The Mismeasure of Man Study Guide

The Mismeasure of Man by Stephen Jay Gould

Contents

Plot Summary

The Mismeasure of Man by Stephen Jay Gould is a book that is concerned with how to rank people into groups on the basis of intelligence in a manner that is meaningful. Since intelligence is an abstraction about the human brain, Gould feels that it is possible to rank humans on this basis. The author, a paleontologist with a statistical background, analyzes data within a historical context and combines his skill as a scientist with his concern as a historian when looking at the issue of biological determinism. He looks at what they did right and what they did wrong in measuring human intelligence. Certain groups are always ranked on the bottom, and this is used to justify the social ordering. Why spend money on them if it is innate is the way the argument goes. The work done in intelligence ranking became a tool of racial prejudice since it was used to suppress the disadvantaged groups and in come cases, to prevent their propagation.

Gould basically covers the history of the field of intelligence testing, looking at how it developed and what the various techniques are. He duplicates the work of some of these earlier scientists and disproves their results such as with Morton's skull measurements. The errors committed in measuring the skulls led to improper conclusions about brain size and intelligence and meant discrimination for various disadvantaged groups that were ranked at the bottom. Gould carefully considers the questions of bias on the part of the experimenter whose studies lead to biased pre-determined results. For example, it was considered that blacks were the inferior group. Data can be selected and used in such a way to prove that blacks are the inferior group. This is the kind of bias that Gould looked for in these intelligence studies since this kind of bias leads to faulty conclusions.

Gould presents a good history of the development of the field of intelligence testing. He looks at the rational behind the different theories and methods used by the early developers of the science. The theory of evolution influenced the way that all scientists viewed man and man's situation. In some cases, many of these early scientists went overboard erring on the side of biology and not giving enough weight to cultural factors. Gould shows how this issue is resolved over time and others repeat the work and debunk the theory, as Gould does.

Gould also looks at the development of different statistical techniques used in intelligence testing. He writes in depth on the statistical technique of factor analysis and how it tries to construct an intelligence measure. He looks at the dispute between Burt and Spearman as to who actually developed the technique. Many laymen will be lost in this chapter as it is rather technical. At the end of the book, there are other articles on subjects to do with statistics like the bell shaped curve, which every student of statistics knows represents a normal distribution.

Even though there are some areas that presuppose a rudimentary knowledge of statistics, the book is still informative regarding the development of the field of intelligence measurement.

Introduction

Introduction Summary and Analysis

The book opens with Gould discussing Socrates' Republic and the fact that the people should be educated and that they belong to either the rulers, auxiliaries or craftsmen class. In this manner, society will remain stable. When asked how to get the people to accept the class that they are assigned to, Socrates says it is all determined before they are born. His friend tells him that it is a lie and that the present generation won't believe it but future generations might. "The same tale, in different versions, has been promulgated and believed every since. The justification for ranking groups by inborn worth has varied with the tides of western history. Plato relied upon dialectic, the Church upon dogma. For the past two centuries, scientific claims have become the primary agent for validating Plato's myth" (Chapter 1, pg. 52). Thus begins the argument over biological determinism.

The argument of biological determinism is the basis for believing that measuring the intelligence of an individual allows a measure of worth or value to be attached to that individual. This argument has been supported by craniometry, which is measuring the size of an individual's skull, and by psychological testing. The individual's social and economic status is determined by biology so any attempt to make changes has to be costly, because the changes force people into situations that aren't natural for them. Gunnar Myrdal, the author of An American Dilemma, discussed the situation and claimed that the Americans and others accepted the biological arguments and would only consider the environmental factors when they were forced to.

Gould's book looks at the deterministic argument and examines the scientific weaknesses. He does not believe that they were bad scientific practices or that they were always wrong. He believes that science must be viewed in its social context since culture and environment also influence facts and theories. Gould also makes it clear that he does not believe in the popular claim that scientific change reflects changes in social concepts. Science means looking for the reality based on facts. Gould goes on to say that in many cases throughout history, science has not been constrained by facts. In some instances, there is a lack of reliable facts and information even though the topic is considered socially important. A second reason has to do with the manner in which scientific questions are formulated.

It is logical to assume that mentality and intelligence are located in the brain. "We now encounter the second fallacy - ranking, or our propensity for ordering complex variation as a gradual ascending scale" (Chapter 1, pg. 56). Ranking means that there is some sort of ordering that is used in assigning individuals to their relevant spot. Each person is assigned a single number that determines his ranking on the scale. This then is used to claim that various disadvantaged groups are inferior. Different arguments have been used to justify the rankings and that is what different chapters in this book are about.

This includes craniometry, or the size of the brain, and intelligence testing and the concepts and techniques involved in each.

