics in the United States. These are from Mexico, the rest of Latin America, Cuba, Puerto Rico, and other Caribbean islands. The Bureau of the Census (1989) of the United States reported that 63 percent of Hispanics were from Mexico, 13 percent from Puerto Rico, 10 percent from Central and South America other than Mexico, 6 percent from Cuba, and 8 percent from elsewhere, mainly from Caribbean islands, particularly Dominica. Thus by far the largest group comes from Mexico, where 9 percent of the population are

white, 60 percent are Mestizo, and 30 percent Native American (Philip's, 1996). Many of those from the rest of Latin America are also Mestizos. Hence most Hispanics in the United States are Mestizos.

Studies of the IQs of Hispanics are summarized in Table 12.6. Rows 1 and 2 give IQs of 89 and 87 for the two first studies carried out in the 1920s. Row 3 gives a non-verbal reasoning IQ of 92 derived from the Progressive Matrices, Lorge-Thorndike, and Gesell Figure Copying test and a verbal IQ of 91 for a sample of Mexican children aged 6-13 compared with 638 whites. Row 4 gives a non-verbal reasoning IQ of 90 for a sample of Mexican children aged 6-12 compared with 638 whites, tested with the Colored Progressive Matrices; they obtained a somewhat lower IQ of 84 on the Peabody Picture Vocabulary Test (PPVT), possibly partly or wholly attributable to some of the Mexican children's use of English as a second language. Row 5 gives an IQ of 95 Mexican children in California compared with 744 white children. Row 6 gives an IQ of 83 obtained from the Colored Progressive Matrices in 1972 for Hispanic children in California and described as a representative sample. Row 7 gives an IQ of 94 for Hispanic 6-11-year-old children in Texas and row 8 an IQ of 84 for Hispanic 9-12-year-olds in Texas.

Row 9 gives results from the standardization of the Stanford Binet 4 showing Hispanics with an IQ of 99 on non-verbal reasoning; this sample obtained an IQ of 93 on verbal reasoning. Row 10 gives an IQ of 87 derived from the standardization sample of the PPVT-Revised. Rows 11 and 12 give IQs of 84 and 83 for Puerto Rico whose population is 80 percent white, 8 percent black, and 11 percent mixed race (Philip's 1996).

Row 13 gives an IQ of 93 and a verbal IQ of 85 obtained from the standardization sample of the K-BIT. Row 14 gives an IQ of 86 for Latinos on a largely verbal test of *g* derived from the National Longitudinal Study of Youth. Row 15 gives an IQ of 92 obtained from the standardization sample of the KAIT. Row 16 gives IQs of 88 for general ability (*g*), 91 (verbal), and 94 (spatial) for employed individuals collected by the United States Employment Service. Row 17 gives an IQ of 91 obtained from the standardization sample of the WISC-III. Row 18 gives an IQ of 81 for a sample of Mexican Americans in Arizona. Row 19 gives an IQ of 92 obtained from the standardization sample of the WAIS-III. Row 20 gives an IQ of 89 obtained from a meta-analysis of 39 studies of employed adult Hispanics. The median IQ of the studies 1-19 is 89, the same as the result of the meta-analysis given in row 20.

9. Genotypic Intelligence of Native Americans

The low intelligence of significant numbers of Native Americans in South and Central America is partly attributable to poor nutrition. It has been estimated that 21 percent of children are "stunted," i.e., have low stature as a result of nutritional deficiencies, and 30 percent of pregnant women are anemic, a result of iron deficiency (De Maeyer and Adiels-Tegman, 1985;

Table 12.6. IQs of Hispanics in the United States

	Location	Age	N	Test	<i>g</i>	Reas	Verb	Vis	Reference
1	New Mexico	6-12	100	Binet	89	-	-	-	Sheldon, 1924
2	USA	6-12	367	DAM	87	-	-	-	Goodenough, 1926b
3	California	6-13	2,025	SPM/LT/SA	91	91	90	-	Jensen, 1973
4	California	6-12	644	CPM/PPVT	90	90	84	-	Jensen, 1974
5	California	7-13	608	CPM/SPM	95	95	-	-	Jensen, 1974
6	California	6-11	597	CPM	83	83	-	-	Raven, 1986
7	Texas	6-11	434	CPM	94	94	-	-	Raven, 1986
8	Texas	9-12	404	SPM	84	84	-	-	Raven, 1986
9	USA	12-23	111	SB4	99	99	-	-	Thorndike et al., 1986
10	USA	3-18	550	PPVT-R	87	-	87	-	Dunn, 1988
11	Puerto Rico	8-15	2,911	SPM	84	84	-	-	Raven & Court, 1989
12	Puerto Rico	5-11	2,400	SPM	83	83	-	-	Raven et al., 1995
13	USA	20-90	37	K-BIT	93	93	85	-	Kaufman & Wang, 1992
14	USA	14-22	3,120	AFQT	86	-	-	-	Herrnstein & Murray, 1994
15	USA	11-93	140	KAIT	92	92	87	-	Kaufman et al., 1994
16	USA	16-74	1,736	GATE	88	-	91	94	Avolio & Waldman, 1994
17	USA	6-16	242	WISC-III	91	-	89	95	Prifitera et al., 1998
18	Arizona	6-16	223	WISC-R	81	-	81	-	Reynolds et al., 1999
19	USA	20-89	163	WAIS-III	92	-	89	96	Kaufman & Lichtenberger, 2002
20	USA	Adults	-	Meta-analysis	89	-	-	-	Roth et al., 2001

UNICEF, 1996). Iodine deficiency is widespread and causes high prevalence rates of goiter and cretinism, which cause stunting and reduce intelligence. In the rural highland regions of Ecuador it is estimated that there is a prevalence rate of cretinism of around 7 percent (Fierro-Benitez, Cazar, and Sandoval, 1989). It is estimated that for every 1 percent of the population who are cretins, 3 percent have some brain damage resulting in lower intelligence and 30 percent have a loss of energy resulting from hypothyroidism (Hetzl, 1994). Thus, in the highlands of Ecuador around 21 percent of the population may have impaired intelligence as a result of sub-clinical cretinism and also some loss of energy. In view of these nutritional deficiencies it may be surprising that Native Americans in South and Central America should have IQs as high as 86. Native Americans in North America have a better environment because the United States and Canada provide higher standards of living, nutrition, and health, so it may be surprising that their IQ of 86 is the same as that in South and Central America.

The low intelligence of Native Americans is most reasonably attributable to both genetic and environmental factors. There are four lines of evidence pointing to some genetic determination. First, only between 20 and 30 percent of Native Americans in South and Central Amer-

ica have nutritional deficiencies that could explain their low IQs. Second, the intelligence of Native Americans in the United States and Canada has shown no improvement relative to that of Europeans since the 1920s, despite great improvements in their living standards and environments. Third, the intelligence of Native American-European hybrids is related to the amount of European ancestry, shown in Section 5. Fourth, Hispanics are largely Native American-European hybrids, and their intelligence is intermediate between the two parent races. Fifth, a study by Cundick, Gottfredson, and Willson (1974) showed that 84 Native American children placed in white middle-class foster homes for a period of six years made no gains in intelligence. This shows that the various environmental advantages associated with being reared in a white middle class family have no beneficial effect on the intelligence of Native Americans and suggests that their IQ is to some degree genetically determined.

Chapter 13. Reliability and Validity of Race Differences in Intelligence

1. Summary of Race Differences in Intelligence
2. Reliability of Racial IQ Data
3. Validity of Racial IQs: Number Concepts
4. Validity of Racial IQs: Educational Attainment
5. Validity of Racial IQs: *Per Capita* Income and Economic Growth

The evidence on the intelligence of the races has been presented in detail in the preceding chapters. In this chapter we give an integrated summary of these differences. We then consider the reliability and validity of these IQs.

1. Summary of Race Differences in Intelligence

Table 13.1 gives a summary of the evidence on race differences in intelligence that has been set out in detail for the races individually in Chapters 3 through 12. The table lists the races ranked in ascending order of their intelligence levels, and gives their geographical location, the number of studies, the number of countries in which the studies have been carried out, the median IQ, and the range of IQs. Row 1 gives a median IQ of 54 for the Bushmen of the Kalahari Desert derived from three studies in which the IQs range from 48 to 62. Rows 2 and 3 give IQs of 62 and 63 for Aborigines in Australia and New Guinea. Combining these two results gives a weighted IQ of 62. Row 4 gives an IQ of 67 for Africans in sub-Saharan Africa derived from 57 studies. Row 5 gives an IQ of 71 for Africans in the Caribbean and Brazil derived from 14 studies. Row 6 gives an IQ of 85 for Africans in the United States derived from 29 studies. Row 7 gives the same IQ of 85 for Africans in the Netherlands derived from 7 studies. Row 8 gives an almost identical IQ of 86 for Africans in Britain derived from 18 studies. Thus, Africans outside Africa consistently obtain higher IQs than indigenous Africans. There are two explanations for this. First, many Africans in the Caribbean, the United States, the Netherlands, and Britain are racial hybrids with appreciable amounts of white ancestry. Second, Africans outside Africa live to varying degrees in societies run largely by Europeans, who are responsible for providing higher living standards that have a beneficial environmental effect on their IQs largely by providing better nutrition and health care.

Rows 9 through 13 give IQs for South Asians and North Africans in various locations. Row 9 gives an IQ of 84 for indigenous South Asians and North Africans derived from 37 studies in 17 countries. Row 10 gives an IQ of 92 for South Asians in Britain obtained from 16 studies. Row 11 gives an IQ of 85 for South Asians in Continental Europe derived from 18 studies in three countries. Row 12 gives an IQ of 86 for South Asians in Africa derived from 6 studies in two countries. Row 13 gives an IQ of 85 for South Asians derived from 3 studies in Fiji, Malaysia, and Mauritius. The IQs of the South Asians and North Africans are fairly consistent, ranging from 84 to 91.

Row 14 gives an IQ of 85 for indigenous Pacific Islanders derived from 14 samples and row 15 gives an IQ of 90 derived from 12 studies for Maori Pacific Islanders in New Zealand. The reason for the higher IQ of the Maori Pacific Islanders in New Zealand is likely to be that they enjoy higher living standards by virtue of living in a country run by Europeans. For this reason the IQ of 85 is adopted as the best reading of the IQ of Pacific Islanders.

Row 16 gives an IQ of 87 for indigenous Southeast Asians derived from 11 samples in 6 countries. Row 17 gives an IQ of 93 for Southeast Asians in the United States and the Netherlands. The reason that this is higher than in Southeast Asia is probably that there has been some selective migration and that living standards are higher.

Row 18 gives an IQ of 86 for Native Americans in North America derived from 19 studies. Row 19 gives the same IQ of 86 for Native Americans in Latin America derived from 9 studies from 5 countries. The IQ of 86 is adopted as the best reading of the IQ of Native Americans. Row 20 gives an IQ of 91 for Arctic Peoples in North America derived from 15 studies in Alaska and Canada.

Row 21 gives an IQ of 99 for Europeans derived from 66 studies in 25 countries (this median excludes the Balkans, who are a European-South Asian cline). Row 22 gives an IQ of 99 for Europeans outside Europe derived from 23 studies in 12 countries. The median of the entire set of studies is 99 and is adopted as the best reading of the IQ of Europeans.

Row 23 gives an IQ of 105 for indigenous East Asians derived from 60 studies in 7 countries. Row 24 gives an IQ of 101 for East Asians in the United States derived from 26 studies. Row 25 gives an IQ of 102 for East Asians elsewhere derived from 9 studies in 5 countries (Belgium, Brazil, Canada, Malaysia, and the Netherlands). The reason for the higher IQ of East Asians in East Asia than in the United States and elsewhere is probably that there has been some selective migration of those below average intelligence. In the case of Belgium, Canada, and the Netherlands it cannot be due to living standards, because these are as high as those in East Asia. It may be that the lower IQ of 99 of East Asians in Brazil and Malaysia is partly attributable to lower living standards in those countries. Because of the likelihood of some element of selective migration of East Asians to countries outside Northeast Asia, the IQ of 105 for indigenous East Asians is adopted as the best reading of the IQ of East Asians.

Table 13.1. Summary of race differences in intelligence

	Race	Location	N. Samples	N. Countries	IQ	Range
1	Bushmen	S. W. Africa	3	1	54	48-62
2	Aborigines	Australia	17	1	62	53-74
3	Aborigines	New Guinea	5	1	63	50-60
4	Sub-Saharan Africans	Africa	57	17	67	59-89
5	Sub-Saharan Africans	Caribbean	14	6	71	60-80
6	Sub-Saharan Africans	United States	29	1	85	77-93
7	Sub-Saharan Africans	Netherlands	7	1	85	83-88
8	Sub-Saharan Africans	Britain	18	1	86	73-94
9	S. Asians & N. Africans	South Asia	37	17	84	77-96
10	S. Asians & N. Africans	Britain	16	1	92	83-96
11	S. Asians & N. Africans	Europe	18	3	85	75-94
12	S.Asians & N. Africans	Africa	6	2	86	77-91
13	S.Asians & N. Africans	Fiji, etc.	3	3	85	82-89
14	Pacific Islanders	Pacific Islands	14	9	85	80-89
15	Pacific Islanders	New Zealand	12	1	90	81-96
16	Southeast Asians	South E. Asia	11	6	87	85-93
17	Southeast Asians	United States	7	3	93	87-96
18	Native Americans	North America	19	2	86	69-94
19	Native Americans	Latin America	10	5	86	79-92
20	Arctic Peoples	North America	15	2	91	78-96
21	Europeans	Europe	71	25	99	87-105
22	Europeans	Outside Europe	23	12	99	93-103
23	East Asians	East Asia	60	7	105	100-120
24	East Asians	United States	26	1	101	96-109
25	East Asians	Elsewhere	9	5	102	95-110

2. Reliability of Racial IQ Data

The IQs of many of the samples are likely to be to some degree inaccurate because of sampling and measurement errors. The accuracy of the results is known as their reliability and is assessed by examining how far two samples obtained for the same country give consistent results. The correlation between two IQs obtained for the same countries, taking the two extreme values where three or more IQs are available, is 0.94. This shows that the IQs are highly reliable.

The validity of the IQs is the question of the extent to which they provide genuine or *valid* measures of the cognitive abilities of samples. It has often been argued that the peoples who obtain low IQs are really just as intelligent as Europeans, but the tests are biased against them. The issue of test bias has been discussed at length by Jensen (1980) in his book *Bias in Mental Tests* and is shown to be not a tenable view. Individuals and races that do well on intelligence tests also tend to do well in education, earnings, job performance, and socio-economic status (Jensen, 1980,1998; Herrnstein and Murray, 1994). An Australian psychologist Murray Dyck (1996, p. 67) has given this verdict on the test bias thesis:

[T]he evidence indicates that cognitive tests are equally reliable across races, are of equivalent item difficulty across races, yield similar subtest correlations...and factor analyses yield similar results. The question of whether standard ability tests are culturally biased has been answered: they are not.

A further recent verdict on test bias comes from Brown, Reynolds, and Whitaker (1999, p. 215): "research to date consistently finds that standardized cognitive tests are not biased in terms of predictive or construct validity."

3. *Validity of Racial IQ Data: Number Concepts*

The validity of racial IQ data means the extent to which they measure real differences in cognitive ability beyond the ability to solve the problems presented in intelligence tests. There are several ways of establishing the validity of the race differences in intelligence. We consider first race differences in the development of the concepts of numbers. It has been shown by Butterworth (1999) that sophisticated numerical systems containing numbers for one to ten, tens, thousands, tens of thousands, and hundreds of thousands were devised by the South Asian and North African and the East Asians four or five thousand years ago and a little later by the Europeans and the Native Americans. The Bushmen, Africans, Australian Aborigines, and New Guinean Aborigines only devised numbers for *one*, *two*, *few*, and *many*. In some of the languages spoken by the Bushmen and the Australian Aborigines it is possible to express numbers up to *six* or *seven* by use of multiples of *one* and *two*. Thus seven is expressed as *two, two, two, one*. Larger numbers cannot be expressed because it becomes too difficult to remember the number of *twos* and *ones*. Construction of complex number systems must have required moderately high intelligence and the racial differences in these suggest that race differences in intelligence were present several thousand years ago.

4. *Validity of Racial IQ Data: Educational Attainment*

From the early years of the twentieth century the validity of intelligence tests has been examined by investigating the extent to which they are correlated with educational attainment. Numerous studies have found that IQs and educational achievement are correlated at around 0.6 to 0.7 (Jencks, 1972; Lynn, Hampson, and Magee, 1984). This shows that intelligence tests are valid measures of general cognitive ability and not merely the ability to solve the problems presented in the tests.

The same procedure is adopted here to examine the validity of race differences in IQs. The problem is to determine whether race differences in IQs are associated with differences in

educational attainment. The procedure is to use nations as the units of analysis, calculate IQs for nations, categorize nations by race, and assess how far the IQs of nations are related to national scores on mathematics and science. IQs for nations have been obtained from the data presented in the preceding chapters. Where two or more IQs are given for a nation, the median has been taken. The IQ for Latvia has been taken from Lynn and Vanhanen (2002). For multiracial societies, IQs have been calculated by weighting the IQs of the races by their proportions in the population. The IQ for Chile has been calculated from the normative study of 4,213 5-16-year-olds tested with the Progressive Matrices by Marinkovich, Sparosvich, Santana, Game, Gomez, and Marinkovich (2000).

National scores on mathematics and science have been obtained from the International Studies of Achievement in Mathematics and Science. These are a series of studies carried out between the mid-1960s and 1994 in which representative samples of primary and secondary school students from a number of countries have been given tests of mathematics and science. Some results are available for a total of 52 countries but not all countries participated in all the studies, so there are quite a lot of missing data. Five data sets of national scores on mathematics and science have been used here and are given in Table 13.2. Column 1 gives the nations categorized by race. Column 2 gives the nations' IQs. Column 3 gives the data from the first two International Studies of Achievement in Mathematics and Science Scores carried out between the mid-1960s and 1986 and combined by Hanushek and Kimko (2000) to give a single score for each nation set on a mean of 50 and standard deviation of 10. Columns 4, 5, 6, and 7 give, respectively, results for 10- and 14-year-olds in mathematics and science in the Third International Mathematics and Science Study, carried out in 1994. The data for these are given by Beaton, Mullis, Martin, Gonzales, Kelly, and Smith (1996) and Beaton, Martin, Mullis, Gonzales, Smith, and Kelly (1996).