Gould's angle is to reanalyze existing data sets that exist in both craniometry and intelligence testing. He is looking for the cultural influences upon science as if he can find this, then he can prove that biological determinism is the result of social prejudice. Gould's second reason is to look for problems in the numerical data. Why did the scientists draw the conclusions that they did? He refers to biological determinism as a theory of limits that has had a profound effect on many people.

American Polygeny and Craniometry before Darwin

American Polygeny and Craniometry before Darwin Summary and Analysis

This chapter discusses the data that ranked individual by the size of their brains. This is one of the arguments used in biological determinism for the inferior status of the people ranked at the bottom of the hierarchy. The craniometry argument is the first scientific argument that has been offered and it first appeared in the early nineteenth century. Gould asks if the science added the legitimate data or did a desire for ranking lead to the questions and data to support a predetermined conclusion. What caused what?

Practitioners of racial ranking placed Indians under whites and black below Indians. Gould talks about two groups. He defines hard-liners as those who feel that blacks are inferior and therefore deserve the status of slave. The other group, or soft-liners, believe in the inferiority argument but also believe that intelligence should not be tied to the right for freedom. This lead to debates on whether education could change the status of the inferior group. There were also debates about the biological basis for inferiority. The opposite of the biological argument is that inferiority is cultural and can be changed by environmental factors.

Many early popular figures, like Benjamin Franklin and Thomas Jefferson, believed in the inferiority of the black. Thus, the leaders of the eighteenth and nineteenth century did not dispute racial ranking. They saw nothing wrong with it. This view was a social belief and not the result of any scientific data. Many compared the anatomical structure of the black to that of different members of the monkey family. Some, like Blumenbach, felt the differences were due to climate.

Two views that developed are called monogenism and polygenism. Monogenism is based on Adam and Eve and has scriptural implications. This view holds that all of mankind evolved from one source - Adam and Eve. The different races represent different stages of degeneration from the perfection of Eve and Adam with the black having degenerated more than the whites. The argument of polygenism views the races as originating from different sources. Therefore, the argument went, blacks did not share in the equality of man, because they were descended from a different source. There was still a lot of belief in climate and its affect on the races as some investigators looked at latitude and longitude.

Polygenism gained support from Serres, the nineteenth century medical anatomist who said that humans were distinguished from savages by the human's ability to improve himself. This argument was used to promote the argument for slavery. Serres tried to document this inferiority and proposed that adult blacks were like white children and that

adult Mongolians were like white adolescents. He was trying to show that entities with higher ranking had to repeat the growth stages of those with lower ranking.

David Hume was also a believer in the superiority of the white race and polygeny. He felt that there never was a civilized nation that wasn't made of white men. Hume felt that this couldn't happen in numerous countries unless there was a biological basis for it. In America, the theory of polygeny was supported by Louis Agassiz. The American scientists won the respect of the Europeans for their work in this area. The Americans formulated the school of thought and developed the data. Agassiz was accepted as the most respected theorists and Morton was accepted as the data analyst. Agassiz believed that there were different centers of creation and that a specie did not move too far from his center. He is known as a splitter in that he looked for small differences between species. Agassiz didn't collect any data for his work but based his theories on his own knowledge of biology. The scientist never met blacks before he came to America and says he experienced immediate revulsion upon the encounter. He believed that they came from different sources than the white race.

"Agassiz then presents his argument: The theory of polygeny does not constitute an attack upon the scriptural doctrine of human unity. Men are bound by a common structure and sympathy, even though races were not created as separate species" (Chapter 2, pgs. 77-78). Agassiz, who presented his theory in a newspaper article, feels that blacks are on the bottom of the ranking scale. He concludes by tying the rankings to educational opportunities, in that blacks should be trained in manual labor work and whites in 'thinking' work. Agassiz calls for legal equality for blacks but not social equality. He is not a proponent of slavery and is against inter-racial marriages.

The other big name is polygenism at this time was Samuel George Morton. Morton was also a physician but he was an empiricist. He was a skull collector having more than one thousand different skulls, mostly from Indian tribes. Morton functioned as the data gatherer of the movement ranking different groups based on brain size. Morton studied the facts in ancient Egypt, measuring dog skulls and deciding that they came from different sources. He also finds that blacks were assigned menial roles in ancient Egyptian society that supports their inferior status. Morton's results are presented in a series of charts in the book in which he ranks the races as Caucasian, Mongolian, Malay, American and Ethiopian.

Gould reanalyzes Morton's data and finds many errors in his results. Gould says that if Morton was perpetuating a fraud, he wouldn't have been so open about publishing his data and work. Crania Americana, Morton's most extensive work, is concerned with proving the inferiority of American Indians based on their smaller brain size. Gould finds that there is bias in Morton's sample in that it contains too many small skulls of Peruvian Incas. Most of the errors that Gould finds have to do with sampling errors. After correcting for sampling errors, Gould finds no significant difference in the skull sizes of Caucasians and Indians.

Crania Aegyptiaca, his second major book, is based on skulls from Egyptian tombs. He divides the skulls into three groups, Pelasgics, Jews and Egyptians. Non-Caucasian

skulls were divided into Negroid or Negro. His divisions are based on his own intuition, not on anything scientific. Since the Negroid and Negro skulls have a smaller capacity, Morton takes this as a sign of intelligence. However, Morton makes no allowances for body size or sex that Gould feels shows Morton's bias for trying to relate brain size to intelligence. Gould finds no differences in the skull sizes of the different races in Morton's study.

Gould has four conclusions regarding Morton's work. First is the problem with sampling. Morton did not have an equal number of skulls for each category. He also seems to have had a predetermined prejudice that he was trying to prove which affected his methodology, and he never considered any other factors affect intelligence other than skull size. Lastly, Gould also found many miscalculations in the data.

Measuring Heads

Measuring Heads Summary and Analysis

During the latter nineteenth century, science became fascinated with number and science began to generate reliable numbers in many different areas. Several names are notable from this period. One such name is Francis Galton, a cousin of Charles Darwin. Galton wrote Hereditary Genius in 1869 and this was his major work. He had a display at the International Exposition of 1884 where he measured people's skulls and gave them his results on his measure of their intelligence.

Another investigator into craniometry was Robert Bennett Bean, a Virginia physician. Bean compared the brains of blacks and whites to prove his view of the inferiority of blacks. Bean gathered data on the corpus callosum and claims that higher mental functions were performed by the front of the brain and motor functions were done by the back of the brain. Due to this, Bean felt that races could be ranked by the size of different parts of the brain. The front of the brain was larger in whites than in blacks. He also felt that the genus, or front part of the brain, was smaller in women than in men. As a result of Bean's work, experts claimed that it did no good to educate blacks, because the brain couldn't handle or absorb any of it. Bean's work was repeated and refuted by Franklin P. Mall who eliminated the cause for a priori bias and found that there was no difference in the brain piece sizes.

There are four points that Gould makes here that he claims to carry throughout the book. First, the claims of inferiority are limited to one group even though race, sex and social class are tied together. Second, the conclusions of the studies are dictated by pre-determined conclusions based on prejudice. Third, flaws in experimental design and procedure do not lead to credibility in the numbers. Craniometry was popular with academics and the public.

Paul Broca is a scientist of this time who used numbers that Gould claims was to support a priori conclusions. Broca was a professor of surgery in Paris. He believed that the size of the brain determined intelligence and had this claim challenged by Louis Pierre Gratiolet. Broca criticized other scientists who disagreed with his preconceived idea. Gould studied Broca's works and statistical procedures and fells that Broca formed his conclusions before doing his research. Broca's numbers were based on his observations but Broca's studies were biased by his choice of what to observe to prove that white brains were larger than black brains and that white males brains were larger than white female brains.

Gratiolet sought to prove that German brains were bigger than French brains. Gratiolet considered other factors that affect brain size, like general health and body size, in his studies. However, Broca kept on looking at brains and comparing sizes. They felt that women should be denied the benefits of education due to their smaller brains even if there were corrections for height and age. Nevertheless, Broca did not consider other

factors that influence brain size. One important indicator is the cause of death. A degenerative disease can diminish brain size in a human. Other found differences in brain size due to the general health of the subject. People with diseases had smaller brain sizes than those who were suddenly killed in accidents.

Craniometry is not considered as important as it was since there are now more acceptable measures of intelligence testing. Yet questions remain about the differences in brain sizes.

Measuring Bodies

Measuring Bodies Summary and Analysis

The nineteenth century was the time of the theory of evolution. This theory had many effects on though, especially in the life sciences. The field of life sciences was redefined during this period. All kinds of people could use brain sizes to make their statements about various groups and tie it into evolution. Other theories came into being because of the theory of evolution. Gould considers two of these categories in this chapter. The first is called recapitulation and the second looks at a biological basis for criminal behavior.

Recapitulation is the theory based on tracing mankind back to the apes as they tried to construct a tree of life. "Recapitulation also provided an irresistible criterion for any scientist who wanted to rank human groups as higher and lower. The adults of inferior groups must be like children of superior groups, for the child represents a primitive adult ancestor. If adult blacks and women are like white male children, then they are living representatives of an ancestral stage in the evolution of while males. An anatomical theory for ranking races - based on entire bodies, not only on heads - had been found" (Chapter 4, pg. 144). Recapitulation was the name given to the theory of biological determinism where members of inferior group were compared with white children.