The nations are categorized by the racial compositions of their populations. The first row for each race gives its median IQ and its median

Table 13.2. National IQs and Attainments in Math and Science

Nations	IQ	Math & Science 1964-86	Math 1994 Age 10	Math 1994 Age 14	Science 1994 Age 10	Science 1994 Age 14
East Asia	105	56.60	604	606	561	568
China	103	59.28	-	-	-	-
Hong Kong	107	56.93	587	588	533	522
Japan	105	60.65	597	605	574	571
Singapore	103	56.51	625	643	547	607
South Korea	109	56.21	611	607	597	565
Taiwan	105	56.28	-	-	-	-
Europe	98	52.84	545	530	549	532
Australia	98	48.13	546	530	562	545
Austria	100	.	559	539	565	558
Belgium	99	53.25	-	-	546	511

Britain	100	53.98	513	506	551	552
Bulgaria	93	59.28	-	-	-	565
Canada	99	47.57	532	527	549	531
Czech Rep	98	-	567	564	557	574
Denmark	98	53.48	-	-	-	478
Finland	99	48.76	-	-	-	-
France	98	54.15	-	-	538	498
Germany	98	59.03	-	-	-	531
Greece	92	-	492	484	-	497
Hungary	98	53.85	548	537	532	554
Iceland	101	-	474	487	505	494
Ireland	93	47.59	550	527	539	538
Italy	102	44.59	-	-	-	-
Latvia	97	-	525	493	512	485
Lithuania	90	-	-	477	-	476
Netherlands	101	56.84	577	541	557	560
New Zealand	99	52.44	499	508	531	525
Norway	100	49.60	502	503	530	527
Portugal	95	50.28	475	454	480	480
Romania	94	-	-	-	-	486
Russia	97	-	-	-	-	538
Spain	98	49.40	-	-	487	517
Slovakia	96	-	547	544	-	-
Slovenia	96	-	552	541	546	560
Sweden	100	47.41	-	-	-	535
Switzerland	101	57.17	-	545	-	-
United States	98	43.43	545	500	-	534
South America	86	30.10	-	385	-	411
Brazil	86	33.91	-	-	-	-
Chile	89	26.30	-	-	-	-
Colombia	84	-	-	385	-	411
South & SE Asia	86	39.83	490	474	473	470
Cyprus	85	-	502	474	475	463
India	82	21.63	-	-	-	-
Iran	84	20.75	429	428	416	470
Israel	95	51.29	531	522	505	524
Jordan	84	39.38	-	-	-	-
Kuwait	86		400	392	401	430
Philippines	86	34.35	-	-	-	-
Thailand	91	39.83	490	522	473	525

Turkey	90	41.52	-	-	-	-
Africa	69	32.00	354	326	-	326
Mozambique	64	24.26	-	-	-	-
Nigeria	69	34.15	-	-	-	-
South Africa	72	-	354	326	-	326
Swaziland	68	32.00				
Correlations with IQ	-	0.81	0.85	0.89	0.81	0.82

educational attainment. Shown first are the six East Asian counties (China, Hong Kong, Japan, Singapore, South Korea, and Taiwan). These obtain the highest IQ (105) and have the highest scores in all five measures of achievement in mathematics and science. Shown next are the 30 European countries. These include the nations outside Europe but populated largely by European peoples including Australia, New Zealand, and the United States. These have the second highest IQ (98) and the second highest scores in mathematics and science. Shown third are the three multiracial countries of South America (Brazil, Chile, and Columbia). They have a median IQ of 86. Data for their scores in mathematics and science are well below those of the European nations. Shown fourth are the nine countries of South and Southeast Asia. Their IQ of 86 is the same as that of the South American countries. Their scores in mathematics and science are slightly higher than in the South American countries but the results for these are very limited. The scores of the South and Southeast Asian countries in mathematics and science are much below those of the European nations. Shown fifth are the four countries of sub-Saharan Africa (the figure for Swaziland is taken from Baker and Jones, 1993). They have the lowest IQ (69) and the lowest scores in mathematics and science.

The bottom row gives the correlations between national IQs and the scores on educational attainment. The correlations range between 0.81 and 0.89 and are all statistically significant at the 1 percent level. These correlations are reduced from their true values by measurement error. In fact the average of the inter-correlations between the five measures of educational attainment is 0.78 and is lower than the average of the correlations (0.83) between the IQs and the five measures of educational attainment. Correction for the unreliability of these measures (correction for attenuation) gives a true correlation of 1.0 between national IQs and national educational attainment. This validates the national IQs and shows that they measure important cognitive abilities and not simply the ability to do intelligence tests.

To provide an estimate of the magnitude of the race differences in mathematics and science as compared with the differences in intelligence, the race differences in IQs and in mathematics and science given in column 3 can be expressed in standard deviation units (*ds*). These comparisons are given in Table 13.3. The IQs and scores in mathematics and science of Europeans are used as the standard against which the *d* scores of the other races are compared. It will be seen that for all comparisons the race differences in educational attainment are greater than the differences in intelligence. Thus, the East Asians have a 0.33d (5 IQ points) advantage over the Europeans in intelligence but a greater advantage of 0.44 in educational attainment. This could be because their schools are more efficient, as I have argued in the case of Japan (Lynn, 1988). For instance, the school year in Japan is 240 days as compared with 180 days in Britain and the United States and 155 days in France. Schools in East Asia are typically more orderly and have fewer discipline problems than those in European countries, so East Asian school students are able to learn more. It may be that East Asian school students have a

stronger work ethic than Europeans and that this contributes to their better educational attainment.

The other three racial and ethnic groups do worse in educational attainment than in intelligence. Thus, the South Americans are lower than the Europeans by $0.66d$ (10 IQ points) on intelligence but by $2.27d$ on educational attainment. The South Asians are lower than the Europeans by 0.93 (14 IQ points) on intelligence but by 1.30J on educational attainment. And the Africans are lower than the Europeans by 2.00 (30 IQ points) on intelligence but by $2.44d$ on educational attainment. Evidently there are other factors over and above lower intelligence that are depressing educational attainment in these economically developing countries. Possibly schools are less efficient or there is a weaker work ethic. The reasons for these race differences in educational attainment have been very poorly researched by educationists, who do not even acknowledge that differences in intelligence are a major factor, although clearly there are other factors operating.

Table 13.3. Comparison of National IQs and Educational Attainments in Math and Science (*ds*)

	East Asia	Europe	S. America	S. Asia	Africa
IQ	+ 0.33	0.00	-0.66	-0.93	-2.00
Attainment	+ 0.44	0.00	-2.27	- 1.30	-2.44

5. Validity of Racial IQ Data: Per Capita Income and Economic Growth

A further method for establishing the validity of intelligence tests is to examine their relation to *per capita* income and economic growth. Several studies of individuals have shown that IQs measured in childhood are correlated with earnings in adulthood at about 0.35 (Jencks, 1972) to 0.37 (Murray, 1998). Because intelligence is measured in childhood it is generally considered that IQ is a determinant of earnings in adulthood. This is supported by numerous studies showing that intelligence is positively related to job proficiency at a magnitude of around 0.4 to 0.6 (Hunter and Hunter, 1984).

The validity of race differences in IQs has been examined by extending this law to races. In Lynn and Vanhanen (2002) we have estimated IQs for all the 185 nations in the world with populations over 50,000. These national IQs are determined by the racial composition of the populations, as shown in the last section. We found that the national IQs are correlated at 0.62 with real GDP (Gross Domestic Product) *per capita* in 1998 and at 0.63 with GNP (Gross National Product) *per capita* in 1998. This shows that national IQs explain 38 percent and 32 percent, respectively, of the variance in *per capita* GDP and GNP. National IQs therefore make a significant contribution to national income as defined by these two measures. The correlations are not huge because national *per capita* incomes are significantly determined by other factors, of which the most important are the possession of natural resources and the presence of a market economy. Thus, for instance, the real GDP *per capita* in 1998 in Qatar (IQ=78) was \$20,987, about the same as that in Britain (\$20,336), and much higher than that in countries in south Asia with about the same IQ but no natural resources, such as India

(IQ=82, GDP=\$2,077) and Jordan (IQ=84, GDP=\$3,347). The reason for the high GDP in Qatar lies in the possession of oil, which is not possessed by India or Jordan. The second major factor determining national incomes is the presence of a market economy. Thus, the countries of Eastern Europe have about the same IQs as those of Western Europe but they have much lower *per capita* incomes (e.g., Russia \$6,460 and Poland \$7,619), as compared with Britain (\$20,336) and France (\$20,846). Similarly, the *per capita* income in China (\$3,105 in 1998) is much lower than in Hong Kong (\$20,763) and Singapore (\$24,210), although the people are all or mainly Chinese and have closely similar IQs (China, 103; Hong Kong, 107; Singapore, 103). The reason for this is that economic development in China has been retarded by the communist economy while that in Hong Kong and Singapore has been facilitated by market economies. In the countries taken together, the extent to which they have market economies measured by the index of economic freedom is correlated at 0.71 with real GDP *per capita* (1998), slightly higher than the correlation of IQ with real GDP *per capita* in 1998 (0.62), showing both economic freedom and IQs contribute substantially to national wealth. Economic freedom was correlated at 0.64 with real GNP *per capita* in 1998, as compared to the correlation of 0.63 between national IQs and GNP *per capita*.

There are also significant associations between national IQs and the rate of economic growth during the twentieth century. Thus, the correlation of national IQ and growth of GDP from 1950 to 1990 is 0.51. This shows that the countries with higher IQs are becoming more affluent and the gap between rich high IQ countries and poor low IQ countries is increasing. This is as would be expected because economic growth is driven by new high technology products such as computers, mobile phones, pharmaceuticals, aircraft, weapons, automobiles, and so forth, which can only be designed by peoples with high IQs. Nations with low IQs earn their living principally by the export of agricultural products, raw materials, and minerals for which there is less demand and prices are lower, so their economic growth rates and *per capita* incomes remain low.

These substantial correlations between national IQs and *per capita* incomes and rates of economic growth provide further validation for the measures of national intelligence, because they can be predicted and the prediction is verified. However, a caveat is required. The positive association between individual IQs and earnings within countries is a one-way causal relationship. IQs that are measured in childhood and adolescence are a determinant of the earnings of adults, while the earnings of adults are not a determinant of their intelligence. The positive association between national IQs and national *per capita* incomes is not so straightforward. It is a two-way causal interaction involving positive feedback. National populations with high IQs are able to produce sophisticated goods and services (computers, mobile phones, automobiles, aircraft, pharmaceuticals, etc.) that command high prices in international markets. This generates high *per capita* national income, which enables these populations to provide favorable environments, with high quality nutrition, health care, and education, for the development of the intelligence of their children. When these children become adults they are able to use their high intelligence to produce more sophisticated goods and services that command high prices in international markets. And so on in a benign circle.

Chapter 14. Environmental and Genetic Determinants of Race Differences in Intelligence

1. Nutrition
2. The Dutch World War II Famine Study
3. Neurophysiological Effect of Malnutrition
4. Education
5. Genetic Determinants of Race Differences in Intelligence
6. Genotype-Environment Co-variation

We now consider the question of the environmental and genetic determinants of race differences in intelligence. There are three possible positions on this issue. These are, first, the differences between all the ten races could be entirely environmentally determined. Second, the differences could be entirely genetically determined. Third, the differences could be determined by both genetic and environment factors. The third of these positions—that both genetic and environment factors contribute to race differences in intelligence—is by far the most probable.

The problem of whether there is a genetic contribution to race differences in intelligence has been debated for well over a century. Much but by no means all of this debate has been concerned with the difference between African Americans and Europeans in the United States. Those who have argued that a significant genetic effect is present include Gobineau (1853), Galton (1869), Garrett (1945, 1961), McGurk (1953a, 1953b), Shuey (1966), Shockley (1968), Jensen (1969, 1980, 1998), Vernon (1969, 1979), Eysenck (1971), Baker (1974), Loehlin, Lindzey, and Spuhler (1976), Rushton (1988, 2000), Rushton and Jensen, (2005), Lynn (1991, 1991b, 1997), Waldman, Weinberg, and Scarr (1994, p. 38), Scarr (1995), Levin (1997), and Gottfredson (2005). Those who have argued that there is no significant genetic determination of race differences include Flynn (1980), Brody (1992, 2003), Neisser (1996), Nisbett (1998), Mackintosh (1998), Jencks and Phillips (1998), and Fish (2002). Whole books have been devoted to this question, and Jensen (1998) in his book *The g Factor* devotes a chapter to it that runs to 113 pages, which is almost a book in itself; even this deals almost exclusively with the difference between blacks and whites in the United States. It is not the objective of this book to address all the relevant evidence and arguments but rather to broaden the debate from the local problem of the environmental and genetic contributions to the difference between blacks and whites in the United States to the much larger problem of the determinants of the global differences between the ten races whose IQs are summarized in Table 13.1.

1. Nutrition

There is no doubt that the low IQs of the peoples in impoverished third world countries are to some degree determined by environmental factors. The most important of these is poor nutrition. Even in affluent economically developed countries poor nutrition is present in significant proportions of the population and has an adverse effect on intelligence. There are many different sources of evidence showing this adverse effect, which I have reviewed in detail in Lynn (1990a, 1993, and 1998b). For instance, it sometimes happens that twins are born with different birth weights and brain size because the heavier twin has received more nutrients in the womb than the lighter twin. The insufficient nutrition obtained by the lighter twins has a

permanent adverse effect on their intelligence, shown by lower IQs, averaging a deficit of about 5 IQ points, in adolescence and adulthood. Seven studies that have shown this are summarized in Lynn (1990a). Several studies in the economically developed countries have found that infants who are breast-fed have higher IQs later in life than those that are fed on formula milk obtained from cows (Lucas, Morley, Cole, Lister, and Leeson-Payne, 1992; Lucas, Morley, and Cole, 1998). The explanation for this is that breast milk contains nutrients not present in formula milk and the iron in breast milk is sufficient, whereas the iron in cows' milk is less absorbable by infants. It has also been shown that some adolescents are nutritionally deficient and that giving these nutritional supplements improves their intelligence. For instance, a study of adolescents in a socially deprived city in Britain found that 17 percent were iron deficient and daily iron supplements given to these for three months increased their IQs by 5.8 IQ points (Lynn and Harland, 1998). Other studies showing positive effects of nutritional supplements on the intelligence of children in economically developed nations have been described by Benton and Roberts (1988), Benton and Cook (1991), and Eysenck and Schoenthaler (1997). The secular increases in intelligence that have occurred in economically developed nations during most of the twentieth century are largely due to improvements in nutrition, which have produced increases in height of the same magnitude of about half a standard deviation over fifty years. The evidence for this is reviewed in Lynn (1990a).

In many impoverished economically developing countries inadequate nutrition is widespread and there is abundant evidence that this has had an adverse effect on the intelligence of the populations. The principal kinds of inadequate nutrition that have been studied are protein-energy malnutrition, iron deficiency, and iodine deficiency. Protein-energy malnutrition retards growth and in extreme cases causes kwashiorkor and marasmus. Iron deficiency produces anemia, and lack of energy and impairs intelligence. Iodine deficiency produces goiter and in pregnant women impairs the neurological development of the brain of the fetus resulting in cretinism and impaired intelligence. The adverse effect of iodine deficiency on intelligence has been synthesized by Bleichrodt and Born (1994) in a meta-analysis of 18 studies that compared intelligence in iodine deficient regions with that in non-deficient regions and the effects of the administration of iodine in iodine deficient populations. They conclude that the effect of severe iodine deficiency is to reduce intelligence by 13.5 IQ points.

Malnutrition impairs physical growth, including the growth of the brain, which is the reason it impairs intelligence. The presence of malnutrition is measured by "stunting," "wasting," and "underweight."

1. Stunting is low height. Moderate to severe stunting is defined as less than two standard deviations below the median height in relation to age of the well-nourished population. Stunting is caused by chronic insufficiency of protein for bone growth.
2. Moderate to severe wasting consists of weighing less than two standard deviations below the median weight for height of the well-nourished population.
3. Moderate to severe underweight consists of weighing less than two standard deviations below the median weight for age of the well-nourished population.

The prevalence rates of moderate to severe malnutrition in different regions of the economically developing world in the early 1990s estimated by UNICEF (1996) and of anemia among pregnant women in the years 1960-1982 estimated by the World Health Organization (De Maeyer and Adiels-Tegman, 1985) are shown in Table 14.1. Surveys in individual countries confirm these results. For instance, a survey in India carried out in the 1980s found about 60

percent of children under 3 years and 44 percent of those between 3 and 5 years were anemic (Seshadri and Gopaldas, 1989). Inadequate nutrition in many economically developing countries is exacerbated by diseases, particularly diarrhea and measles, which impair the absorption of nutrients.

Table 14.1. Prevalence of malnutrition in economically developing countries (percentages)

Region	Underweight	Wasting	Stunting	Anemia
Sub-Saharan Africa	31	7	41	40
Middle East & North Africa	12	5	24	-
South Asia	64	13	62	40
East Asia & Pacific	23	4	33	25
Latin America & Caribbean	11	3	21	30

The adverse effect of malnutrition on the intelligence of many of the peoples in developing countries is shown by a number of studies that have compared the IQs of well-nourished and malnourished children. Simeon and Grantham-McGregor (1990) have reviewed fifteen such studies and conclude that in ten of them malnourished children obtained lower IQs than adequately nourished. The adverse effect of inadequate nutrition on intelligence has also been shown by a number of studies in which nutritional supplements have been given to malnourished children and the effect has been to increase their intelligence. Seven such studies in economically developing countries have been summarized by Simeon and Grantham-McGregor (1990).

While inadequate nutrition undoubtedly impairs the intelligence of significant numbers in economically developing countries, it does not provide a full explanation for race differences. The figures set out in Table 14.1 show that fewer than half the children in economically developing countries of sub-Saharan Africa, the Middle East and North Africa, East Asia, the Pacific Islands, Latin America, and the Caribbean suffer from malnutrition. It is only in South Asia that more than half the children are malnourished with 64 percent underweight and 62 percent stunted. While several studies have shown that malnourished children in economically developing countries have lower IQs than well-nourished children, the well nourished still have IQs well below those of Europeans and East Asians in economically developed countries. For instance, Galler and her colleagues have reported that children in Barbados who were malnourished in their first year of life had an IQ of 68 at the ages of 9 to 15, while a group of well-nourished children obtained an IQ of 83 (Galler, Ramsey, and Ford, 1986). The 15 IQ point difference indicates that the effect of malnourishment is to reduce IQs by 15 IQ points. However, only 16.5 percent of children in Barbados are malnourished and the IQ of 83 of well-nourished African children is well below the IQ of 99 of Europeans and of 105 of East Asians. In broad terms the effect of malnourishment on Africans in sub-Saharan Africa and the Caribbean probably explains about half the low IQs, leaving the remaining half to genetic factors.

It has sometimes been asserted by environmentalists that poor nutrition contributes to the low IQ of African Americans in the United States. Thus, Richardson and Spears (1972, p. 82)

have written "we have overwhelming evidence that minority groups like the blacks always tend to be less well fed than the majority." They offer no evidence for this assertion and it is doubtful whether it is correct. Poor nutrition reduces height and thus short stature is an index of poor nutrition. But as early as 1918 the heights of American conscripts were 170.96 cm for whites and fractionally greater at 171.99 cm for blacks (Nelson, 1933). A further study published later in the twentieth century has confirmed that there is no difference in height between American blacks and whites at the ages of 4 and 7 years or among adults (Broman, Nichols, Shaughnessy, and Kennedy, 1985). Surveys of nutrition have also failed to find any differences between American blacks and whites. For instance, a survey of 1987-88 found that in a representative sample of 2,379 9-10-year-old girls, 20 percent of blacks and 25 percent of whites had below the RDA (recommended daily allowance) of 45 mg a day of vitamin C (Simon, Schreiber, Crawford, Frederick and Sabry, 1993). The First Health and Nutrition Examination Survey of girls up to the age of 15 found no difference between blacks and whites in low vitamin C intake (National Center for Health Statistics, 1979). Other dietary deficiencies are likely to be associated with vitamin C deficiency, so these results suggest that American blacks do not experience any greater nutritional deficiency than whites.

With regard to East Asians, the study of Korean infants adopted by American parents before the age of 2 years and intelligence-tested at the ages of 6 to 14 years reported by Winick, Meyer, and Harris (1975) found that those who had been severely malnourished as infants had an IQ of 102, those who had been moderately malnourished as infants had an IQ of 106, while those who had been well nourished had an IQ of 112. The results suggest that severe malnourishment in infancy impairs intelligence by 10 IQ points. Nevertheless, even East Asians who had been severely malnourished as infants had an IQ of 102, slightly higher than that of well-nourished Europeans, suggesting that genetic factors are responsible for the higher East Asian IQ.

2. The Dutch World War II Famine Study

The principal study suggesting that prenatal and early postnatal malnutrition does not have an adverse effect on the intelligence of children is the Dutch World War II Famine Study of Stein, Susser, Saenger, and Marolla (1972). This study examined the effect of a famine in one region of the Netherlands in the winter and spring of 1944-45, in which the population, including pregnant women, experienced severe malnutrition for a period of six months. Food was reduced to around 700 calories a day, about a quarter to a fifth of that normally consumed in economically developed nations. During this period babies had lower birth weights by around 300 grams, but at the age of 19 years they had the same IQs as those who had lived in other regions of the Netherlands who had not experienced the famine and been exposed to prenatal starvation. However, the authors warn that "the results should not be generalized to the effects of chronic malnutrition with a different set of dietary deficiencies such as often occurs in developing countries, nor to nutritional insult in postnatal life" (p. 712). This point has been elaborated by Martorell (1997) who contends that 6 months of poor nutrition does not have any adverse effect if the mothers are well nourished previously and the fetuses are well nourished in the remainder of the pregnancy and as infants after birth. He suggests that the mothers probably had reserves of micronutrients that were used during the period of the famine. In the economically developing countries many people are chronically undernourished and no compensation of this kind is possible. It is doubtful whether this is the correct explanation in view of the fact that the infants born in the famine region had substantially lower birth weights of approximately 300 grams compared with 330 grams in the non-famine

regions, and the substantial evidence that low birth weight is associated with reduced intelligence. If mothers had been able to draw on reserves of nutrients the birth weight of their infants would have been normal. The fact that it was considerably reduced shows the malnutrition caused by the famine did have an adverse effect. The most probable explanation for the result is that the proportion of babies born to non-manual families increased in the famine areas relative to those in manual labor families. Possibly the reason for this is that non-manual families were better able to get food from the non-famine areas and this improved their nutrition and increased their fertility relative to that of non-manual labor families. There is a strong association between intelligence and socio-economic status, so the effect of this would have been that the increase in the proportion of babies born in non-manual labor families compensated for the adverse effect of malnutrition in this cohort.

3. Neurophysiological Effect of Malnutrition

The neurophysiological effect of malnutrition is to impair the growth of the brain so that it functions less effectively. Prenatal and early postnatal malnutrition has the most serious adverse effect on intelligence because about 70 percent of brain growth takes place in utero, and the remaining 30 percent including dendritic growth and synaptic branching is completed by the ages of 18-24 months (Dobbing and Smart, 1974). Malnutrition has various adverse effects on the brain of the fetus and young infant that impair later intelligence, of which the best established are the following:

1. Malnutrition impairs the growth of the brain and reduces the number of brain cells, and brain size is associated with intelligence with a correlation of 0.40 (Vernon, Wickett, Bazana, and Stelmack, 2000);
2. The effect of iron deficiency is to reduce the number of dopamine receptors and this impairs dopamine neurotransmission, which in turn impairs learning and brain function in adulthood;
3. Fatty acids are essential for brain growth and efficient functioning; about half of these acids are acquired in utero and the other half in the first 12 months of life from breast milk; these fatty acids are not present in cow's milk or in most infant formulas, which is one reason why infants who are breast fed have higher subsequent IQs (Grantham-McGregor, Walker, and Powell, 1994).

4. Education

A second environmental factor that has sometimes been proposed as responsible for the low IQs of peoples in economically developing countries is lack of education. For instance, Fish (2002, p. 14) writes "a lack of formal education of Africans in relation to European comparison groups provides an obvious explanation of their lower test performance." Biesheuvel (1949) has advanced the same view and cites a study in South Africa showing that Africans who had never been to school had IQs about 10 points lower than those who had been to school, and he contends that this shows that lack of schooling impairs intelligence. It is difficult to establish this contention because it is probable that children who are sent to school have parents with higher IQs and higher socio-economic status than those who do not attend

school, and their higher IQs may have been acquired from their parents rather than from their schooling. Studies of the effects of schooling on intelligence in the economically developed world have had mixed results. Ceci (1991) and Mackintosh (1998) review several studies showing that schooling increases intelligence, but these are short-term gains and disappear after a few years. It has not been demonstrated that they are permanent. There is also some contrary evidence. In Britain children begin school at the age of 5 years and in nearly all other countries they begin school at six or seven, but British children do not appear to gain any advantage from the extra year of schooling. In the United States the Coleman Report that was commissioned to investigate the effects of schooling concluded that "schools bring little influence to bear on a child's achievement that is independent of his background and general social context" (Coleman et al., 1966, p. 325). Schools in the United States have been integrated since the 1960s, with blacks, whites, Asians, and other races attending the same schools, achieved in many areas by busing, but there has been little or no increase in the IQs of African Americans and Native Americans. In Britain and Continental Europe, all races attend the same schools but the race differences in intelligence are still present.

In the studies of the intelligence of the races reviewed in Chapters 3 through 12, most of the studies have been carried out on children attending school, and in a number of these studies the children have attended the same schools as Europeans. In South Africa, the 16-year-olds in Owen's (1992) sample had had eight to ten years of formal education, yet they obtained a typical mean IQ of 63. Twelve studies of African university students in South Africa who had had ten to twelve years of schooling found that they have IQs around 20 points lower than those of whites (see Chapter 4, Table 4.2). Similarly, in India three studies of the intelligence of university students found they obtained IQs of 88, 90, and 95, well below the average of Europeans.

Furthermore, several studies have shown that the race differences in intelligence are fully present in preschool children. Thus African 3-year-olds in Dominica have an IQ of 67 (Wein & Stevenson, 1972), and 4-year-olds in St. Lucia have an IQ of 62 (Murray, 1983). In the United States, 3-year-old Africans have an IQ of 86 (Montie & Pagan, 1988) and 85 (Peoples et al., 1995), and 4-year-olds have an IQ of 87 (Broman et al., 1975), just about the same as African-American adolescents and adults. These preschool studies suggest that lack of education is not a significant factor determining racial differences in intelligence.

5. Genetic Determinants of Race Differences in Intelligence

While environmental factors undoubtedly contribute to the differences in intelligence between the races, there are a number of considerations that suggest that genetic factors are also involved. Ten of these are discussed in this section.

First, it is a principle of evolutionary biology that when sub-populations of a species become geographically isolated and occupy different environments, they become genetically differentiated and eventually diverge so much that they become different species. Thus, squirrels in North America have evolved gray fur while those in Europe have evolved red fur. From an original ancestral species, cats have evolved into lions, leopards, and cheetahs in Africa, tigers in Asia, and jaguars and pumas in the Americas. The general principle has been stated by Dawkins (1988, pp. 238-9), who writes that when two populations become isolated from one another

they become so unlike each other that, after a while, naturalists would see them as belonging to different races; after a longer time, they will have diverged so far that we should classify them as different species... the theory of speciation resulting from initial geographical separation has long been a cornerstone of mainstream, orthodox neo-Darwinism.

The processes by which these genetic divergences take place have been described in Chapter 2. It is in accordance with this principle that the races have become genetically differentiated for all characteristics for which there is genetic variation, including body shape; color of skin, hair, and eyes; prevalence of genetic diseases; and blood groups. It is inconceivable that intelligence would be the single exception to these differences. Some racial differences in intelligence must also have evolved as a matter of general biological principle.

Second, the studies summarized in Table 13.1 show a consistency of the IQs of the races in a wide range of geographical locations that can only be explained by some genetic determination. For instance, in the 57 studies of general population samples of Africans in 17 African countries, all the IQs lie in the range between 59 and 88 (Table 4.1), and in the 14 Caribbean and Latin American countries all the IQs lie in the range between 60 and 80 (Table 4.3). Similarly, in the 58 studies of indigenous East Asians in 6 countries all the IQs lie in the range between 100 and 120 (Table 10.1). Only a genetic factor can explain the consistency of these race differences in so many different environments. It is curious that those who support the environmentalist theory of race differences in intelligence, such as Neisser (1996), Mackintosh (1998), Jencks and Phillips (1998), Nisbett (1998), Flynn (1980), Fish (2002), and Brody (2003), fail to make any mention of the consistency of the racial differences in so many different environments and nations.

Third, the races differ consistently in IQ when they live in the same environments. Thus, Africans in the United States, Britain, the Netherlands, and Brazil consistently have lower IQs than whites. The same is true of South Asians and North Africans in Britain, Continental Europe, Africa, Fiji, Malaysia, and Mauritius; of Native Americans living with Europeans in the United States, Canada, and Mexico; of Arctic Peoples living with Europeans in Canada; of Australian Aborigines living with Europeans in Australia; and of Pacific Islanders living with Europeans in New Zealand and Hawaii. All these differences are consistent and add to the credibility of the genetic theory.

Fourth, when babies from other races are adopted by Europeans in Europe and the United States, they retain the IQs characteristic of their race. This has been shown for Africans in the United States, where black infants adopted by white middle class parents have the same IQ as blacks reared in their own communities (Lynn, 1994c); for Australian Aborigines in Australia; and for East Asians in the United States and Europe, where Korean infants adopted by Europeans have IQs in the range between 102 and 110 (Table 10.4) shown in Chapters 4, 8, and 10, respectively.

Fifth, mixed-race individuals have IQs intermediate between those of the two parent races. Thus, in the Weinberg, Scarr, and Waldman (1992) study of children adopted by white middle class families, at the age of 17 years blacks had an IQ of 89, those of mixed black-white parentage an IQ of 98, and whites an IQ of 106 (Lynn, 1994c). When the amount of European ancestry in American blacks is assessed by skin color, dark-skinned blacks have an IQ of 85 and light-skinned blacks have an IQ of 92 (Lynn, 2002a), and there is a statistically significant association between light skin and intelligence. Similarly, mixed-race Australian Aborigines have IQs intermediate between full-blooded Aborigines and Europeans (Chapter 8, Section

2); and mixed-race Native Americans have IQs intermediate between full-blooded Native Americans and Europeans (Chapter 12, Table 12.4).

Sixth, the IQs of races explain the extent to which they made the Neolithic transition from hunter gathering to settled agriculture. This transition was made completely by the more intelligent races: the Europeans, the South Asians and North Africans, the East Asians, the Southeast Asians, and the Native Americans; to some extent by the Pacific Islanders, who were handicapped by living in small and dispersed populations on small islands; minimally by the Africans; but not at all by the Bushmen and Australian Aborigines, with IQs of 54 and 62, who have made virtually no progress in the transition from hunter-gatherers to settled agricultural societies. The only anomaly is the Arctic Peoples, with their IQ of 91, who remain largely hunter-gatherers, but this is due to their very small and dispersed populations and the harsh climate of the Arctic Circle.

Seventh, the IQs of races are consistent with their achievements in the development of early urban civilizations with written languages, systems of arithmetic, and codified laws as shown by Baker (1974), who has documented that only the East Asians, the Europeans, the South Asians and North Africans, and the Southeast Asians developed early civilizations. The less intelligent Native Americans developed a half civilization; and the remaining races failed to develop anything that could be called civilizations. The anomalies of the Pacific Islanders and Arctic Peoples, with their IQs of 90 and 91, neither of which has ever developed anything resembling a civilization, can be explained in the case of the Pacific Islanders as due to their very small and dispersed populations on isolated islands and, in the case of the Arctic Peoples, the severity of their climate, which has made it impossible to sustain urban civilizations. These race differences that Baker (1974) analyzed in the development of early civilizations in the period between approximately BC 4000 and 500 have persisted from 1 AD to the present. Virtually all the advances that have been made in the last two thousand years in science, mathematics, technology, and the arts have been made by the East Asians and the Europeans, with some small input from the South Asians and North Africans. This has been documented in detail by Murray (2003), although he analyzes these advances by geographic region and refrains from pointing out that it has been almost exclusively the East Asian and European peoples who have made these advances. The achievements of the races in making the Neolithic transition, in the development of early civilizations, and in the advances of mature civilizations during the last two thousand years show that the differences in intelligence go back many thousands of years and are a further expression of genetically based race differences in intelligence.

Eighth, all the twin studies that have been carried out in Europe, India, and Japan, and on blacks and whites in the United States, have found a high heritability of intelligence in national populations. It is improbable that these high heritabilities within races could co-exist with the absence of any heritability for the differences between the races.

Ninth, there are race differences in brain size that are associated with differences in intelligence, and brain size has a heritability of 90 percent (Baare, Pol et al., 2001) (see also Rush-ton and Osborne, 1995). The only reasonable interpretation of this association is that the races with the higher intelligence have evolved larger brains to accommodate their higher IQs. A further elaboration of this point is given in Chapter 16, sections 3 through 6.

Tenth, the consistency of all the racial differences in so many different nations, in the development of early and later civilizations, and the high heritability of intelligence wherever it has been investigated, all need to be considered in terms of Popper's (1959) theory of the logic of

scientific explanation. This states that a scientific theory generates predictions that are subjected to empirical testing. A strong theory has few assumptions and generates a large number of predictions that are empirically verified. If the predictions are discontinued the theory is weakened and may even be destroyed, although a single disconfirmation can generally be explained or the theory can be modified to account for it. For the problem of race differences in intelligence, the theory that these have some genetic basis explains all the numerous phenomena set out in the points listed above, and there are no serious anomalies. The theory that the race differences in intelligence are to a significant extent genetically based fulfills Popper's criteria for a strong theory. Those who assert that there is no evidence for a genetic basis of racial differences in intelligence betray a lack of understanding of the logic of scientific explanation.

6. Genotype-Environment Co-variation

The problem of the relative contributions of environmental and genetic factors to race differences in intelligence is made more difficult by the principle of genotype-environment co-variation. This states that the genes for high intelligence tend to be associated with favorable environments for the optimum development of intelligence (Plomin, 1994). Thus, intelligent women who are pregnant typically refrain from smoking, drinking excessive alcohol, and taking drugs because they are aware that these are likely to impair the growth of the brain and subsequent intelligence of the children they are carrying. Intelligent parents tend to provide their children with good quality nutrition because they understand the general principles of what constitutes a healthy diet, and a healthy diet is a determinant of intelligence. Intelligent parents are also more likely to give their children cognitive stimulation, which is widely believed (not necessarily correctly) to promote the development of the intelligence of their children. The same principle operates for races. The races with high intelligence tend to provide their children with the double advantage of transmitting favorable genes to their children and of providing them with a favorable environment with good nutrition, health care, and, possibly, education that enhances the development of their children's intelligence. Conversely, the children of the less intelligent races tend to transmit the double disadvantage of poor quality genes and a poor quality environment. Thus it is problematical whether the poor nutrition and health that impair the intelligence of many third world peoples should be regarded as a purely environmental effect or as to some degree a genetic effect arising from the low intelligence of the populations that makes them unable to provide good nutrition and health for their children. The principle of genotype-environment co-variation implies that differences in intelligence between the races for which the immediate cause is environmental are also attributable to genetic factors that contribute to the environmental differences.

It is difficult to avoid the conclusion that race differences in intelligence have both environmental and genetic factors. The extent of the heritability of race differences in intelligence must be expected to vary according to which pairs of races are compared. The magnitude of the heritability depends on the variability in the environmental determinants of intelligence in the population and, in the case of two populations, the differences in the environmental determinants between the two. In the comparison between Africans in Africa and Europeans, the environmental differences between the two populations, consisting of the quality of nutrition, health, and education, are quite large. Consequently they will have a significant impact and possibly explain about 50 percent of the differences in intelligence between the two populations (see Chapter 4). In the comparison between Africans in the United States and Europeans, the environmental differences between the two populations are much smaller, since they

have about the same nutrition and education, so the environmental effect is much smaller and the heritability correspondingly greater. Similarly, in the comparison between East Asians and Europeans the environmental conditions in which they live are closely similar in so far as they enjoy approximately the same standards of living, nutrition, health care, and education, so the slightly higher IQ of the East Asians is probably largely determined genetically.

Chapter 15. The Evolution of Intelligence

1. General Principles of the Evolution of Intelligence
2. Mammals
3. Birds
4. Primates
5. Hominids
6. IQs of Monkeys, Apes, and Pre-human Hominids

We turn now to the question of how intelligence has evolved. Throughout the course of evolution there has been a general trend for species to develop greater intelligence. This chapter gives an account of the principles responsible for this. The evolution of race differences in intelligence has been a continuation of this trend and is discussed in the next two chapters.

1. General Principles of the Evolution of Intelligence

The general principles of the evolution of greater intelligence over the course of some 225 million years have been formulated by Jerison (1973, 2000). He has shown that two principles have operated. The first is that from time to time species have occupied new environments or niches that have required increased cognitive demands. When this has occurred these species have responded by evolving larger brains with which to accommodate greater intelligence. These have enabled the species to deal with the cognitive demands of the new niche. The second principle is that carnivores and herbivores have been engaged in a form of arms race in which carnivores have needed to become more intelligent in order to catch herbivores while herbivores have needed to become more intelligent in order to escape predators. A useful account of this process has been given by Dawkins and Krebs (1979).

There is a problem in making comparisons between species in brain size and intelligence because there is a strong association across species between brain size and body size. The reason for this is that much of the brain services the functions of the body, so species with large bodies have large brains. To control for body size in comparing the brain size of different species, Jerison has devised the concept of the encephalization quotient (EQ) as a measure of brain size in relation to body size. He sets the EQ of average living mammals at 1.0 and expresses the EQs of other extinct and living species in relation to this standard. Jerison defines intelligence of species as their EQ, which determines the information-processing capacity of the brain.

The important developments in the evolution of higher EQs as new species have evolved are summarized in Table 15.1. These data have been compiled from Jerison (1973, 2000), Cutler (1976), and Harvey and Glutton-Brock (1985). Rows 1, 2, and 3 of the table show that 225

million years ago fish and reptiles had small EQs of 0.05 and that their EQs have shown no increase by 60 million years ago or at the present day.

Table 15.1. Evolution of encephalization quotients (MYA = million years ago)

	MYA	Species	EQ
1	225	Fish & reptiles	0.05
2	60	Fish & reptiles	0.05
3	Living	Fish & reptiles	0.05
4	225	First mammals	0.25
5	60	Average mammals	0.75
6	Living	Average mammals	1.00
7	150	First birds	0.10
8	60	Average birds	0.75
9	Living	Average birds	1.00
10	60	First primates	0.75
11	Living	Tree shrew	0.85
12	Living	Potto	1.10
13	Living	Senegal gelago	1.20
14	Living	Gentle lemur	0.70
15	Living	Macaco lemur	1.60
16	30	First monkeys	1.00
17	Living	Marmoset	1.50
18	Living	Squirrel	2.80
19	Living	Capuchin apella	3.50
20	Living	Langur presbytis	1.30
21	Living	Rhesus	2.10
22	Living	Baboon hamadryas	2.40
23	16	First apes	2.00
24	Living	Gorilla	2.00
25	Living	Siamang gibbon	2.10
26	Living	Orangutan	2.40
27	Living	Chimpanzee	2.60
28	Living	Lar gibbon	2.80
29	4	Australopithecus	3.70
30	1.7	Homo habilis	4.30
31	0.7	Homo erectus	5.00
32	Living	Homo sapiens	7.50

2. *Mammals*

Row 4 shows that the EQ of the first mammals that evolved approximately 225 million years ago was 0.25. This was a five-fold increase from the reptiles from which they evolved and was the first quantum leap in the increase of EQ and intelligence.