E.D. Cope was one of the theorists of this genre who believed that Southern Europeans were inferior to others due to the warmer climate that brought on an earlier maturation. This caused the slowdown in development that resulted in their inferiority to Northern Europeans. G. Stanley Hall, A.F. Chamberlain, Henry Clay, Rudyard Kipling and others looked upon the inferior groups as being on a level with children and therefore biologically inferior to whites. This view prevailed for more than seventy years, and there were many researchers who engaged in studies that proved these "facts".

Havelock Ellis was a scientist who claimed the superiority of women during this period. He also found urban males to be more effeminate than their rural counterparts. Louis Bolk also believed in the inequality of the races and felt that blacks were not totally inept. He felt that the whites as the most progressive race was also the most retarded of the races. The British psychologist H. J. Eysenck also believed in black inferiority based on three facts. First, the sensory motor development of black youngsters develops more quickly than in whites. Secondly, the average IQ of whites exceeds that of blacks. The third fact is that the people with the more rapidly developing sensory motor skills tended to have lower IQs. Gould feels that Eysenck's arguments are not based on statistical fact but are the result of non causal correlations.

The second branch of theories springing from evolution had to do with criminal behavior and, based on Cesare Lombroso states that criminal behavior is hereditary. The genes of the past are contained in the hereditary of the individual and the behavior surfaces at times. Lombroso basically made his arguments in a way that lead to their defeat. He would try to make the facts and data fit his system. One of the problems faced by

Lombroso was the theory's need to call children criminals. His theory was known as atavism.

Criminal anthropology was a hotly debated topic at the turn of the twentieth century. The logical consequence would be to screen people before they could commit their first offense. Lombroso and his colleague did not favor death for those found to be born criminals. The chapter epilogue notes that the chromosome XYY was discovered in the 1960s and linked to violent behavior in males.

The Hereditarian Theory of IQ

The Hereditarian Theory of IQ Summary and Analysis

Alfred Binet studied human intelligence and how to measure it while working at the Sorbonne. He began by measuring skulls as Broca had done and after spending three years and publishing nine papers, he began to question the technique. He was going to different schools and measuring the heads of children and trying to correlate his measurements with the teacher's designation of smart and dumb. Binet did not find large significant differences in his measurements and was questioning the theory. He found too much variability in the results and found that the measurements did not support the theory. He was also aware of bias and tried not to let that influence his results but he notices discrepancies between the figures collected by himself and his student, Simon. Binet ended the heyday of craniometry with his work since there wasn't enough of a difference in measurements to support the theory.

Binet continued his work on intelligence but emphasized the psychological measures instead of the medical measures. Binet was commissioned, in 1904, to find a way to identify children who needed special help in school. He did so by devising a series of tasks, like counting coins that the children would be measured on. As the test was further developed, Binet assigned age levels to the different tasks and these tasks became a measure of IQ. The test was administered in such a way that the child began with the lowest age level task and kept going up age levels until he could no longer do the task. "The age associated with the last tasks he could perform his 'mental age,' and his general intellectual level was calculated by subtracting this mental age from his true chronological age. Children whose mental ages were sufficiently behind their chronological age could then be identified for special educational programs, thus fulfilling Binet's charge from the ministry. In 1912 the German psychologist W. Stern argued that mental age should be divided by chronological age, not subtracted from it, and the intelligence quotient, or IQ, was born" (Chapter 5, pg. 180).

Binet thus developed a scale on which to rank human intelligence based on the outcome of the tasks performed by the individual. He tried to devise a method that would distinguish between natural intelligence and what was learned. Binet also worried that his technique would be used to label people instead of to identify those children who needed special attention in school. The teacher who has the IQ information may treat the child in such a way as to result in their following the path predicted by the test. His only purpose in devising this test was to help identify children who needed special help.

"The difference between strict hereditarians and their opponents is not, as some caricatures suggest, the belief that a child's performance is all inborn or all a function of environment and learning. I doubt that the most committed antihereditarians have ever denied the existence of innate variation among children. The differences are more a matter of social policy and educational practice. Hereditarians view their measures of

intelligence as markets of permanent, inborn limits. Children, so labeled, should be sorted, trained according to their inheritance and channeled into professions appropriate for their biology. Mental testing becomes a theory of limits. Antihereditarians, like Binet, test in order to identify and help. Without denying the evident fact that not all children, whatever their training, will enter the company of Newton and Einstein, they emphasize the power of creative education to increase the achievements of all children, often in extensive and unanticipated ways. Mental testing becomes a theory for enhancing potential through proper education" (Chapter 5, pg. 183).