The explanation of this development is that the reptiles were largely diurnal and relied primarily on vision for information about the world. Like living reptiles, their behavior consisted largely of hardwired responses to visual sign-stimuli. The first mammals were small animals about the size of the rat and occupied a nocturnal niche in which they slept during the day and foraged at night. This niche was advantageous because it afforded protection from predator reptiles, but it had the disadvantage that for nocturnal animals vision is seriously inadequate for gathering information about the external world, although it has some value at dusk and dawn and on moonlit nights. To overcome this problem the early nocturnal mammals developed their senses of hearing, smell, and touch and an integration processor to obtain and analyze information from the three senses as well as from vision. They were then able to integrate information obtained from the four senses to identify predators, food, and mates. The development of the information-processing capacities of hearing, smell, and touch required the enlargement of the auditory, olfactory, and tactile centers of the brain and the development of an integration capacity to combine the information obtained from the four senses. These new cognitive functions required a five-fold increase of the encephalization quotient over that of average fish and reptiles, from 0.05 to 0.25.

Row 5 shows that by 60 million years ago the EQ of average mammals had increased to 0.75, representing a three-fold increase from 0.25 in the first mammals. Row 6 shows that over the next 60 million years the EQ of average mammals increased further to 1.0. Thus, during the 225 million years following their first appearance, the EQ of average mammals increased approximately four-fold. This increase appears to have taken place largely through the operation of the principle of the arms race between carnivores and herbivores, each of which exerted selection pressure on the other for greater intelligence and higher EQs to accommodate it.

3. *Birds*

Row 7 shows the appearance of the first birds approximately 150 million years ago. The first bird, *Archaeopteryx*, had an EQ of 0.10, twice as large as that of the reptiles from which it evolved. This was the second quantum leap in EQ and intelligence. Rows 8 and 9 show that the EQs of birds had increased to approximately 0.75 by 60 million years ago, and increased further to 1.0 over the next 60 million years up to the present. Thus, the average living birds have approximately the same EQ of 1.0 as that of average living mammals. The explanation for the increase in the EQs of birds appears to be that they occupied the niche of living largely in the air. This had the advantage of being well away from predators but the disadvantage that newly hatched chicks in nests in the tops of trees had to be fed for several weeks until they had grown sufficiently to be able to fly and fend for themselves. To raise their chicks the parents had to build nests, learn the location of their nests in spatial maps of their terrain, form pair bonds between mother and father birds, and co-operate in feeding their young and in defending their nests from predators. These tasks evidently required greater intelligence and learning capacities and a higher EQ than was needed by fish and reptiles, which do not care for their young. The greater intelligence of birds and mammals such as dogs and rabbits has been shown in various experimental tasks reviews by Razrin (1971). The increase in the EQs

of birds over time probably occurred largely through the arms race between predators and non-predacious birds, each of which exerted selection pressure on the other for greater intelligence and higher EQs to accommodate it.

4. *Primates*

Row 10 shows the EQ of 0.75 of the first primates who appeared approximately 60 million years ago following the extinction of the dinosaurs. The EQ of the first primates was about the same as that of average mammals and birds at that time. Rows 11 through 15 give the EQs of the living representatives of the first primates: tree shrews (EQ 0.85), pottos (EQ 1.1), gelagos (EQ 1.2), the gentle lemur (0.7), and the Macaco lemur (EQ 1.6). These five living species have an average EQ of 1.1, an increase of about 50 percent over that of the first primates of 60 million years ago. Row 16 shows the EQ of 1.0 of the first monkeys, which appeared about 30 million years ago. Rows 17 through 22 show the EQs of six typical living species of monkey. Their EQs range between 1.3 for the Langur prebytis and the 3.5 for the Capuchin apella, so all of them have higher EQs than the first monkeys of 30 million years ago with their EQ of 1.0. Row 23 shows an EQ of 2.0 for the first species of apes that appeared around 16 million years ago. The principal distinctions between monkeys and apes is that apes have no tails and more flexible shoulders that allow them to raise their arms above their heads and swing from branches of trees, whereas monkeys walk on branches. Rows 24 through 28 give the EQs of the five species of living great apes. The EQs range from 2.0 for the gorillas of central Africa, through 2.1 for the Siamang gibbon of southeast Asia and Indonesia, 2.4 for the orangutan of Borneo and Sumatra, 2.6 for the chimpanzee of central Africa, to 2.8 for the Lar gibbon of Southeast Asia and Indonesia. Considered as a genus, the great apes do not appear to have evolved higher EQs than the monkeys. The average EQ of the five species of great apes is 2.4 while the average of the six species of monkeys is 2.3. Some of these EQs are derived from quite small numbers and may not be strictly accurate because of sampling errors.

The rapid evolution in EQs of monkeys and apes, from 1.0 to 2.4 over the 30 million years of their existence, was much greater than that of other mammals and of birds during the same period. This was the third great quantum leap in the evolution of brain size and intelligence. There appear to have been two reasons for this rapid increase in EQ. First, while the early primates were nocturnal like the mammals from which they evolved (Byrne, 2002), the monkeys and apes became diurnal, living by day and sleeping at night. Diurnal species rely heavily on vision to obtain information about the external world, and in accordance with this principle the visual centers in the brain increased in size in monkeys and apes to give greater visual processing capacity. Second, they lived in social groups, whereas the early primates were solitary. Living in groups has the advantages for securing the exclusive use of a territory and its resources, and co-operation in finding food, rearing the young, and defense against predators. The cost is that the individuals have to learn complex social skills for living harmoniously with other group members, with whom they have to co-operate for defense of the territory but who are also competitors for food and mates. The social system of these animals typically consists of groups of around thirty to eighty animals, in which there are dominance hierarchies in which two or three dominant males have more food, sole access to the females when they are in estrus, and the best sleeping berths in trees. To keep their position, dominant males typically form alliances to fight off challenges from non-dominant males. The non-dominant males belong to the group but have to be careful to respect the position of the dominant males, who will drive them out of the group if they are challenged. Nevertheless, the non-dominant males seem to understand that if they exercise adroit social skills the time will

come when the dominant males will grow old and weak and eventually die, and they will be able to succeed them. To maintain their position in the group while awaiting this eventuality, non-dominant males have to exercise restraint and judgement in biding their time until they have a good chance of successfully challenging and displacing a dominant male. Meanwhile they form alliances with other non-dominant males to maintain their position in the group and strengthen their chances of becoming dominants. The acquisition of these social skills requires rapid learning and the capacity to inhibit challenges to the dominant males. These social skills have come to be designated "social intelligence" and they appear to need a relatively large EQ for understanding and manipulating the social relationships, observing, learning, and memorizing the characteristics of other group members, and inhibition of impulsive actions. Males with high social intelligence eventually become dominants and are able to reproduce, and this drives up the social intelligence of the species. The theory that becoming highly social animals was the niche that drove up the EQs of monkeys and apes has been developed by Dunbar (1992), who has shown that among primates the size of the social group in primate species is correlated with the EQ, suggesting that primates that live in larger groups need a higher EQ to deal with the more complex social relationships present among their members. Thus, the monkeys and apes occupied a new niche as co-operative social species that required greater intelligence provided by higher EQs.

Monkeys and apes display in various ways a high level of intelligence consistent with their high EQs. The most studied species is the chimpanzee. In the 1920s it was shown by Kohler (1925) that when confronted with a difficult problem, such as how to retrieve a banana hanging from the ceiling and out of reach, chimpanzees can figure out how to use boxes to build a platform onto which they can climb and grab the banana. Later it was shown by Goodall (1986) that chimpanzees in the wild learn to make and use tools for a variety of purposes. They take sticks from which they pare off the side stems, lick to make tacky, insert into the holes in termite mounds and ant nests, pull out the tacky sticks and eat the termites or ants adhering to them. They make pestles to pound the pulp from wood into an edible paste, and chisels to open bees' nests, use stones to break open nuts, use leaves for drinking cups and to clean themselves, and take up pieces of wood to threaten and hit predators and intruders into their territories. They also have a vocabulary of around a dozen cries to convey information, including the presence of predators, intrusion into their territories of neighboring groups, the location of a supply of food, willingness or unwillingness to share food, and so on. It has recently been shown that orangutans also make and use tools (Fox, Sitompul, and Van Schaik 1999). In laboratory studies only monkeys and apes can master oddity problems, in which three objects are presented, two of which are the same, and the correct choice is the odd one; and one-trial learning sets, where two different objects are presented and the correct choice varies from day to day.

5. *Hominids*

The fourth quantum leap in EQ and intelligence took place with the evolution of the *hominids*. This is the series of species that led eventually to the appearance of *Homo sapiens*. It began about 4 million years ago in central East Africa, in what is now Kenya and Tanzania, with the appearance of the australopithecines and was followed by the three successive species of *Homo habilis*, *Homo erectus*, and finally *Homo sapiens*. The times of these species and their EQs are given in rows 29 to 32 of Table 15.1. The first of these, the australopithecines, comprised several species. The first to appear was *Australopithecus afarensis*, which evolved from an ape closely resembling the chimpanzee. Over the next two million years further species of

australopithecines evolved including *africanus*, *robustus*, and *boisei*. The later species were larger and their brain sizes increased, but not in proportion to their body size, so their encephalization quotients remained the same. The reason for the evolution of the australopithecines was that apes are adapted to live in forests, but in central East Africa the climate became dryer and as a result much of the forest disappeared and was replaced by grasslands with some brushwood and the occasional clump of trees. Hence the apes in central East Asia had to adapt to survive in the new niche of open savanna. Their three most distinctive adaptations were that they stood upright, whereas apes move by knuckle walking on all fours; their thumbs evolved in opposition to the fingers; and their EQs increased. The principal adaptive advantages of the upright posture were that it afforded them better vision that enabled them to see predators at a greater distance, and to walk over long distances to forage for food, and that it freed the hands. The freeing of the hands and the development of the thumb in opposition to the fingers made it possible to use the hands to carry food from a distance back to the camp, to make stone tools, and to grip stones and pieces of wood more effectively and use them to drive off predators.

The EQs of the hominids showed approximately a threefold increase over the course of about 4 million years from about 2.6 of the apes from whom they evolved to 7.5 of *Homo sapiens*. This was a very rapid rate of increase as compared with the 56 or so million years for the same rate of increase to evolve in the primates from 0.75 of the first primates some 60 million years ago to 2.6 of the most encephalized monkeys and apes. The explanation for this increase is that the hominids entered a new niche of the open savannah in which survival was more cognitively demanding than that of the apes from which they evolved. The cognitive demands of the new niche would have consisted principally of finding a variety of different kinds of foods and protecting themselves from predators. The australopithecines and the succeeding hominids continued to live largely on plant foods, like the apes from whom they evolved, but in open savannah these had to be more varied and dispersed over a larger terrain than those of apes. To obtain these foods they would have needed spatial maps of a large area and this would have required a larger brain. The foods they ate can be determined from the wear of their teeth, which shows that they subsisted largely on a diet of leaves and fruits but that they also ate tubers, nuts, grass seeds, and insects (Isaac, 1978; Parker and Gibson, 1977; Grine and Kay, 1988; Stahl, 1984). Some of them lived on the shores of lakes Baringo and Turkana in present-day Kenya. Here they could pick up shellfish and crack them open by hitting them with a rock, which they were able to grip between their thumbs and fingers.

The hominids supplemented their plant and insect diet with a certain amount of meat obtained by scavenging and possibly by occasionally killing small animals. Baboons and chimpanzees sometimes kill small animals for food, although meat has never become more than a small part of their diet (Strum, 1981). Possibly the australopithecines and the later hominids *Homo habilis* did the same. They were also scavengers of the remains of animals killed by lions, cheetahs, and leopards. The sites of *Homo habilis* contain the bones of large herbivores with carnivore teeth marks on which stone-cut marks made by the hominids have been superimposed. This shows that the large herbivores had been killed by lions, cheetahs, and leopards and that *Homo habilis* scavenged the bones, which they broke up to extract the marrow and brains, which the lions, cheetahs, and leopards were unable to get at (Binford, 1985; Blumen-schne, 1989). With their increased EQ of 4.3, *Homo habilis* became the first hominids with the brain power to make stone tools on an extensive scale, by knapping flints to produce sharp cutting implements with which they made weapons such as spears and knives to dismember the carcasses of large mammals killed by lions, cheetahs, and leopards.

In addition to obtaining food, the other principal problem of the hominids living in open grasslands would have been to protect themselves against lions, cheetahs, and leopards. Apes and monkeys escape from the big cats by climbing into trees and swinging or jumping from one tree to another. For the australopithecines and the later hominids in open grasslands this was no longer possible. They must have warded off lions, leopards, and cheetahs by throwing stones at them and hitting them with clubs made from pieces of wood collected from the few trees that remained. For this their newly evolved thumbs giving greater gripping power would have been a great advantage. Chimpanzees sometimes use sticks to ward off predators but they do not collect an arsenal of sticks and stones for this purpose. The australopithecines would have had to do this and this would have required greater foresight and intelligence. A further selection pressure proposed by Alexander (1989) for the increase in the EQs of the hominids was probably that more intelligent individuals were more effective as tool makers and hunters and had greater social intelligence that enabled them to secure higher rank in dominance hierarchies, through which they increased their fertility.

6. IQs of Monkeys, Apes, and Pre-human Hominids

A number of attempts have been made to assess the intelligence of monkeys, apes, and pre-human hominids by using Piaget's theory of the development of intelligence in children. Piaget's theory states that children progress through four stages of cognitive development. The first of these is the sensorimotor stage of infancy in which the child learns about the properties of objects, space, time, and causality. At about the age of two, children make the transition to the "pre-operational" stage, in which they acquire language and abstract concepts but are not yet able to understand logical principles. This stage lasts until the age of about six. In Western societies children at around the age of seven make the transition to the "concrete operations" stage when they can grasp logical principles but only in concrete terms. At around the age of 12 years children progress to the fourth and final stage, "formal operations," when they become able to think logically in terms of general principles divorced from concrete examples.

The applications of this theory to the intelligence of monkeys, apes, and pre-human hominids have been summarized by Parker and McKinney (1999). Their conclusion is that most species of monkeys do not progress beyond the first of Piaget's stages, so they remain at the cognitive level of human toddlers at the ages of about two years. On the scale of human intelligence, their IQ would be about 12. Apes are at Piaget's early pre operations stage and reach the cognitive level of the average European 3-4-year-old. Their IQ would be about 22. Estimates of the Piagetian level of ability achieved by successive species of hominids from tools they made have been attempted by Wynn (1989). His conclusion is that *Homo habilis*, living in East Africa around 2.4 million years ago, was making simple stone tools that required the early stage of pre-operational ability, about the same as that of apes. *Homo erectus*, who appeared about 1.7 million years ago with a somewhat larger brain, made the more sophisticated Acheulian stone tools, including bifaced hand axes, that would have required the concrete operational thinking of the kind achieved by contemporary European 7-8-year-olds. From this it can be inferred that their IQ would have been about 50. 7uy

Chapter 16. Climate, Race, Brain Size, and Intelligence

1. Evolution of the Races
2. Cognitive Demands in Northern Latitudes
3. Race Differences in Brain Size
4. Race Differences in Winter Temperatures, Brain Size, and IQ
5. Brain Size and Intelligence in Humans
6. Contribution of Race Differences in Brain Size to Differences in Intelligence
7. Sex Differences in Intelligence and Brain Size
8. Genetical Processes in the Evolution of Race Differences in IQ

This chapter gives an account of the general principles of the evolution of race differences in intelligence. The crucial selection pressure responsible for the evolution of race differences in intelligence is identified as the temperate and cold environments of the northern hemisphere, imposing greater cognitive demands for survival and acting as selection pressures for greater intelligence. The South Asians and North Africans, the Europeans, the East Asians, Arctic Peoples, and Native Americans adapted to these cognitive demands by evolving greater brain size and intelligence. The genetical processes consisted of increases in the frequencies of the high intelligence alleles and of mutations for higher intelligence.

1. Evolution of the Races

The consensus theory of the evolution of the races is that humans evolved from apes in sub-Saharan Africa during the last four million years or so. During this time a succession of species known collectively as the hominids evolved with increasingly large brains. These were the australopithecines, followed by *Homo habilis* and then by *Homo erectus*, who appeared about 1.5 million years ago, and finally by *Homo sapiens* (modern humans) who appeared around 150,000 years ago (Relethford, 1988). From around 100,000 years ago groups of *Homo sapiens* began to migrate from equatorial Africa into other regions of the world and by around 30,000 years ago they had colonized most of the globe. In the early part of this period they spread through most of sub-Saharan Africa and by 100,000 years they were established in the south of Africa where they evolved into the Bushmen. By 88,000 years ago they were settled in southwest Asia. By 60-40,000 years ago they were established throughout Asia, and by about 40,000 years ago they were settled in Europe, the Indonesian archipelago, Australia, and the Americas. During the last 6,000 years or so they colonized the Pacific islands (Foley, 1997; Mellars and Stringer, 1999; Cavalli-Sforza, 2000). A map showing the approximate times and directions of the migrations of modern humans indicated from the archeological record is given in Figure 1.

It is a general principle of evolutionary biology that when populations are isolated from one another in different locations, they inevitably develop genetic differences and evolve into different breeds or, in the case of humans, races. These differences evolve through the processes of founder effects, genetic drift, mutation, and adaptation to different environments. The founder effect occurs when a small group breaks away from a population, migrates to a new location, and establishes a new population. The migrating group is likely to differ genetically by chance from the group it has left, bringing about two groups with different genetic characteristics. It is not considered likely that this process played any significant part in the development of genetic differences in intelligence between the races. The second process through which races diverge genetically is through genetic drift. This is a process in which the fre-

quencies of some genes increase, while those of others decrease, through chance. It is possible that the racial differences in the frequencies of different blood groups and of genetic diseases may have arisen in this way, but again this process is not considered likely to have played any significant part in the development of race differences in intelligence. It is believed that it is through the two remaining processes of adaptation to different environments and genetic mutations occurring in some races but not in others that race differences in intelligence have come about.

Many of the human race differences can be understood as adaptations

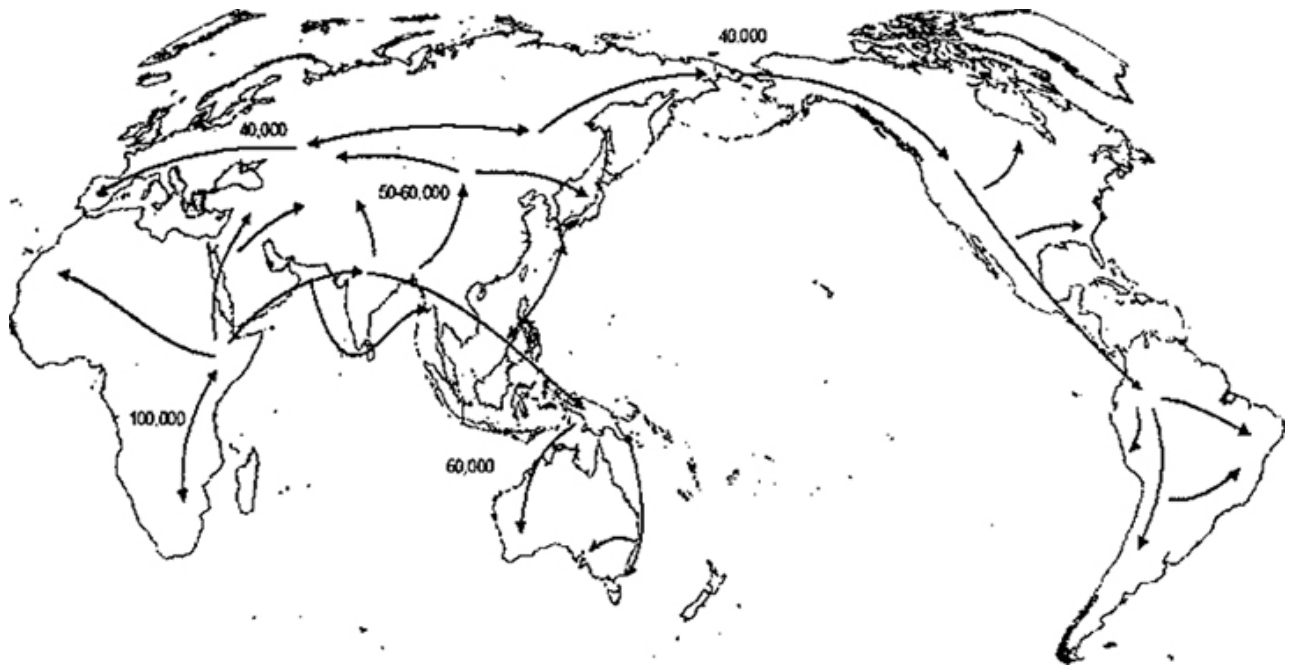


Figure 1. Migrations of modern humans, beginning in Africa about 100,000 years ago.

to climate. The morphological differences have evolved in accordance with Allen's law' which states that species and breeds in cold regions tend to evolve shorter limbs because these produce a smaller ratio of surface to body volume and this reduces heat loss. Hence, East Asians and Europeans in temperate and cold environments have shorter limbs than Africans in tropical and sub-tropical environments. The dark skin of the Africans and Australian Aborigines living in tropical and sub-tropical environments gives protection against sunburn and skin cancer; the absence of facial hair in East Asian men prevents frostbite that would develop if the hair froze on the face; the smaller nostrils of East Asians and Europeans as compared with Africans and Australian Aborigines warm and humidify inhaled air (Coon, 1962; Krantz, 1980).