Binet knew that a child could not receive the help he needed if he was labeled, and this is what he feared his test would lead to. Various techniques, like small classrooms, were needed to help those students identified by the test as requiring assistance. These kinds of students required special help in the areas of attention span and discipline and these should precede lessons in other traditional areas like grammar. Binet referred to this as mental orthopedics and felt that certain aspects of intelligence could be learned. Not all intelligence was inborn.

Because of his fears of misuse of his test, Binet developed a set of three rules that were to apply to anyone using his tests. First, the scores are to be interpreted in a practical manner. They do not measure the innate aspects of intelligence. The scale he developed for his test is used to identify those with learning problems and should not apply to those without learning problems. Thirdly, the identified student should receive help with special training in school. The problem is those who followed Binet and used his tests did not follow his rules and this led to misuse of the test in the following years.

Some of the problems that resulted from this test stemmed from the equation of hereditary and inevitable. In other words, if it was inherited, it was inevitable. This is necessarily true, because education can correct many deficiencies. Another problem arises from the confusion of hereditary within and between groups. Comparing white children in different situations is not the same thing as comparing white and black children, because they come from different groups with different means. Problems arose, because American psychologists did not follow Binet's three rules and tried to use Binet's methodology to measure intelligence based on heredity. This led to the belief that IQ determined an individual's status in life and that any differences in scores between groups were due to heredity.

In America, three men worked on the theories of heredity and intelligence. They were H.H. Goddard, L.M. Terman and R.M. Yerkes. Goddard is the individual who first brought the Binet scale to America. Goddard knew that the terms idiot and imbecile had special meaning in psychology. Idiots had a mental age below three and imbeciles had a mental age between three and seven. Another group were identified by the French and called debiles with mental ages of eight to twelve. They differed from the other two groups in that they were trainable. These are the morons.

Binet's scale was used and refined by Goddard, who introduced it to America and had Binet's articles translated into English and published. Unlike Binet, Goddard used to scores to label and categorize. Goddard tried to develop a unilinear scale to measure

intelligence. Two errors prevailed. First, intelligence could be determined as a single measurable entity. Second, a scale went from low to high. This means that there is a single thing that is measurable that determined an individual's position on a scale. There are many factors that contribute to heredity like genetic accidents, poor nutrition during pregnancy, etc. However, to Goddard the results meant that anyone in a certain category was treated in a certain way, regardless of circumstance. Intelligence, to Goddard, came from family lines and nothing else.

Goddard considered the moron to be the most dangerous, because he could be trained to function. He could do the monotonous jobs that are required in a society. He could also live independently and reproduce and be a threat to racial health. Goddard was excited about Mendel's work with heredity and peas. He applied this to his feeble-minded at his institution and tried to trace their lineage and decided that they conformed to Mendel's principles. He believed that there was a specific gene responsible for intelligence, and he believed that mental-deficients should be prevented from breeding, because they will have mentally deficient children. This is Goddard's belief of how to deal with the problem.

Goddard also went to Ellis Island and tested immigrants to see if they were defective. He received grant money for a study to be conducted there are felt that people could be trained to pick out defectives by sight. They tested groups of Jews, Russians, Hungarians and Italians and found the majority of them to be feeble-minded on the Binet scale. People tended to score low on Goddard's version of the Binet test. This is what Terman found out in 1916, when he devised the Stanford-Binet scale. By 1928, Goddard was retracting much of what he had claimed earlier. He admitted to overstepping the boundaries that Binet had established for his tests.

Lewis Terman was another scientist who popularized the Binet scale as the Stanford-Binet scale. It remained a test for individuals just as the Binet test was. Terman restructured the test so that each age level represented one hundred points and mental age was equal to chronological age. There was a standard deviation of fifteen for each chronological age. The test was then mass marketed and created a lot of controversy. Termen felt that testing could result in the removal of the sociopath from society and channeling people into various professions based on their test results. He hoped that minimum IQ levels would be established for different professions. Terman himself determined some IQ levels for various occupations like semi-skilled labor.

Terman also studied the intelligence of people in various occupations and found some of them working in occupations that had lower minimum IQ requirements than they qualified for. These are the low achievers. His study of hoboes showed many of them scored higher than other groups like firefighters and police officers. Terman solves this problem by only using the lowest quarter of each group that puts the hoboes at the bottom of the list. In spite of this, Terman and his group wrote and published Genetic Studies of Genius, which is a five volume series on the higher scoring people. In it, they try to reconstruct the IQs of past historical figures. Terman, Cattell, Cox and others had to estimate these IQs from biographical information. These IQs did not really measure the intelligence of the people just the quality of the data. High IQs meant a lot of data

and low IQs meant little data. This was the problem with Cox's study: the IQ was dependent on the amount of data that was available about the subject.