2. Cognitive Demands in Northern Latitudes

The selection pressure for enhanced intelligence acting on the peoples who migrated from tropical and sub-tropical equatorial Africa into North Africa, Asia, Europe, and America was

the problem of survival during the winter and spring in temperate and cold climates. This was a new and more cognitively demanding environment because of the need to hunt large animals for food and to keep warm, which required the building of shelters and making fires and clothing. In addition, Miller (2005) has proposed that in temperate and cold climates females became dependent on males for provisioning them with food because they were unable to hunt, whereas in the tropics women were able to gather plant foods for themselves. For this women would have required higher intelligence to select as mates the men who would provision them. For all these reasons temperate and cold climates would have exerted selection pressure for higher intelligence. The colder the winters the stronger this selection pressure would have been and the higher the intelligence that evolved. This explains the broad association between latitude or, more precisely, the coldness of winter temperatures and the intelligence of the races.

The theory that race differences in intelligence evolved because the peoples who migrated out of Africa into the temperate and cold climates of Asia and Europe entered a more cognitively demanding niche that required greater intelligence is a further instance of the general principle that had operated in the evolution of greater intelligence in mammals when they colonized the nocturnal niche, birds when they colonized the air, monkeys and apes when they became co-operating social animals, and hominids when they adapted to the open savannah. The new niche of the temperate and cold environments colonized by the races that migrated out of Africa demanded an adaptation from an herbivorous to a largely carnivorous life style. The primates from whom humans evolved had lived for a period of approximately 60 million years as herbivores in the tropical and sub-tropical environment of equatorial Africa, in which plant foods are available throughout the year. The hominids that evolved in equatorial East Africa remained largely herbivorous. In contemporary times hunter-gatherer peoples in tropical and subtropical latitudes continue to subsist largely on plant foods, of which numerous species are available throughout the year (Lee, 1968; Tooby and de Vore, 1989).

Because primates are adapted as herbivores in tropical and sub-tropical environments they have found it difficult to survive in temperate environments in which plant foods are not available for a number of months in the winter and spring. An early instance of primates encountering the problem of survival during the winter and spring in temperate environments occurred during the mid-Miocene between 16 and 14 million years ago. This was a warm period in which much of Eurasia became subtropical. Two species of apes, *Pliopithecus* and *Dryopithecus*, migrated from Africa into Eurasia and flourished there. At the end of this period, about 14 million years ago, Eurasia became colder and the climate became temperate. In Europe and in most of Asia these apes were unable to survive during the winters and became extinct. The only part of Asia where these early apes were able to survive was in the tropical southeast and the Indonesian archipelago, where they evolved into the orangutans and gibbons (Pickford, 1986).

3. Race Differences in Brain Size

The races that migrated into the temperate and cold environments of North Africa, Asia, Europe, and the Americas evolved greater intelligence to survive in these more cognitively demanding climates. To accommodate this enhanced intelligence they evolved larger brains, just as had occurred in previous adaptations in the evolution of mammals, birds, and primates to more cognitively demanding niches. Studies on race differences in brain size have been given for each race in Chapters 3 through 12. It is not possible to average these to give mean

brain sizes, because there are different methods for measuring brain size and these give different results. The principal methods are by measuring the length, breadth, and height of the head of living individuals and calculating the volumes, and by filling skulls with lead shot or seed and transferring these to a container to measure the volume. What is needed is a large collection of brain sizes measured by the same method and one that includes all the races. Only one such data set is available. This is the mean brain sizes of 87 populations worldwide, based on measurements of approximately 20,000 crania, published by Smith and Beals (1990). These are categorized in Table 16.1 into the ten races with which we are concerned. The figures in bold are the means of the brain sizes of the samples of each race.

Table 16.1. Brain sizes (cc) for ten races

Race	Brain Size	Race	Brain Size	Race	Brain Size
Native Americans	1,366	Arctic Peoples	1,443	Africans	1,282
Alacaluf	1,397	Aleut	1,518	Azande	1,345
Araucanians	1,386	Buryat	1,465	Batetela	1,274
Arikara	1,399	Inuit	1,377	Mangbetu	1,247
Blackfoot	1,365	Inuit	1,474	Masai	1,245
Botocudo	1,350	Inuit	1,411	Nubians	1,235
Caddo	1,345	Inuit	1,429	Xhosa	1,344
Carib	1,315	Koryak	1,419		
Cheyenne	1,399	Ostyak	1,416	Pacific Islanders	1,317
Chinook	1,321	Yakut	1,478	Maori	1,393
Chippewa	1,418	Yukaghir	1,439	Marquesians	1,336
Choctaw	1,292			New Britain	1,232
Cowichan	1,288	Australian Aborigines	1,225	New Caledonia	1,311
Delaware	1,411	NSW	1,228	New Ireland	1,250
Гуаджиро	1,263	NT	1,232	Tahitians	1,380
Gosiute	1,338	QL	1,215		
Gros Ventre	1,394	Tasmanians	1,239	Bushmen	1,270
Haida	1,358	West	1,212		
Huron	1,424			South Asians	1,293
Koskimo	1,330	Europeans	1,369	Arabs	1,315
Mandan	1,382	Basques	1,368	Burmese	1,227
Maya	1,342	Czechs	1,341	Egyptians	1,379
Nahua	1,388	Dutch	1,373	Hindus	1,362
Native Americans	1,366	Europeans	1,369	South Asians	1,293
Nez Perce	1,483	French	1,361	Sinhalese	1,222
Ona	1,391	Germans	1,391	Tamils	1,254
Paiute	1,328	Italians	1,411		

Pawnee	1,334	Poles	1,315	Southeast ans	Asi-	1,332
Piegan	1,381	Scots	1,316	Andamanese		1,214
Quechua	1,296	Swiss	1,408	Javanese		1,403
Salish	1,284			Lawa		1,413
Tarahumara	1,404	East Asians	1,416	Papuans		1,304
Teton	1,454	Chinese	1,418	Papuans		1,270
Wichita	1,309	Gilyak	1,443	Seri		1,388
Yahgan	1,363	Japanese	1,318			
Zuni	1,235	Kalmyk	1,371			
		Mongols	1,489			
		Samoyed	1,458			

4. Race Differences in Winter Temperatures, Brain Size, and IQ

The evolution of larger brain size to accommodate greater intelligence in the races that occupied the colder environments is shown in Table 16.2. Column 2 gives the races ranked by the severity of the winter temperatures to which they were exposed. Column 3 gives present-day coldest winter monthly temperatures taken from the Encyclopedia Britannica World Atlas and are averages of the regions inhabited by the races. Column 3 gives the coldest winter monthly temperatures during the main Wurm glaciation, which lasted between approximately 28,000 and 10,000 years ago and during which winter temperatures fell by about 5 degrees centigrade in the northern hemisphere but not in the southern hemisphere (Roberts, 1989; Foley, 1987). Column 4 gives average brain sizes taken from Table 16.1. It is apparent that there is a general correspondence between coldest winter monthly temperatures and brain sizes. For the first six races listed, brain sizes decrease with less severely cold winter monthly temperatures. However, in the remaining four races this linear trend becomes irregular. The Africans inhabit a warmer zone than the Bushmen but have larger brain size. The Australian Aborigines continue the trend with a warmer zone and lower brain size. However, the Southeast Asians and the Pacific Islanders in tropical and sub-tropical zones have larger brain sizes than the South Asians and North Africans, the Bushmen, the Africans, and the Australian Aborigines.

Column 5 gives the IQs of the races. Here too it is apparent that there is a general correspondence between the IQs and the coldest winter monthly temperatures and brain sizes, but once again there are anomalies. First, the Arctic Peoples inhabit the coldest zone and have the largest brain size, but their IQ is only 91. Second, the Bushmen have the second smallest brain size (1,270cc) but the lowest IQ (54), while the Australian Aborigines have the smallest brain size (1225cc) but a slightly higher IQ (62) than the Bushmen. Apart from these anomalies there is a perfect correspondence between race differences in brain size and IQ. To explain these anomalies we have to consider the genetical principles involved in the evolution of the race differences in intelligence. This question is taken up in Section 8.

Table 16.2. Race differences in winter temperatures (degrees centigrade) and brain size

Race	Winter Temp	Wurm Temp	Brain Size	IQ
Arctic Peoples	-15	-20	1,443	91
East Asians	-7	-12	1,416	105
Europeans	0	5	1,369	99
Native Americans	7	5	1,366	86
S. Asian & N. Africans	12	7	1,293	84
Bushmen	15	15	1,270	54
Africans	17	17	1,280	67
Australians	17	17	1,225	62
Southeast Asians	24	24	1,332	87
Pacific Islanders	24	24	1,317	85

studies that used an external measure of head size. Every single one of the studies showed a positive relationship and the overall correlation was 0.18. They also report 11 studies of normal populations that measured brain size by CT (computerized axial tomography) and MRI (magnetic resonance imaging), which give a more accurate measure of brain size, and for which there was an overall correlation of 0.40. A further study published subsequent to this review found a correlation for 40 subjects between brain size measured by MRI and intelligence of 0.44 (Thompson, Cannon, Narr, et al., 2001). Vernon et al. conclude that the most reasonable interpretation of the correlation is that brain size is a determinant of intelligence. Larger brains have more neurons and this gives them greater processing capacity. It is not only among humans that brain size is correlated with intelligence. The same association has been found among rats in a study by Anderson (1993), in which rats' ability to learn their way through mazes was positively correlated with their brain weight.

The correlation of 0.40 obtained by Vernon et al. (2000) between brain size and IQ should be corrected for measurement error ("correction for attenuation") of the intelligence tests. Correction for measurement error is obtained by dividing the correlation by the square root of the product of the reliability coefficients of the two measures from which the correlation coefficient is computed. The reliability of intelligence tests is typically around 0.90 (Bouchard, 1993, p. 49; Mackintosh, 1998). The reliability of the brain size measures is not known but it is assumed to be perfect. Correction of the correlation of 0.40 between brain size and IQ for the imperfect reliability of the intelligence tests (0.90) gives a true correlation coefficient of 0.44.

6. Contribution of Race Differences in Brain Size to Differences in Intelligence

We now consider the extent to which race differences in brain size can explain the differences in intelligence. To do this we have to calculate the race differences in brain size in standard deviation units (d) and multiply the d s by the correlation between brain size and intelligence. This gives the IQ differences of the races attributable to the brain size differences. These calculations require means and standard deviations of brain size for the races. The standard de-

viations are only available for Europeans, Africans, Native Americans, South Asians, and East Asians and are given by Seals, Smith, and Dodd (1984) so these are the only races for which the calculations can be made. The results are summarized in Table 16.3. Column 1 gives the two races being compared. Column 2 gives the differences in brain size between the two races expressed as d scores (i.e., in standard deviation units) calculated from the figures given in Table 16.1. Column 3 gives the IQ difference between the two races expressed as d scores predicted from the brain size difference, obtained as the product of the d scores given in column 2 multiplied by 0.44 (the correlation between brain size and intelligence corrected for measurement error). Column 4 gives the racial IQ differences predicted from the brain size differences. Column 5 gives the actual IQ of the race in comparison with 99 for Europeans.

Row 1 gives these figures for the European-African comparison. The difference in brain size predicts that Africans would have an IQ of 91. Their actual IQ is 67, so the brain size difference predicts 28 percent of the IQ difference. In Chapter 4 the genotypic IQ of Africans was calculated as 80, so the brain size difference explains about half the genotypic IQ difference. The other half must be attributed to differences in neurophysiological processes.

Row 2 gives the figures for the European-Native American comparison. The difference in brain size predicts that Native Americans would have an IQ of 97. Their actual IQ is 86, so the brain size difference predicts about a fifth of the IQ difference. Row 3 gives the figures for the European-South Asian and North African comparison. The difference in brain size predicts that South Asians and North Africans would have an IQ of 96. Their actual IQ is 84, so the brain size difference predicts a quarter of the IQ difference. Row 4 gives the figures for the European-East Asian comparison. The difference in brain size predicts that East Asians would have an IQ of 109. Their actual IQ is 105, so this time the brain size difference overpredicts the IQ difference by 4 IQ points. There are two likely explanations for this. The first is that East Asians suffer environmental disadvantages that prevent their genotypic IQ being realized; if this is so, the East Asian IQ will rise to around 109 when their environmental conditions improve to the level of Europeans. The second is that the large East Asian brain serves cognitive abilities not fully represented in intelligence tests. The most likely of these is the visualization abilities.

Although the contribution of race differences in brain size to race differences in IQs can only be calculated for the racial comparisons given in Table 16.3, the results showing that race differences in brain size explain about a quarter of the differences in intelligence can probably be reasonably be extended to all race differences. The remainder of the differences are attributable to environmental inequalities and differences in neurophysiological processes.

Table 16.3. Race differences in IQs predicted from differences in brain size

	Racial comparisons	Brain size difference: d	Predicted IQ difference: d	Actual IQ difference: d
1	European- African	1.46	0.69	2.1
2	European-N. American	0.43	0.20	0.9
3	European-South Asian	0.48	0.23	0.8
4	European-East Asian	1.23	0.58	0.4

7. Sex Differences in Intelligence and Brain Size

A problem that has sometimes been raised in connection with the existence of race differences in brain size and intelligence is that women have significantly smaller brains than men and yet it has been virtually universally asserted that there is no difference in intelligence between men and women. For instance "women's brains are 10% smaller than men's, but their IQ is on average the same" (Butterworth 1999, p. 293). Since women with their smaller average brain size are just as intelligent as men, it appears to follow that brain size has no effect on intelligence. This is the conclusion drawn by Gould (1996, p. 132), who writes that it disproves "the myth that group differences in brain size bear any relationship to intelligence." The smaller average brain size of women has been shown by Ankney (1992) and Rushton (1992). Ankney calculated that the average male brain, adjusted for larger body size, is 100 grams heavier than that of women. Rushton calculated from another data set of 6,325 military personnel that the average male brain, adjusted for larger body size, is 1,442cc and the average female brain is 1,332cc, a male advantage of 110cc; 1cc of brain tissue weighs approximately 1 gram, so the Ankney and Rushton results are closely similar.

Thus we have the paradox that brain size is positively related to intelligence, that men have larger average brain size than women, and yet men and women have the same intelligence. I have presented the resolution of this paradox in Lynn (1994b and 1999) and in Lynn and Irwing (2004). It is that up to the age of 15 years males and females have approximately the same intelligence except for a small male advantage on the visualization abilities, but from the age of 16 years males begin to show greater intelligence, reaching an advantage of from 3 to 6 IQ points in adults. Intelligence can be defined in four ways and in three of these the evidence for higher average IQs in men is quite clear. First, intelligence can be defined as the full-scale IQ of the Wechsler tests, which provide the average of all major abilities including verbal comprehension, verbal and non-verbal reasoning, visualization, perceptual ability, immediate memory, and perceptual speed. On five standardization samples of the tests for adults the average male advantage is 3.5 IQ points (Lynn, 1994b, 1997, 1999). A more recent study by Colom, Garcia, Juan-Espinosa, and Abad (2002) of the Spanish standardization sample of the WAIS-III reports an almost identical male advantage of 3.6 IQ points. The average male advantage of 3.5 IQ points among adults on the full scale IQ of Wechsler tests obtained from the six standardization samples underestimates the true male advantage for two reasons. First, the tests are biased in favor of females because verbal abilities, on which the male advantage is relatively small, are over-represented with six subtests, while visualization abilities, on which the male advantage is larger, are under-represented with only two subtests (block design and mazes). Second, in the construction of the tests a number of items favoring either males or females were eliminated, which would tend to produce equal IQs for males and females (Matarazo, 1972).

A second approach to the issue is to define intelligence as non-verbal reasoning ability as measured by the Progressive Matrices. This is the definition adopted by Mackintosh (1996), and the test is widely regarded as one of the best tests of *g* (general intelligence). It has been asserted by Court (1983), Mackintosh (1996), and Jensen (1998) that there is no difference in the mean scores obtained by males and females on the Progressive Matrices and therefore that there is no difference between males and females in reasoning or in *g*. Contrary to these assertions, a meta-analysis of all fourteen known studies of adults has shown that men invariably obtain a higher mean IQ than women on the Progressive Matrices by an average of 5 IQ points (Lynn and Irwing, 2004).

A third approach to the problem is to define intelligence as the average of non-verbal reasoning, verbal comprehension, and visualization abilities, as proposed by Gustafsson (1984). Data assembled from thirteen countries show that on this definition the mean IQ of adult men exceeds that of women by 4.9 IQ points (Lynn, 1999, p. 4).

The most satisfactory definitions of intelligence are (1) to follow Mackintosh (1996) and define it as non-verbal reasoning ability, or (2) to define it as the average IQ of non-verbal reasoning, verbal comprehension, and visualization abilities. The two definitions yield similar results. On the first there is an adult male advantage of 5 IQ points (Lynn and Irwing, 2004), while on the second there is an adult male advantage of 4.9 IQ points (Lynn, 1999).

A fourth approach is to define intelligence as the *g* extracted from a battery of tests containing all or most of the major primary abilities. This definition has been adopted by Jensen (1998, p. 538). He presents the results of five studies. The results were that males obtained higher IQs of 5.49 IQ points on the ASVAB (Armed Services Vocational Aptitudes Battery for 18-23-year-olds), 0.18 on the American standardization sample of the WAIS (25-34-year-olds), and 2.83 on the American standardization sample of the WISC-R (5-16-year-olds), while females obtained higher IQs of 0.03 IQ points on the BAS (British Ability Scales 14-17-year-olds), and 7.91 IQ points on the GATB (General Aptitude Test Battery for 18-year-olds). From these inconsistent results he concludes that "the sex difference in psychometric *g* is either totally nonexistent or is of uncertain direction and of inconsequential magnitude" (Jensen, 1998, p. 340). Jensen's conclusion does not resolve the problem that males have larger average brain size than females, yet according to this analysis have the same average IQ. Jensen suggests that the resolution of this problem may be that males and females have the same number of neurones but the female ones are more densely packed into a smaller brain (p. 541). It is improbable on general biological grounds that a sex difference of this kind would have evolved and it has been disconfirmed by Packer and Gundersen (1997), who found that men have more neurones than women (22.8 billion compared with 19.3 billion), but there is no difference in neuronal density between male and female brains.

There are two problems with Jensen's conclusion that there is no sex difference in intelligence. First, he does not acknowledge the evidence that I set out in Lynn (1994b) and that has been confirmed by Colom and Lynn (2004) and Lynn and Irwing (2004) that the male advantage is not present or is minimal up to the age of 16 years, so the results of the WISC-R on 5-16-year-olds and of the British Ability Scales on 14-17-year-olds need to be set aside. Second, the inconsistency between the 5.49 IQ male advantage on the ASVAB and the 7.91 female advantage on the GATB is so great that something must be wrong with the method. The problem is that the nature of the *g* extracted from a battery of tests is affected by the kind of tests in the battery. A predominantly verbal test like the Wechsler's yields a verbal *g* on which on the adult male advantage is quite small. The GATB, on which there is a female advantage 7.9 IQ points on *g*, contains a number of perceptual and psycho-motor tests and hence yields a perceptual-psychomotor *g*. Females perform better than males on these tests and so, as Nyborg (2003, p. 206) correctly observes, they have a higher *g*. If these tests are removed and the tests of verbal, numerical, and spatial abilities are analyzed, the female advantage disappears, as Jensen shows (1998, p. 543). More recent studies using this method show further inconsistent results. Colom, Juan-Espinoza, Abad, and Garcia (2000), analyzing a large Spanish sample, and Colom, Garcia, Juan-Espinoza, and Abad (2002), analyzing the Spanish standardization sample of the WAIS-III by the same method, found that the sex differences in *g* were negligible. However, using the same method Nyborg (2003, p. 209) has obtained a male advantage among adults of 5.55 IQ points and Colom and Lynn (2004), in an analysis of the Spanish standardization sample of the DAT, obtain a male advantage among 18-year-olds of

4.3 IQ points. It is evident that the sex difference obtained by this method is highly variable. The reason for this is that different tests produce different *gs*.

The higher male IQ can be ascribed to the larger male brain. Three studies have shown that the average male brain size exceeds that of the female brain, corrected for body size. Ankney (1992) found a larger brain size measured by weight of approximately 100 grams. Rushton (1992) found a difference in volume of HOcc and Tan et al. (1999) found a difference among college students in Turkey of 91cc. Ankney expresses the male-female difference as $0.78d$ (SD units). The correlation of brain size with intelligence is 0.44 (corrected for test reliability). Hence the predicted male advantage in intelligence arising from a larger average brain size is 0.78 multiplied by 0.44, giving a male advantage of $.34J = 5.1$ IQ points. This should be considered the same, within the range of error arising from the use of different tests, measurement error, and different definitions of intelligence, as the actual male advantages of 4.9 IQ points estimated in Lynn (1999), 5.0 IQ points estimated in Lynn and Irwing (2004), 5.49 IQ points on the ASVAB, 5.55 IQ points found in a Danish sample by Nyborg (2003, p. 212), and 4.3 IQ points found by Colom and Lynn (2004) in a Spanish sample. The average of the four estimates is 5.0 IQ points and should be adopted as the best estimate of the male advantage among adults. This advantage is wholly explicable by the larger male brain, as would be expected because males and females experience the same environment and therefore environmental factors cannot account for the male-female difference. The explanation in evolutionary terms for the greater average intelligence of men is probably that in most social species males compete with one another to obtain female mates and in the evolution of the hominids intelligence came to play a significant role in success in this competition. Females do not compete for male mates to anything like the same extent. This would have exerted stronger selection pressure for enhanced intelligence in men than in women.

9. Genetical Processes in the Evolution of Race Differences in IQ

Two genetical processes must be assumed to explain the evolution of race differences in intelligence. The first of these is that differences in the frequencies of the alleles for high and low intelligence have evolved between races such that the alleles for high intelligence are more common in the races with the higher IQs and less common in the races with the lower IQs. The early humans that migrated out of Africa and spread throughout the world would have carried all the alleles for high and low intelligence with them, but those who colonized Asia and Europe were exposed to the cognitively demanding problems of survival during cold winters. Many of those carrying the alleles for low intelligence would have been unable to survive during the cold winters and the less intelligent individuals and tribes would have died out, leaving as survivors the more intelligent. This process would have reduced and possibly eliminated the alleles for low intelligence, leaving a higher proportion of the alleles for high intelligence. The more severe the winter temperatures, the greater the selection pressure for the elimination of low IQ individuals carrying low IQ alleles. This process explains the broad association between coldest winter temperatures and IQs and brain size shown in Table 16.2.

A parallel genetical process must have been involved in the evolution of race differences in skin color. The first humans who evolved in tropical equatorial Africa must have had black or very dark skins, as these peoples do today, because of the adaptive advantage of dark skin in strong sunlight. When some of these early peoples migrated into North Africa, Asia, and Europe, alleles for paler skins must have appeared as mutations. Individuals with these mutations would have had a selective advantage because they could synthesize vitamin D from

sunlight, while at the same time they did not suffer the disadvantage of contracting skin cancer from the excessively strong sunlight of the tropics. Hence, individuals with paler skins left more surviving offspring, with the result that the alleles for paler skins spread through the population and eventually replaced the alleles for dark skin. This process produced the same broad gradient for skin color as evolved for intelligence, with the Arctic peoples, East Asians, and Europeans having evolved the palest skins, the South Asians and North Africans, Native Americans, Southeast Asians, and Pacific Islanders having evolved somewhat paler skins, while the Africans, Bushmen, and Australian Aborigines exposed to the strongest sunlight retained the darkest skins.

A second genetical process has been proposed by Miller (1996, 2005), in which several new alleles for high intelligence appeared as mutations in some races but did not appear in others, and these were never transmitted to some other races. This assumption is necessary to explain some of the anomalies in the general relationship between severe winters and the race differences in intelligence. The general principles are that new mutant alleles for high intelligence would be most likely to appear in large populations and in populations that are subjected to stress. New mutant alleles for high intelligence would be most likely to appear in large populations because a mutation is a chance genetic event and hence is more likely to occur in races with large populations. In addition, populations subjected to stress, including extreme temperatures, also experience more mutations (Plomin, DeFries, and McClearn, 1990, p. 91). The effect of these two principles is that mutations for higher intelligence would have been more likely to occur and can be assumed to have occurred more frequently in the South Asians, who had large populations and were subjected to cold stress, and particularly in the East Asians and Europeans, who had large populations and were subjected to extreme cold stress, than in the Africans, who had a large population but were not subjected to extreme cold stress, and in the Australian Aborigines and Bushmen, who had small populations and were not subjected to extreme cold stress. The Arctic Peoples were subject to extreme cold stress but comprised very small populations, so they would be unlikely to have had mutations for higher intelligence. It may also be that "directed mutation" also operated to produce new mutant alleles for high intelligence in the South Asians, and particularly in the East Asians and Europeans. The concept of "directed mutation" is that a mutation is more likely to occur if it is advantageous to the organism. The theory was first proposed by Cairns, Overbaugh, and Miller (1988) and has been supported by a number of biologists (Lenski and Mittler, 1993). Higher intelligence would have been more advantageous for the South Asians, and particularly for the East Asians and Europeans, than for the Africans.

Once a new mutant allele for higher intelligence had appeared it would confer a selection advantage and would have spread throughout the group of around 50 to 80 individuals in which people lived during the hunter-gatherer stage of human evolution. It would then have spread fairly rapidly to adjacent groups because hunter-peoples typically have alliances with neighboring groups with which they exchange mating partners, and it is reasonable to assume that this custom was present for many thousands of years during the evolution of the races. These alliances of groups are known as *demes*, and a new mutant allele for higher intelligence and which conferred a selection advantage would have spread fairly rapidly through a deme. From time to time matings would take place between demes and by this means new mutant alleles for higher intelligence would spread from one deme to another and eventually throughout an entire race. It has been estimated by Rouhani (1989), using reasonable assumptions of a selection coefficient of 0.01 and a 5 percent migration per generation between hunter-gather demes of around 500 individuals, that advantageous alleles would spread at a rate of 0.8 miles a generation. Thus, in 25,000 years, consisting of approximately 1,000 generations, an advantageous allele would be transmitted about 800 miles. Hence, an advanta-

geous allele occurring as a mutant in the region of, say, Beijing, 25,000 years ago would not yet have spread outside China and would take another 50,000 years or so to reach the Arctic Peoples of far Northeast Asia. This model does not, however, take account of the geographical barriers that have generally been present between the races, such as the Gobi Desert between East Asians and Europeans and the Sahara between sub-Saharan Africans and North Africans, which have largely prevented interbreeding between the demes of different races and hence the transmission of new mutant alleles for higher intelligence from one race to another.

Chapter 17. The Evolution of Race Differences in Intelligence

1. Africans
2. Bushmen
3. South Asians and North Africans
4. Southeast Asians
5. Pacific Islanders
6. Australian Aborigines
7. Europeans.
8. East Asians
9. Arctic Peoples
10. Native Americans
11. Conclusions

Now that the general principles of the evolution of intelligence and the crucial effects of climate on the evolution of race differences in intelligence and brain size have been set out in Chapters 15 and 16, we are able to reconstruct for each race how and when the differences in intelligence evolved. We begin with the *Homo erectus* peoples who flourished in equatorial Africa from approximately 1.7 million years ago to around 200,000 years ago. During this period their brain size increased from about 885cc to about 1,186cc (Ruff, Trinkaus, and Holliday, 1997). The reason for this increase in brain size is that in all mammals intelligence has been under continual directional selection, i.e., the more intelligent individuals left more surviving offspring, and this process was speeded up in the evolving hominids. At the end of this period *Homo sapiens* had appeared (Relethford, 1988) and the quality of their tools suggests that they were capable of Piaget's stage of concrete operational thinking of the kind achieved by contemporary European 7-8-year-olds, indicating that their IQ was about 50 (Chapter 15, Section 6).

1. Africans

During the last 200,000 years the ancestors of the Africans continued to inhabit the tropical and sub-tropical environments of equatorial sub-Saharan Africa. This environment was not strongly cognitively demanding for them because primates had become adapted to it for some 60 million years. During the evolution of the hominids *Homo erectus* were largely plant eaters but supplemented their diets with scavenging the carcasses of animals killed by lions, leopards, and cheetahs (Lee, 1968; Tooby and de Vore, 1989). The evolving Africans lived much as hunter-gatherer peoples in tropical and sub-tropical environments do today, subsisting

largely on plant foods, of which numerous species are available throughout the year, and on insects and eggs, with only occasional supplementation from animal meats obtained from hunting.

The ready availability of plant foods, insects, and eggs throughout the year meant that the evolving African peoples in tropical and sub-tropical Africa did not have to hunt animals to obtain meat. A conference of anthropologists was convened in 1966 to debate the Man the Hunter thesis of the importance of hunting for contemporary hunter-gatherers, at which "the consensus of opinion was that meat is of relatively little nutritional importance in the diets of modern tropical foragers" (Stanford and Bunn, 2001, p. 4). In 1999 a similar conference took place at which there was "a consensus that hominid diets were primarily plant based, as they are among modern tropical foragers" (Stanford and Bunn, 2001, p. 356). Hence the Africans had no need to develop the intelligence, skills, tools, and weapons needed for hunting large mammals. Furthermore, the temperature of equatorial Africa varies annually between approximately 32°C. in the hottest month and 17°C. in the coldest, so the African peoples did not encounter the cognitively demanding requirements of having to make needles and thread for making clothes and tents, to make fires and keep them alight, or to prepare and store food for future consumption. It was relatively easy to keep babies, infants, and young children alive because there was no need to provide them with clothing and from quite a young age they were capable of going out and foraging for food by themselves.

Nevertheless, the brain size of the Africans increased during the last 200,000 or so years from approximately 1,186 to 1,276cc, and it can be reasonably assumed that this entailed an increase in their intelligence to its contemporary value of 67. This increase occurred because of continual directional selection for intelligence, i.e., the more intelligent individuals had more surviving offspring. The genetical processes will have consisted of the increase in the frequencies of the alleles for higher IQs and probably of some mutations for higher intelligence. If these mutations for higher intelligence appeared they would have spread through the population because high intelligence is a fitness characteristic but they would not have spread so rapidly and extensively as in the races in temperate and cold climates because the selection pressures for higher intelligence were not so strong in the benign climate of equatorial Africa.

The level of intelligence that evolved in the Africans was sufficient for them to make a little progress in the transition from hunter-gathering to settled agriculture, but not sufficient to develop anything that could be called a civilization with a written language and arithmetic, construction of a calendar, cities with substantial stone buildings, and other criteria set out by Baker (1974).

2. *Bushmen*

It appears to have been around 100,000 years ago that some groups of archaic Africans began to migrate south, where they evolved into the Bushmen, who came to occupy most of southern Africa but of whom only a few tens of thousands survive today in the Kalahari Desert. During the last 100,000 years the brain size of the Bushmen increased by approximately ten percent to 1,270cc, at which it stands today, and their IQ increased to 54. The climate in southern Africa is warm temperate with slightly cooler winters than in equatorial Africa. Nevertheless, the Bushmen were able to survive largely on plant foods, insects, and eggs, as they do today. It has been reported by Stahl (1984) that Bushmen eat around 90 different plant foods and these constitute 70-85 percent of their diet. Hence, they were not exposed to the

cognitive demands of survival in a cold temperate environment. Nevertheless, on a solely climatic theory of the evolution of race differences in intelligence, the Bushmen should have evolved a higher level of intelligence than the Africans. This failed to occur, and the IQ of the Bushmen today is lower than that of the Africans (54 and 67, respectively). The explanation for this is probably that some mutations for higher intelligence appeared in the Africans because of their large population that did not appear in the Bushmen because of their smaller numbers. However, the brain size of the Bushmen is only slightly smaller than that of Africans (approximately 1,270cc and 1,276cc, respectively). This indicates that the mutant alleles for higher IQs that probably appeared in Africans and spread through the population were for neurological processes rather than for increased brain size.

3. South Asians and North Africans

The first groups to migrate out of sub-Saharan Africa colonized North Africa and Southwest Asia between about 100,000 to 90,000 years ago. In the period between about 90,000 to 60,000 years ago they colonized the whole of South Asia. Here they were isolated from the Africans by distance and by the Sahara Desert and evolved into the South Asians and North Africans. They initially encountered a temperate climate similar to that of today, with the coldest winter month about 13°C. Around 70,000 years ago the first ice ages began in the northern hemisphere and lasted until around 50,000 years ago. This was followed by a warmer period between around 50,000 and 28,000 years ago, and then by a second and more severe ice age (the main Wiirm glaciation) that began around 28,000 years ago and lasted until around 10,000 years ago, when temperatures rose quite rapidly to the benign climate of today (Roberts, 1989; Foley, 1987). During the main Wiirm glaciation winter temperatures in North Africa, Eurasia, and North America fell by approximately 5°C. (Roberts, 1989), and the coldest winter month in North Africa and South Asia fell to approximately 7°C.

Survival during the ice ages for the peoples in the cold temperate environments in North Africa and South Asia, and later in the sub-arctic environment of Europe and northern Asia, would have presented a number of cognitively demanding problems that would have acted as selection pressures for greater intelligence than was required in the tropical and sub-tropical climates of sub-Saharan Africa. There would have been five major problems. First: plant foods were not available during the winter and spring, and were not abundant even in the summer and autumn; insects and reptiles were not available either, because these hibernate in temperate climates. The major source of food, therefore, became large mammals such as antelope, deer, horses, and boars that people had to hunt to secure food supplies. It would have been difficult to hunt these large mammals in the grasslands that covered much of the northern hemisphere during the last ice age because there is good visibility for several thousand yards and the herbivores have ample warning of approaching predators. Hunting in open grasslands is more difficult than in the woodlands of the tropics and sub-tropics, where there is plenty of cover for hunters to hide in. The humans that evolved in equatorial Africa were largely herbivorous and were not adapted for hunting large mammals, so this would have presented new cognitive problems for them. Large herbivores can run fast and are virtually impossible to catch simply by chasing after them. The only way of killing these animals was to make use of natural traps into which the animals could be driven and then killed. One of the most frequently exploited natural traps was narrow ravines through which the beasts could be driven and where some of them would stumble and could be speared or clubbed by members of the group waiting in ambush. Another was cliffs towards which a group of men could drive a herd of herbivores, so that some of them would fall over the edge and be killed or suffi-

ciently injured for other members of the hunting group to kill them. Other natural traps were bogs and the loops of rivers, into which hunting groups could drive herbivores and then kill them. Archeological excavations have shown that all these traps were used by early humans in Eurasia (Geist, 1978; Mellars, 1999). Working out strategies for cooperative group hunting and trapping large herbivores in these ways would have required an increase in cognitive ability.

It has been shown that among contemporary hunter-gatherers the proportions of foods obtained by hunting and by gathering varies according to latitude. Peoples in tropical and sub-tropical latitudes are largely gatherers, while peoples in temperate environments rely more on hunting, and peoples in arctic and sub-arctic environments rely almost exclusively on hunting and fishing, and have to do so because plant foods are unavailable except for berries and nuts in the summer and autumn (Lee, 1968). When people migrated into the temperate regions of North Africa and South Asia, many of those with low IQs could not survive the cold winters and this raised the IQ of the survivors to 84.

Second: the effective hunting of large herbivores required the manufacture of a variety of tools from stone, wood, and bone for making spears and for cutting up the carcasses. Some of these animals could be brought down by spears that had to be made by hafting or tying a sharp piece of stone, which had to be manufactured, onto the end of a shaft. When these peoples had brought down and killed a large herbivore they would have had to skin it and cut it up into pieces of a size that could be carried back to the base camp for the women and children. These animals have thick skins and tough ligaments that are difficult to cut, and people would have needed sharp tools manufactured for these specific purposes. In sub-arctic environments animals that are killed freeze fairly rapidly and become impossible to cut up, so the hunters had to have good cutting tools that would do the job quickly, before the carcasses froze solid.

Peoples in cold environments need more tools of different kinds and greater complexity than peoples in tropical and sub-tropical environments. This has been shown by Torrence (1983), who has demonstrated an association between latitude and the number and complexity of tools used by contemporary hunter-gatherers. He found that hunter-gatherer peoples in tropical and subtropical latitudes such as the Amazon basin and New Guinea typically have between 10 and 20 different tools, whereas those in the colder northern latitudes of Siberia, Alaska, and Greenland have between 25 and 60 different tools. In addition, peoples in cold northern environments make more complex tools, involving the assembly of components, such as hafting a sharp piece of stone or bone onto the end of a spear and fixing a stone axe head onto a timber shaft.

Third: another set of problems encountered by the peoples in the northern hemisphere would have been concerned with keeping warm. People had to solve the problems of making fires and shelters. Archeological excavations have shown that during the ice ages peoples in China and Europe were making fires. To do this they would have had to learn how to make sparks by striking one stone against another and then get these sparks to ignite dried grass. They would have needed a supply of dry grass and dry wood and animal dung stored in caves to get their fires started and keep them going. This would have needed intelligence and forward planning. Peoples in sub-Saharan Africa and Australia also had fire but it would have been easier to get fires going in the tropics and sub-tropics because there would have been spontaneous bush fires from which ignited branches could be taken and carried back to camp to start domestic fires. The problems of starting fires and keeping them burning would have been

considerably more difficult in Eurasia and North America than in the tropical and sub-tropical southern hemisphere.