Terman's work was concerned with the variance within a group or the children within a certain group or school. Their relative positions of children within the group did not tend to change with time. The few variations that Terman found he attributed to biology and not to environment. Terman, like Goddard, also changed his position. He warns people about using the means, because the differences are too small to be meaningful.

The third major figure of this period is R.M. Yerkes, a Harvard psychologist. Yerkes wanted to prove that psychology was a rigorous science and felt this could be done by using numbers in the area of mental testing. Nevertheless, the tests yielded inconsistent results and there was not enough support to build a database on which to build. As World War I began, Yerkes had the idea of having the Army test its new recruits. Yerkes and his colleagues wrote the tests. The written exam was called the Army Alpha. For those who were illiterate or who failed the Army Alpha, there was the Army Beta. Those who failed the Army Beta were given individual exams. The Army didn't use the tests for much but determining who could qualify for officer training.

E.G. Boring, an assistant to Yerkes, had to work some of the problems out of the results and convert them to a common standard. Three results became known from these tests. First, the average mental age of white males was thirteen, just barely above being a moron. The average mental age had always been assumed to be sixteen. This lower figure was attributed to in breeding with the black and other ethnic groups. The second fact was that European immigrants are scored based on their group being their country of origin and their average person is a moron. Third, the black is at the bottom of the scale with darker skin types scoring lower on the test.

One thing that Yerkes found was that the Goddard version of the Binet test resulted in lower scores. However, even the Yerkes Army tests resulted in low scores for most people. The tests included in the Alpha version were eight different tests and there were seven in the Beta version. They could be administered to large groups within an hour. In some cases, the conditions varied. They ran out of printed test forms and had to improvise with blank sheets of paper or the standards for the Alpha and Beta versions contained variety depending on the location of the test site since there was no measure of literacy available. Not all of the men received an individual exam after failing the Army Beta version. A review of the procedures revealed many inconsistencies. The instructions for the Alpha test were much more detailed and received better than the instructions for the Beta test.

Many of the subjects had difficulties understanding the instructions and this may have invalidated many of the test results.

Yerkes felt the tests measured innate intelligence not influenced by environmental factors. He managed to explain away any environmental factors that appeared. Whites scored higher than blacks did, because whites had more schooling than blacks did. He doesn't address the issue of quality of schooling. Northern blacks scored higher than

Southern blacks did. Test results also showed that Northern Europeans scored highest among immigrants. English speakers scored higher than others did. Non-familiarity with American ways was a possibility for the differences in test scores but Yerkes tried to tie it to heredity. The thirteen-year mental age of the whites bothered Yerkes. It could be that the tests were not measuring innate intelligence but were measuring education and familiarity with culture. "Unfortunate 13 became a formula figure among those who sought to contain movements for social welfare. After all, if the average man is scarcely better than a moron, then poverty is fundamentally biological in origin, and neither education nor better opportunities for employment can alleviate it" (Chapter 5, pg. 253).

C.C. Brigham, in 1923, wrote a book called A Study of American Intelligence in which he examined the group differences in the Army data. He felt that the Alpha tests may contain the effects of education but the Best tests were tests of innate intelligence, because they required no English. He attributed the higher scores of Northerners to better education, wages and living conditions. Brigham also found that the longer an immigrant was in the country, the higher the scores were. He still felt that the results were based on biology, not on environment. These Army studies had implications for immigration and immigration policy that resulted in quotas based on nationality.

Brigham also retracted his theory after a few years. He said Alpha and Beta measured different things and therefore could not be ranked on the same scale as they had done. He also decided that the tests were not measuring innate intelligence but were measuring familiarity with American language and culture.

The Real Error of Cyril Burt

The Real Error of Cyril Burt Summary and Analysis

Much of this chapter has to do with the statistical technique of factor analysis. It explains this technique in terms of geometry and matrix algebra. Since this is not a book on math, the highlights of this presentation will be presented and discussed in as simple a manner as possible.

Sir Cyril Burt was a medical tester who studied twins, and he made quite a name for himself, publishing papers during his retirement. "The story of Burt's undoing is now more than a twice-told tale. Princeton psychologist Leon Kamin first noted that, while Burt had increased his sample of twins from fewer than twenty to more than fifty in a series of publications, the average correlation between pairs for IQ remained unchanged to the third decimal place - a statistical situation so unlikely that it matches our vernacular definition of impossible" (Chapter 6, pg. 265). As others studied Burt's work and data, more suspicion was raised about Burt's fabrications.

Many of Burt's fabrications were uncovered by L.S. Hearnshaw who found that Burt manufactured his data. Burt's falsifications began in the 1940s when his papers and data were destroyed in the bombing of London. Burt also tried to claim that he developed the statistical technique of factor analysis, which was actually developed by Charles Spearman who had not used the statistical technique in psychology. Burt used the technique in psychology but did not develop the technique. Factor analysis is considered a correlation method technique as opposed to the age scale method that the Binet scale is considered to be. Factor analysis was right technique to be used in intelligence testing, even though Burt went about it the wrong way.

Correlation is a way of measuring the relationship between variables. It indicates how much of a change there is in one variable due to a change in another variable. When variables change in the same direction, the correlation is positive. When the variables change in the opposite direction, the correlation is negative. When a change in one variable has no affect on another variable, then it is called a zero correlation. Correlations do not imply anything about causality. A correlation means that a relationship exists but does nothing to explain why. Correlation is measured by the Pearson product moment coefficient, denoted by r. A +1 means there is perfect positive correlation; a zero indicates no correlation and -1 denotes perfect negative correlation. No matter how strong a correlation is, it still says nothing about cause. As Gould indicates, there is a strong correlation between age and the price of gasoline, but there is no casual factor. Correlations can exist between more than two variables. Factor analysis is a method of simplifying the system of correlations into a manageable form.

If the factor analysis situation is graphed, highly correlated vectors lay close to one another. Overlapping vectors have perfect correlation. If the vectors form right angles, they are independent of each other. Negative correlation is given by vectors going in

opposite directions. Spearman calculated a matrix principal component in 1904 known as "g" which represented general intelligence. He thought it could be used to rank human intelligence but it never attained that role and could never be used as causal entities. In the 1930s, these vectors were rotated and the "g" disappeared. Thus, there is no general coefficient of intelligence as Spearman thought.

These correlation coefficients were a big thing when they were first developed in the 1930s and 1940s. Today, with computers and all of the advances in technology, they are calculated on calculator and as by-products of other statistical tests and techniques. "Charles Spearman developed factor analysis - still the most important technique in modern multivariate statistics - as a procedure for deciding between the two - vs. the many-factor theory by determining whether the common variance in a matrix of correlation coefficients could be reduced to a single 'general' factor, or only t several independent 'group' factors. He found but a single 'intelligence,' opted for the two-factor theory..." (Chapter 6, pg. 287).

Spearman has two primary claims. The first is that intelligence is a unitary thing. The second is that there is a physical substrate for intelligence except that this can be affected by environmental factors. However, Burt felt there were four reasons that could be used for discounting the effects of environment. First, parents can still afford to send their children to school, no matter how poor they are. Therefore, environment is not a factor that matters. Second is the minute difference in the educative influences of social life and home life. The third factor is that the nature of the tests eliminates the environment factor. Fourth is that there is no readjustment of rank over time. These are the reasons that Burt felt negated the effect of environment.

The principal components approach allowed Burt to identify group factors. Burt differed with Spearman over the existence of group factors. Burt thought that he could identify them; Spearman thought he couldn't. Spearman believed in the importance of "g" with everything else being subordinate to "g". They also identified specific factors that Spearman designated as "s". This consisted of a single trait's attributes that could always be measured. Accidental factors were attributes that could be measured once but not always. "G" was considered to be inherited and "s" was considered the product of training by both Spearman and Burt. Burt had three claims about factors. First, they were mathematical abstractions; second, they were something that was contained in the human brain; third, they corresponded to real categories of thought within psychic reality.

Burt developed a form of factor analysis that was inverted and based on a correlation between people instead of between tests. Burt was more interested in the people that were tested while others were more interested in the abilities that were being tested. There was also uproar over the 11+ practice. The age of eleven represented the age where there was a separation. It was the age of transition from primary to secondary school and the age at which "g" stabilized. There was not much change after this age and all special abilities were identified before this age. Burt said that he supported this rule, because it provided more education for the disadvantaged.

L.L. Thurstone, a University of Chicago psychologist also did work on the intelligence measuring issue. Thurstone proved that "g" was worthless. He did not agree with the use of principal components to generate "g" or group factors and eliminated the use of negative test projections. Thurstone felt that the vectors had to represent independent primary abilities and the group factors were known as primary mental abilities or PMAs. Since then there has been a debate over the reality of "g" and whether or not it is an acceptable measure. Arthur Jensen, in 1979, supported Spearman defense of IQ based on "g". Jensen supports the use of "g" as derived by Burt, Spearman and Thurstone's approaches.

A Positive Conclusion

A Positive Conclusion Summary and Analysis

Gould feels that he has followed Walt Whitman's advice regarding negatives and using them as much as possible. Gould has done this is exposing the errors involved in biological determinism and what did the various scientists do that was wrong. Most of the errors are the result of prejudice. Gould sees his efforts as positive. Finding the errors and pointing them out is a part of positive science. The unilinear rankings are a form of racial ranking and many results from racial prejudice. "Scientists do not debunk only to cleanse and purge. They refute older ideas in the light of a different view about the nature of things" (Chapter 7, pg. 352).