Fourth: a further problem of keeping warm would have necessitated the making of clothing and tents by sewing together animal skins. This entailed the drying and treatment of the skins of large herbivores and the manufacture of needles from bone and thread to sew skins together to make clothes and footwear. It would have been necessary to make clothes for babies and children as well as adults. Some people kept warm by living in caves but in places where there were no caves they used large bones and skins sewn together to make tents resembling the yurts that are still made in Mongolia (Geist, 1978; Mellars et al., 1999).

Fifth: the final problem for the peoples in temperate and cold environments concerned food storage. This was necessary because when they had killed and dismembered several large mammals they could not eat them all within a few days and they therefore needed to conserve them for future use.

Some animals that could be killed are migratory and appear in any particular location for only short periods of time each year. This presents opportunities to kill large numbers of them, too many for immediate consumption, but they can be stored for future use. One example is reindeer that migrate regularly over long distances at certain times of the year. In many cases they follow the same routes at the same time of year, so their appearance could be predicted by early humans who had acquired a knowledge of the seasons and the calendar from astronomical observations. Another migratory species is salmon, who migrate in large numbers at a certain time of the year from the sea up rivers in order to spawn. Many of these rivers are quite shallow and it is not too difficult to spear large numbers of salmon as they swim upstream. It is also possible to catch them in nets, the construction of which was another cognitively demanding problem for peoples in Eurasia. These peoples would have been able to anticipate the arrival of these migrating herds and fish and kill large numbers of them as they passed through.

In very cold environments the problem of storing food for future consumption could be solved for part of the year by building icehouses, which served as freezers for preserving the carcasses. Another solution was to cut the flesh into thin slices and dry them. If this is done properly the pieces will remain edible for a considerable time, but if not they become toxic. Some of the less intelligent, unable to do this properly, would have died from food poisoning. This would have been another of the many selection pressures acting to increase the intelligence of the peoples colonizing the niche of the temperate and cold environments. It has been suggested by Miller (1991) that the storage of food would also have required the formulation of rules for rationing its consumption and that this would have involved the development of arithmetic to allocate it equitably.

Among contemporary hunter-gatherers it has been shown by Binford (1980, 1985) that there is a relationship between the extent to which they store food and the temperature of the environments in which they live. The colder the environments, the more they store food for future consumption. He reports that in general it is only in colder climates where growing seasons are less than about 200 days that hunter-gatherer peoples store food.

In addition to these five cognitive problems of survival in the northern hemisphere, a further selection pressure for greater intelligence on these peoples would have been the operation of sexual selection by women. In Eurasia and North America women would have become entirely dependent on men for much of the year to provide food for themselves and their chil-

dren. In equatorial Africa and the southern hemisphere where plant and insect foods are available throughout the year, women are relatively independent of men. Even women with infants and young dependent children can take these with them on foraging trips, or can leave them in the care of other women for a few hours while they go out and gather plant foods. It would have been more difficult and frequently impossible for women with infants and young children in the northern hemisphere to go out on hunting expeditions, possibly lasting several days, kill and dismember large mammals, and carry pieces of them for many miles back to camps. The effect of this would have been that women in the northern hemisphere would have depended on men to bring them food. They would therefore have tended to accept as mates intelligent men who were good at hunting and making tools and weapons. The effect of this sexual selection by women would have been that intelligent men would have had more children and this would have increased the intelligence of the group. Another effect of the greater dependence of women on men in Eurasia would have been that men and women would become psychologically more closely bonded. This explains why the marriages and non-marital relationships of European and East Asian peoples are more stable than those of Africans (Lynn, 2002).

Survival in the cold environment of the northern hemisphere would have required an increase in general intelligence, defined as general problem solving and learning ability, and in most of the primary cognitive abilities of which general intelligence is composed. Stronger reasoning ability would have been needed to solve all the new problems encountered in the cold northern latitudes such as building shelters and fires, making clothes, and manufacturing more efficient tools for killing, butchering, and skinning large animals. Improved verbal ability would have been needed for better communication in discussions of how to solve these problems, for planning future activities, and for transmitting acquired cultural knowledge and skills to children. Improved visualization ability would have been needed for planning and executing group hunting strategies, for accurate aiming of spears and missiles, and for the manufacture of more sophisticated tools and weapons from stone, bone, and wood. Fathers would have shown sons how to chip flints to produce good cutting tools and to make spears with sharp points, and these skills would have been conveyed largely by watching and imitation, much as craft skills are learned today by apprentices watching skilled craftsmen, rather than by verbal explanations. Hunting and tool making would have been undertaken principally by males and this would be why it has virtually always been found that the visualization abilities are stronger in males than in females (Linn and Peterson, 1986). There would have been less selection pressure on the peoples in the northern hemisphere to develop better short-term memory and perceptual speed, which explains why these abilities have not become so strongly enhanced among the Europeans as compared with the Africans.

The selection pressures for enhanced intelligence in the temperate environment of North Africa and South Asia, and later in the sub-Arctic environment of Europe and North Asia, would have acted on both men and women. The selection pressure on men for greater intelligence would have been the need to go on hunting expeditions to kill large mammals and to make the tools required for this and for skinning and cutting them up. This would have required enhanced spatial intelligence and reasoning ability, which are greater on average in men than in women (Linn and Petersen, 1986; Lynn and Irwing, 2004). Women would have needed enhanced general intelligence for lighting and maintaining fires and preserving food and storing it for future consumption, and they would have had the responsibility of keeping babies and young children alive by keeping them warm. The genetic processes occurring in the North Africans and South Asians would have been an increase in the frequencies of the alleles for higher intelligence and probably the appearance of new mutations for higher intelligence and their diffusion through the population.

The most probable scenario is that the intelligence of North Africans and South Asians increased during both of the two ice ages, the first of which lasted between approximately 70,000 and 50,000 years ago and the second of which lasted between approximately 28,000 and 10,000 years ago. The increase in intelligence after the end of the first of these two ice ages can be inferred from their more sophisticated tools and other artifacts (Stringer and McKie, 1996, p. 185-187). However, their intelligence did not increase to the level at which they were able to make the Neolithic transition from hunter-gathering to settled agriculture. This further increase in intelligence must have taken place during the second major ice age (the main Wurm glaciation). The severity of the climate during this period will have been the main selection pressure that drove the brain size of the South Asians and North Africans up to 1,342cc and their IQ up to 84. This was sufficient to allow them to make the Neolithic transition to settled agriculture and then to build the early civilizations along the valleys of the Nile, Tigris, Euphrates, and Indus rivers, in which they developed cities, written languages, arithmetic, legal systems, and all the criteria of civilization.

4. Southeast Asians

Some of the peoples in South Asia migrated into Southeast Asia around 70,000 years ago and evolved into the Southeast Asians. This region enjoys a tropical and sub-tropical climate where the coldest monthly winter temperature is about 24°C. These peoples had reached this region before the onset of the ice ages that had little effect in Southeast Asia. Hence they were under little selection pressure for an increase of intelligence. However, their IQ of 87 is fractionally higher than that of the North Africans and South Asians (84), from whom they mostly evolved. The most probable explanation is that there is some East Asian admixture in the Southeast Asians from East Asians who have migrated south and interbred with indigenous populations. There has been substantial migration of East Asians into Southeast Asia. Thus, today in Singapore 76 percent of the population are Chinese, in Malaysia 30 percent of the population are Chinese, and there are significant Chinese minorities in Cambodia and Thailand (Philip's, 1996). These East Asians have interbred with the indigenous peoples and this has produced a racial hybrid population in Southeast Asia. As a result of this migration and inter-mating, the Southeast Asian peoples are closely related genetically to the southern Chinese (Cavalli-Sforza, Menozzi, and Piazza, 1994, p. 78). The Chinese admixture in the Southeast Asians has introduced some of the alleles for high intelligence and raised their IQs to 87.

This IQ enabled the Southeast Asians to make the Neolithic transition from hunter-gathering to settled agriculture and then to build moderately impressive civilizations around 0-1,000 AD. These civilizations appeared somewhat later than those of the South Asians and North Africans because the river valleys in Southeast Asia were densely forested and do not have the flood plains from which the agricultural surpluses were produced to sustain the first civilizations in Mesopotamia, Egypt, and China. However, from around 1,000 AD their IQs were not sufficient for them to be able to compete economically or in science and technology with the Europeans and the East Asians.

5. Pacific Islanders

It was only around 6,000 years ago that some Southeast Asians began to migrate into the Pacific islands, where they evolved into the Pacific Islanders. Their IQ of 85 is not significantly

different from that of 87 of the Southeast Asians from whom they largely evolved, and is likewise higher than would be expected from the benign climates they experience, where the coldest monthly winter temperature is about 24°C. The explanation for this is the same as for the Southeast Asians, namely an admixture with East Asians who migrated south and interbred with indigenous populations. The presence of significant East Asian ancestry in the Pacific Islanders is shown by their small teeth, which are small in East Asians but large in the Australian Aborigines (Brace and Hinton, 1981). Unlike the Southeast Asians, the Pacific Islanders made only moderate progress in the Neolithic transition to settled agriculture and no progress in developing civilizations. The explanation for this is that their populations have been so small, typically numbering only a few thousands, scattered on remote islands separated over huge distances. It was only the Maoris who had a large territory in New Zealand, but they only colonized the islands about the year 800 AD and have had insufficient time to produce a large population, make the full Neolithic transition, and begin to build a civilization.

6. Australian Aborigines

Some of the peoples of South Asia and East Asia migrated into the islands of the Indonesian archipelago and reached New Guinea about 65,000 years ago. About 60,000 years ago some of these peoples migrated into Australia, where they evolved into the Australian Aborigines (Bradshaw, 1997). A closely related people survived in the highlands of New Guinea as the New Guinea Aborigines.

The ancestors of the Australian Aborigines and the New Guineans were never exposed to the severe winters that began in South Asia with the onset of the first ice age about 70,000 years ago. By this time they would have been in Southeast Asia, Indonesia, or New Guinea, all of which lie on the equator or very close to it. They were not affected by the second ice age in the northern hemisphere. Thus the Australian Aborigines and the New Guineans have the morphological features of a people who have evolved in tropical and subtropical environments and have never been exposed to a temperate climate. They are similar to the Africans in their dark skin, wide noses, long legs, slender trunk, and large teeth.

Like other peoples who have evolved in tropical and subtropical environments, the New Guineans and the Australian Aborigines were able to live on plant foods, insects, and eggs throughout the year. When the Australian Aborigines were studied in the desert of Western Australia in the twentieth century it was found that they obtained 70-80 percent of their food from plants and most of the remainder from eggs and insects. They had no well-developed group hunting techniques (Gould, 1969). It has been estimated that the Gadio people, a tribe of New Guineans, obtain 96 percent of their food from plants and only 4 percent from meat (Dornstreich, 1973). The ready availability of plant foods throughout the year, together with insects and eggs, meant that the Aboriginal peoples in tropical and subtropical New Guinea and Australia never had to rely on meat for their food supply and did not come under strong selection pressure to develop the cognitive abilities required to hunt large animals. Neither did they need to make clothes to keep warm. Even in the island of Tasmania off the south of Australia the temperature in July, the coldest month of the year, averages 45 degrees F, and "the Tasmanians habitually went naked" (Coon, 1967, p. 114). This explains why their intelligence and brain size are both low at an IQ of 62 and an average brain size of 1,225cc. These are both a little lower than those of the Africans with their IQ of 67 and average brain size of 1,280cc. The most probable explanation for this is that the Africans were a much larger population in

which mutations for higher intelligence had a greater chance of occurring, while the Australian Aborigines were much fewer. The number of Aboriginal New Guineans in the highlands of New Guinea is around a quarter of a million. The number of Australian Aborigines in the eighteenth century when the Europeans first arrived is estimated at about 300,000. In such a small population the probability of new mutations for higher intelligence occurring would have been low and the geographical isolation of the Aborigines of Australia and New Guinea would have prevented the acquisition of these mutations from other races.

When Europeans discovered Australia in the late eighteenth century they found the Aborigines at a primitive level of cultural development. "Their Mesolithic (stone age) culture was (and still is in remote areas) without pottery, agriculture, or metals" (Cole, 1965, p. 82). They did not plant seeds to grow food or keep herds of animals (Elkin, 1967). They did not store food for future consumption. As described by Bleakley (1961, p. 78) "the Aborigine seems to have had no idea of conserving supplies against a hungry time." Thomas (1925, p. 295) described the Aborigine as "a nomad, who knows neither pottery nor metal work, has no domesticated animals, for the dingo is at most tamed, and he does not till the ground, depending for his sustenance on snakes and lizards, emus, grubs, and simple vegetable foods." "Their main stone implements include the hafted stone axe and knife, and microliths (tiny flakes) mounted as barbs of spear-heads, teeth of saw-knives, and so on. Weapons consist of clubs, spears, spear throwers, and the boomerang. Women use digging sticks to uproot yams and other roots" (Cole, 1965, p. 83). They never invented or acquired the bow and arrow (Coon, 1967). Several of the British explorers and early anthropologists who studied the Aborigines in the nineteenth century concluded that they had a low level of intelligence: "they are still but children in their mental development" (Wake, 1872, p. 80). Their languages lacked numbers except for one and two: "two or a pair represent the extent of their numerals" (Crawford, 1883, p. 170). Their languages were also lacking in abstract concepts and were "poor in collective nouns" (Curr, 1886, p. 20), indicative of the inability to formulate general concepts that is one of the principal characteristics of intelligence. The Aborigines did however make primitive drawings of the human form which survive in the Jinmion rock shelter in the Northern Territories and which have been dated at about 58,000 years ago (Bradshaw, 1997).

Diamond (1997, p. 309) attributes the failure of the Australian Aborigines to domesticate animals or to develop agriculture to "the lack of domesticable animals, the poverty of domesticable plants, and the difficult soils and climate," but on the same page he tells us that yams, taro, and arrowroot grow wild in northern Australia and could have been planted, and there are two indigenous wild grasses that could have been bred to produce cereals. The kangaroo and the dingo could have been domesticated by selective breeding for tameness over a number of generations. The climate of Australia is very varied and apart from the deserts of the central region is potentially suitable for the agriculture that was developed during the nineteenth and twentieth centuries by Europeans.

The Tasmanians had an even lower level of cultural development than the Aborigines of the Australian mainland. The Russian anthropologist Vladimir Kabo (1995, p. 603) has written that they are "the only society that persisted at the level of the late Paleolithic right up to the beginning of European colonization." Captain William Bligh visited Tasmania in 1788 and described them as nomadic hunter gatherers who "had some miserable wigwams, in which were nothing but a few kangaroo skins spread on the ground," "they moved from one area to another, foraging as they went, seeking out berries and fruits and the seeds of various bushes. Apart from kelp, they rarely carried food of any kind with them and "they usually went naked, but occasionally draped a kangaroo skin over their bodies (Bowdler and Ryan, 1997, pp. 313-326). They are the only known people who never discovered how to make fire (Gott, 2002).

They were sometimes able to obtain fire from spontaneous bush fires, but if these went out they had to wait for a new spontaneous bush fire or get it from a neighboring band. They never invented the device of hafting a sharp stone into a wooden shaft to make a spear or axe (Ryan, 1992).

When Europeans discovered the New Guineans in the seventeenth and eighteenth centuries they found them at a slightly more advanced stage of cultural development than the Australian Aborigines. The New Guineans were largely hunter-gatherers but they had some agriculture consisting of planting yams and bananas, and they had domesticated chickens and pigs. But "until Europeans began to colonize them, all New Guineans were non-literate, dependent on stone tools, and politically not yet organized into states, or (with few exceptions) chiefdoms" (Diamond, 1997, p. 299). Following the European colonization some of them moved into towns and villages and others remained in rural areas living as subsistence farmers. Europeans built and staffed schools for those in towns and villages and boarding schools were established for those in rural areas, although some rural children did not attend school. Kelly (1977) described the life style of typical rural and village tribes in Papua New Guinea in the 1970s. They lived largely by subsistence slash-and-burn agriculture carried out mainly by women. The men did some hunting, and some of them worked for wages on coffee plantations run by Europeans. The clothing of the less developed tribes consisted of skirts made from leaves and bark. Some of the tribes had counting systems that enabled them to count to a thousand while others only had words for "one," "one plus," and "many." The principal reason that the New Guineans were a little more advanced than the Australian Aborigines is that the coastal regions of the island were settled by Southeast Asians and Melanesian Pacific Islanders who brought with them the taro, an edible root which they cultivated, and also domesticated chickens and pigs. The New Guineans adopted some of these cultural innovations, but never developed anything that could be called a civilization with towns, substantial buildings, metal working, a written language, or arithmetic.

7. Europeans

Some of the peoples who colonized the Near East between 100,000 and 90,000 years ago migrated northwards and around 60,000 years ago reached the Caucasus, from which they spread into the Ukraine and then, around 40,000 years ago, into central and western Europe. Other peoples from Southwest Asia began to colonize Southeast Europe from Anatolia. These peoples evolved into the Europeans with their paler skins and, in the north of Europe, their fair hair and blue eyes. The Europeans were largely isolated from the South Asians and North Africans on the south by the Mediterranean Sea, and on the east by the Black and Caspian Seas, the high mountains of the Caucasus and Himalayas, and the Kara Kum desert in present-day Turkmenistan. In the last ice age, which lasted from around 28,000 to 10,000 years ago, the winters were significantly colder than those in South Asia with the coldest winter month falling to about -5°C. The terrain in Europe became similar to that of present-day Alaska and Siberia. The north of England, Germany, Russia, and the whole of Scandinavia were covered with a permanent ice sheet and the remainder of Europe was cold grasslands and tundra with a few clumps of trees in sheltered places.

These cold winters must have been the main selection pressure for an increase in the brain size and intelligence of the Europeans that drove the average brain size up to 1,369cc and their IQ up to 99. Expressing the increase in their brain size as encephalization quotients (EQ) to control for body size, Cutler (1976) has estimated that pre-Wiirm Europeans had an EQ of 7.3

and by the end of the Wiirm glaciation they had an EQ of 8.1. When the ice sheets that covered northern Europe receded by about 10,000 years ago the Europeans with their increased intelligence were able to make the Neolithic transition to settled agriculture. However, despite their high IQ they were not able to develop early civilizations like those built by the South Asians and North Africans because Europe was still cold, was covered with forest, and had heavy soils that were difficult to plough unlike the light soils on which the early civilizations were built, and there were no river flood plains to provide annual highly fertile alluvial deposits from which agricultural surpluses could be obtained to support an urban civilization and an intellectual class (Landes, 1998). From around BC 2500 the Europeans overcame these problems in the relatively benign climate of southern Europe, where they developed the first European civilizations in Crete and Greece. From around BC 700 the Italians began to build a civilization that eventually became the Roman empire and by 200 AD embraced the whole of Europe west of the Rhine and included the Danube basin, the Near East, and North Africa. These first European civilizations in Greece and Rome surpassed those of the South Asians and North Africans in science, mathematics, technology, literature, philosophy, and the arts. The western Roman Empire collapsed in 455 AD and European culture suffered a setback in the ensuing dark ages, but from about the year 1000 AD it revived and from around the year 1500 the Europeans became the foremost people in virtually all areas of civilization, as extensively documented by Murray (2003).

The genetical processes through which the higher IQs of the Europeans have evolved will have consisted of changes in allele frequencies towards a greater proportion of alleles for high intelligence and probably also through the appearance of new mutations for higher intelligence and the rapid spread of these through the population. The probability of new mutations for higher intelligence in the Europeans will have been increased by the stress of the extreme cold to which the Europeans were exposed.

The lower IQs in the range 90 to 94 in Southeast Europe are probably attributable to some gene flow between South Asians and Europeans across the Dardanelles and Aegean, producing a cline of South Asian and European hybrids in the Balkans with IQs intermediate between those of Europeans (99) and South Asians (84). The same cline is present in Turkey where the IQ of around 90 is only fractionally lower than in the Balkans.

8. East Asians

Some of the peoples of South and Central Asia began to colonize Northeast Asia in the region of present-day China between 60,000 and 50,000 years ago where they evolved into the East Asians and later into the Arctic Peoples of the far Northeast. The archaic East Asians were largely isolated from the Europeans by the Gobi desert to the west and from the South Asians by the Himalayas to the south. The winters to which they were exposed were much more severe than in South Asia and somewhat more severe than in Europe, with coldest winter temperatures falling to about -12°C during the main Wiirm glaciation. The reasons for the intense winter cold in Northeast Asia as compared with Europe is that Northeast Asia a much larger land mass while Europe is much smaller, and that Europe is warmed by prevailing westerly winds from the Atlantic. It was in response to the cold winters that the East Asians evolved the cold adaptations of the flattened nose to prevent frost bite, the short legs and thick trunk to conserve heat, the subcutaneous layer of fat that gives the skin a yellowish appearance, the sparse facial hair in men (because profuse beards would freeze and produce frost bite), and the epicanthic eye-fold to mitigate the effect of dazzle of reflected light from snow and ice.

The severe winters would have acted as a strong selection for increased intelligence and raised the IQ of the East Asian peoples to 105. The genetic processes involved probably consisted of an increase in the frequencies of the alleles for high intelligence and also of new mutations for higher intelligence resulting from chance and from severe cold stress. The appearance of new mutations may explain why East Asians have particularly strong visualization abilities, as compared with Europeans. New mutations for enhanced visualization abilities may have appeared in East Asians and spread through the population because they were useful for hunting, tool making, and navigation over long distances through featureless terrain.

As with the Europeans, it is probable that most of the increase in the intelligence of the East Asians occurred during the main Wiirm glaciation. This will have acted as the selection pressure for greater brain size and must have driven their IQ up to its present value of 105. It was not until after the end of the Wiirm glaciation that their intelligence reached the level at which they were able to make the Neolithic transition to settled agriculture and then to build the civilization in the valley of the Yellow river and the subsequent developments of civilizations in China, Japan, and Korea. During the period between around 0-1500 AD the Chinese built impressive civilizations that were in some respects in advance of those in Europe. For instance, the Chinese invented printing, paper, paper money, gunpowder, the magnetic compass, and the construction of canals with locks several centuries before the Europeans. During the period from 1500 to the present, however, the intellectual achievements of the East Asians have been less impressive than those of the Europeans, as has been exhaustively documented by Murray (2003). Historians regard this as a major puzzle to which there is no consensus solution. One factor may be that the East Asians have evolved a higher degree of social conformity than the Europeans, documented by Allik and Realo (2004), and also expressed in their low level of psychopathic personality that I have documented in Lynn (2002). A low level of social conformity and an element of psychopathic personality appear to be ingredients in creative achievement because they reduce anxiety about social disapproval and appear to facilitate the generation of the original ideas that are required for the highest levels of scientific discovery. Another factor may be the historical accident suggested by Weede and Kampf (2002) that throughout much of its history China was a single state whose autocratic rulers were able to suppress liberties, including freedom of thought, more effectively than the rulers of the numerous European states, who were forced by competition to concede liberties to their peoples.

9. Arctic Peoples

Sometime between 50,000-40,000 years ago some of the archaic East Asian peoples migrated into the far northeast of Asia where they evolved into the Arctic Peoples. These peoples evolved into a separate race because they were geographically isolated from the East Asians on the south by the high Chersky, Khrebet, Khingan, and Sayan mountains, and about a thousand miles of forest north of the Amur river. The Arctic Peoples experienced the severest winter conditions of all the races with coldest winter temperatures of about -15°C and falling to about -20° C during the main Wiirm glaciation. In response to these cold winters the Arctic Peoples evolved more pronounced forms of the morphological cold adaptations of the East Asians, consisting of the flattened nose, the short legs and thick trunk, the subcutaneous layer of fat that gives the skin a yellowish appearance, and the epicanthic eye-fold. These severe winters would be expected to have acted as a strong selection for increased intelligence, but this evidently failed to occur because their IQ is only 91.

The explanation for this must lie in the small numbers of the Arctic Peoples whose population at the end of the twentieth century was only approximately 56,000 as compared with approximately 1.4 billion East Asians. While it is impossible to make precise estimates of population sizes during the main Wiirm glaciation, there can be no doubt that the East Asians were many times more numerous than the Arctic Peoples. The effect of the difference in population size will have been that mutations for higher intelligence occurred and spread in the East Asians that never appeared in the Arctic Peoples. The East Asians consisting of the Chinese, Koreans, and Japanese would have formed a single extended breeding population of demes in which mutant alleles for high intelligence would have spread but would not have been transmitted to the Arctic Peoples isolated by high mountain ranges and long distance. The Arctic Peoples did, however, evolve a larger brain size, approximately the same as that of the East Asians, so it is curious that they do not have the same intelligence. A possible explanation for this is that the Arctic Peoples have evolved strong visual memory that would have been needed when they went out on long hunting expeditions and needed to remember landmarks in order to get home in largely featureless environments of snow and ice. An increase of this ability would have required an increase in brain size but is not measured in intelligence tests. A further possibility is that one or more new mutant alleles for more efficient neurophysiological processes underlying intelligence may have appeared in the East Asians but not in the Arctic Peoples.

There is a further anomaly in the intelligence of the peoples of Northeast Asia concerning the IQs of the Mongols of Mongolia and the closely related Samoyeds of Northern Siberia. There are no studies of the intelligence of these peoples but their low level of cultural development and technology suggests that it is not so high as that of the East Asians of China, Japan, and Korea. Yet these peoples also experienced many thousands of years of severe winter environments that have produced the pronounced morphological cold adaptations of the epicanthic eye-fold, short legs, and thick trunk that evolved in the Arctic Peoples. The probable explanation of this anomaly is the small population size of these peoples (the population of present-day Mongolia is approximately 2.4 million and there are only a few tens of thousands of Samoyeds of Northern Siberia) and they have been isolated from neighboring peoples by the Gobi desert and high mountain ranges, so new mutations for higher intelligence did not occur and their geographical isolation would have prevented the acquisition of these mutations from other races.

10. Native Americans

The Native Americans evolved from peoples who migrated from Northeast Asia across the Bering Straits into Alaska and then made their way southward into the Americas. The dates at which these crossings were made are disputed and it has frequently been claimed that they occurred about 12,000 to 11,000 years ago. Contrary to these claims, there is strong evidence that they were made much earlier at around 40,000 years ago. This evidence comes both from the archeological record and from genetic analysis. Archeological finds of Amerindian artifacts have been dated by radiocarbon analysis at 24,000 years ago in Mexico (Lorenzo and Mirambell, 1996), 30,000 years ago in California (Bada, Schroeder, and Carter, 1974), 32,000 years ago in the northeast of Brazil (Guidon and Delibrias, 1996), 35,000 to 43,000 years ago for a rockwall painting in the Serra da Capivara National Park in northeast Brazil (Watanabe, Ayta, Mamaguchi, et al., 2003), and 33,000 years ago at Monte Verde in Chile (Dillehay and Collins, 1998). It must have taken several thousand years for these peoples to make their way from Alaska to South America, so the archeological evidence points to the first peoples mak-

ing the crossing at least 40,000 years ago. This archeological evidence is corroborated by genetic analysis that also puts the first migration into the Americas at approximately 40,000 years ago (Cavalli-Sforza, 2000).

It seems most probable that there was an archaic East Asian people in Northeast Asia around 50,000 years ago, some of whom migrated northwards into Kamchatka and the Chersky Peninsula and then made the crossing of the Bering straits into Alaska around 40,000 years ago. Some of these peoples migrated southwards until they colonized the whole of the Americas and evolved into the Native American Indians, while the archaic East Asian peoples that remained in Northeast Asia evolved into the present-day East Asians. The relatively recent common origin of these two races is apparent from a number of genetic similarities. For instance, the Rhesus negative blood group allele is rare in both races, the Diego blood group is unique to these two races, and they both have similar coarse, straight black hair, shovel incisor teeth, and the Inca bone in the skull (Krantz, 1990).

The archaic East Asian ancestors of the Native Americans who were present in Northeast Asia around 60,000-50,000 years ago were exposed to cold winters but these were not so severe as those of the main Wiirm glaciation of approximately 28,000 to 10,000 years ago (Roberts, 1994), by which time the ancestors of the Native Americans had colonized the Americas. Hence, the Native Americans were never exposed to extreme cold and do not have the morphological adaptations to severe cold that evolved in the East Asians. The nose is not recessed but is quite prominent, and they do not have the full East Asian eye-fold or the short legs and thick trunk of the East Asians. In these respects they are similar to the Ainu, the original inhabitants of Japan, a few of whom survive on Hokkaido, who also do not have the cold adapted morphology of the East Asians because the climate of the Japanese islands was more maritime and less severe than that of mainland Northeast Asia.

Thus, the Native Americans were established throughout the Americas by around 33,000-30,000 years ago. Those in the southern part of the United States and in Central and South America were not exposed to the severe conditions of the main Wtirm glaciation, so they did not evolve either the morphological cold adaptations or the high IQ of the East Asians. Furthermore, once the ancestors of the Native Americans had crossed the Bering Straits and made their way down into the Americas they would have found life a good deal easier than their ancestors had been accustomed to in Northeast Asia. They would have found a number of herbivorous mammals such as mammoth, antelope, sloth, armadillo, and bison, which were unused to being hunted by man. Normally predators and prey evolve together in that predators become more intelligent in order to catch prey, and prey become more intelligent in order to evade predators. But the herbivorous animals of the Americas had no experience of predation by man and would have been easy game for the skilled hunters who had evolved for many thousands of years in the more severe environment of Northeast Asia. The Native Americans would have found large numbers of these herbivores that were easy to catch, and as they migrated southward they would have found plant foods more readily available so that plant foods came to play a significant part in their diets (MacNeish, 1976; Hayden, 1991).

The evolution of intelligence in the Native Americans can be reconstructed as follows. The archaic East Asians from whom they evolved would have had higher intelligence than the South Asians because they were exposed to the cold climate of Northeast Asia for around 20,000 years, between around 60,000 and 40,000 years ago. The ancestors of the Native Americans spent another few thousand years in Alaska during which they experienced a severe climate that will have driven up their intelligence further. Once they were in the Americas south of Alaska the selection pressure for any additional increase in intelligence would

have been weak because of the benign climate and the ease of survival in the continent hitherto unexploited by humans. This explains their present IQ of 86, a little higher than the 84 of the South Asians, but much below the 105 of the East Asians. This reconstruction provides further evidence that it was the selection pressure exerted by the main Wiirm glaciation of approximately 28,000 to 10,000 years ago that must have raised the intelligence of the East Asians by around 19 IQ points above that of the Native Americans.

There is a problem with this reconstruction that the Native Americans in the northern part of North America would have been exposed to severely cold winters during the main Wiirm glaciation and it would be expected that this would have increased their intelligence. The most probable explanation for why this did not occur is that the population of the Native Americans was quite small. The earliest reliable estimate of population sizes is for BC 400 and puts their number at approximately 1 million in North America (Biraben, 1980). Hence, the probability of mutations for higher intelligence appearing in the Native Americans in the north of North America was quite small and possibly did not occur or fewer of them appeared than in the much more numerous East Asians and Europeans.

The Native Americans have the same profile of intelligence as the East Asians and the Arctic Peoples consisting of strong visualization abilities and weaker verbal abilities. The probable explanation for this common profile is that one or more mutations for higher visualization abilities appeared in the ancestral archaic East Asians around 50,000 years ago and were transmitted to the subsequent East Asians, Arctic Peoples, and Native Americans who evolved from this ancestral population. Genetic studies have shown that there are genes determining the strength of visualization ability in addition to those determining the strength of the verbal abilities and of *g* (Plomin, DeFries, and McClearn, 1990).

With their IQ of 86 the Native Americans were able to make the Neolithic transition from hunter-gathering to settled agriculture and then to build the civilizations of the Maya, Aztecs, and Incas. The reason that these were built in Central and South America and not in North America is probably that their numbers were much greater at approximately 11 million as compared with only 2 million as of 500 AD (Biraben, 1990). However, despite their reasonably impressive civilizations the Native Americans were no match for the Europeans who from the sixteenth and seventeenth centuries onwards had little difficulty in defeating them in battle, taking most of their lands, and killing large numbers of them.

11. Conclusions

The IQs of the races set out in Chapters 3 through 12 can be explained as having arisen from the different environments in which they evolved, and in particular from the ice ages in the northern hemisphere exerting selection pressures for greater intelligence for survival during cold winters; and in addition from the appearance of mutations for higher intelligence appearing in the races with the larger populations and under the greatest cold stress. The IQ differences between the races explain the differences in achievement in making the Neolithic transition from hunter-gathering to settled agriculture, the building of early civilizations, and the development of mature civilizations during the last two thousand years. The position of environmentalists that over the course of some 100,000 years peoples separated by geographical barriers in different parts of the world evolved into ten different races with pronounced genetic differences in morphology, blood groups, and the incidence of genetic diseases, and yet have identical genotypes for intelligence, is so improbable that those who advance it must

either be totally ignorant of the basic principles of evolutionary biology or else have a political agenda to deny the importance of race. Or both.

Appendix. Intelligence Tests

Brief descriptions of the tests abbreviated in the tables are given below.

AAB. The American Army Beta constructed for testing the IQs of military personnel in World War 1. A non-verbal test of general intelligence on which the performance subtests of the Wechsler tests were based.

AFQT. Armed Forces Qualification Test. A mainly verbal test of general intelligence.

AH. Alice Heim. Tests of verbal and non-verbal reasoning ability.

AP. Alexander Passalong Test. A non-verbal test of intelligence and visualization consisting of a succession of shallow boxes in which are placed a number of colored square and rectangular blocks. The task is to rearrange the blocks so that the red ones are all at one end and the blue all at the other.

Arthur Point Performance Scale. A non-verbal test of general intelligence. BAS. British Ability Scales. A test of general intelligence, verbal and nonverbal ability.

BG. Bender Gestalt. A drawing test of general intelligence.

BTBC. Boehm Test of Basic Concepts. A test of general intelligence measuring verbal understanding of spatial and quantity concepts.

BTBC-R. Boehm Test of Basic Concepts-Revised. A revised version of the BTBC.

CCAT. Canadian Cognitive Abilities Test. A test of verbal, quantitative and non-verbal reasoning.

CEFT. Children's Embedded Figure Test. A children's version of the EFT. Test of the ability to find a simple figure embedded in a larger figure.

CF. Cattell's Culture Fair Test. A non-verbal test of general intelligence.

CITO. A Dutch test measuring numerical reasoning and verbal comprehension.

CMM. Columbia Mental Maturity Scale. A verbal and non-verbal reasoning test of general intelligence.

CPM. Colored Progressive Matrices. A non-verbal reasoning test for ages 5-11.

CPMT. A test of visualization.

CTMM. California Test of Mental Maturity. A non-verbal reasoning test of general intelligence.

DAM. Goodenough Draw a Man test. A drawing test of general intelligence.

EFT Embedded Figure Test. A test of the ability to find a simple figure embedded in a larger figure. Correlates 0.65 with WISC performance and 0.30 with verbal scale (Witkin et al., 1962).

EPVT. English Picture Vocabulary Test.

FF. Fergusson Form Boards. A test of visualization involving fitting pieces of different shapes into spaces as in a jig-saw puzzle.

GALO. A Dutch test of general intelligence.

GFT. Gottschalt Figures Test. A test of visualization.

GMRT. Group Mental Rotations Test. A test of visualization.

GSAT. General Scholastic Aptitude Test. A South African test of reasoning, verbal, visualization and other abilities.

ITPA. Illinois Test of Psycholinguistic Abilities. Measures 12 auditory (verbal) and visual language abilities.

JAT. Junior Aptitude Test. A South African test with 10 subtests measuring reasoning, verbal, spatial, etc abilities.

KABC. Kaufman Assessment Battery for Children. A test of general intelligence resembling the Wechsler tests.

KAIT. Kaufman Adolescent and Adult Intelligence Test. A test of general intelligence resembling the Wechsler tests.

LPT. Learning Potential Test. A test of general intelligence.

LT. Lorge-Thorndike. A test of general intelligence. Matrix Analogies Test. A non-verbal reasoning test.

MFFT. Matching Familiar Figures Test.

MH. Moray House. A verbal test of general intelligence.

MHV. Mill Hill Vocabulary. A measure of verbal ability.

MMFT. Matching Familiar Figures Test. A mainly visualization test.

MMSE. Mini-Mental State Examination. A test of general intelligence.

NFER. British National Foundation for Educational Research Test of non-verbal reasoning and verbal ability.

OT. Otis Test. A mainly verbal test of general intelligence.

PAT. Progressive Achievement Test. A verbal test of general intelligence.

PIPS. Pacific Infants' Performance Test. A non-verbal test of general intelligence.

PNL. Pintner Non-Language Test. A non-verbal test of general intelligence.

PPMA. Primary Test of Musical Audation. A test of musical ability.

PPVT. Peabody Picture Vocabulary Test. A set of four pictures of different objects that have to be named.

QT. Queensland Test. A non-verbal test of general intelligence.

RACIT. A Dutch test with a number of subtests measuring reasoning, verbal, spatial, etc abilities.

SA. Stanford Achievement Test. A verbal test of word meaning, spelling, and arithmetic.

SB. Stanford-Binet. A mainly verbal test of general intelligence. **Seashore.** A test of musical ability.

SON-R. The Snijders-Ooman non-verbal intelligence test. A non-verbal test of general intelligence.

SOT. Spiral Omnibus Test. A reasoning test.

SRAT. Science Research Associates Test. A test of general intelligence.

STAS. Stanford Test of Academic Skills. A test of a range of academic subjects.

TOSCA. Test of Scholastic Abilities. A verbal and numerical test of general intelligence.

WAIS. Wechsler Adult Intelligence Scale. Gives measures of general, verbal and visualization intelligence

WB. Wechsler Bellevue. Gives measures of general intelligence, verbal and visualization abilities

WCST. Wisconsin Card Sorting Test. A non-verbal test of general intelligence.

WISC. Wechsler Intelligence Scale for Children. Gives measures of general, verbal and visualization intelligence.

WPPSI. Wechsler Preschool and Primary Scale for Intelligence. Gives measures of general, verbal and visualization intelligence for 4-6-year-olds.

WRAT. Wide Range Achievement Test. A test of general intelligence.

3DW. An Austrian test of general intelligence.

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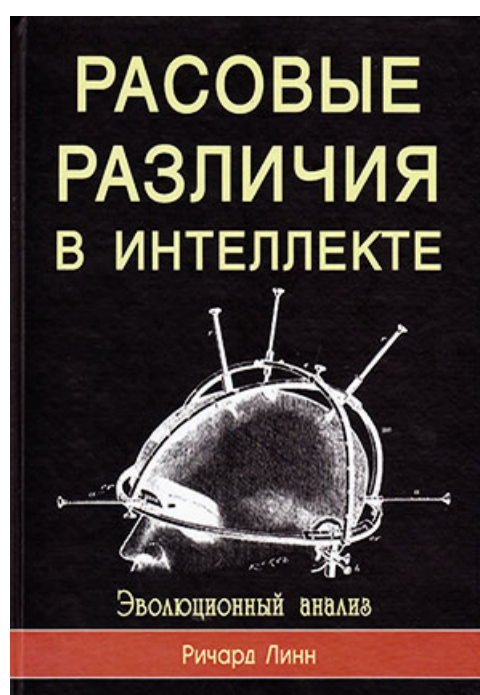
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