Another reasons that Gould thinks that his book is valuable is because there is a learning valued involved in debunking theory. This doesn't mean to replace one form of prejudice with another. Many theories of biological determinism become rejected as more information becomes available. Errors and erroneous theories are discarded as more knowledge becomes available. This is how scientific progress takes place. Gould does not believe in the blank slate theory. He refers to himself as an evolutionary biologist and as such that he can't believe that people are blank slates at birth. Humans are unique and that uniqueness comes from the brain.

One of the reasons for the failure of biological determinism is that most of the factors that they identified were the result of culture and not the result of biology. It is basically because of the uniqueness of humans that biological determinism is rejected. Most scientists won't accept the argument for genetics being responsible for differences in behavior between groups.

Gould sees various reasons for biological insight. When humans adapt, it doesn't means that it is the result of biology. Adaptation can also be the result of cultural factors and biology can still be useful in its explanation. Human are limited by their biological boundaries and for the most part cannot overcome them. There are ranges in behavior with limits set by genes. The narrower the range the more likely that the behavior can be attributed to genetics. The wider the range of behavior, the less like that it is due specifically to genetics. Gould disagrees with the sociobiologists that take this approach.

Biological determinism is looking for the genetic basis of human nature. Biological potentiality is looking for the underlying rules and both of these things are biological theories.

Characters

Alfred Binet

Binet was working at the Sorbonne when he first became involved in measuring human intelligence. He began by using Broca's technique of measuring skulls and went to various schools measuring the heads of children and seeing if they conformed to the teacher's designation of smart of dumb. He found that there was not always a correlation and his work basically ended the popularity of the theory of craniometry. He devised a test consisting of a series of tasks that had age levels assigned to them. From this, he was able to identify school children who required special training. He had three rules that he followed for using his tests. Those who came after him did not always follow the rules which is why they abused so many people with the results.

H.H. Goddard

Goddard was one of the early Americans who worked on the question of heredity and intelligence. Goddard used Binet's scale in America and turned it into a measure of intelligence. Goddard ran an institution and also tested immigrants on Ellis Island. He became interested in Mendel's studies of genetics and peas and decided that there was one gene that was responsible for intelligence. Goddard believed that the defective people could be found through testing and then prevented from breeding so as to prevent propagation of the species. By the mid 1920s, Goddard was retracting most of what he had claimed since he knew that he had overstepped Binet's parameters for how to use the test.

Etienne Serres

Serres was a French medical anatomist who believed in the superiority of the white race. He wrote in circa 1860 that humans were the only race that could improve themselves and this distinguished them from savages. He then applied this principle to polygenism to provide support for the argument of slavery. American support of slavery was based on this argument.

Louis Agassiz

Agassiz was the American proponent of polygeny. Originally from Switzerland, he came to America in the 1840s and taught at Harvard. He opposed slavery and developed a theory based on centers of creation and that species did not go far from their center. He did not support the social equality of blacks but did believe in legal equality. In the last years of his life, his students and other scientists began to question and shun him, although he remained popular with the public. Agassiz was basically the theorist of the biological determinism movement in America.

Samuel George Morton

Morton was a scientist and physician and the empiricist of the polygeny movement. He had more than one thousand skulls as part of his data gathering effort on brain size believing that ranking could be based on brain size. Crania Americana, written in 1839, is his most extensive work with most of his results being corrected by Gould. Gould followed Morton's methodology and repeated his work, finding many errors that he corrected. Morton second major work is Crania Aegyptiaca, which is based on skulls from Egyptian tombs.

Francis Galton

Galton is a cousin of Charles Darwin and a scientist of the nineteenth century. He was interested in craniometry and, according to Gould, his conclusions were tainted with his own prejudice that led to his predetermined conclusions. Galton wrote Hereditary Genius in 1869 and in 1884 had a booth at the International Exposition where he measured people's skulls and told them their resulting level of intelligence.

Robert Bennett Bean

Bean is the Virginia physician who believed it was the size of the different parts of the brain that could be used to determine intelligence. He believed that higher functions resided in the front of the brain and that motor functions resided in the back of the brain. He measured the parts of brains of whites and blacks and found that whites have larger front brains than blacks.

Paul Broca

Broca was a scientist of the late nineteenth century who basically used numbers to reach his predetermined conclusion in terms of craniometry. He was a professor of surgery in Paris. His findings supported the conclusion that brain size determined intelligence. Broca criticized other scientists that didn't support his conclusions.

Cesare Lombroso

Lombroso was an Italian physician who believed that criminal behavior was hereditary. Germs of the past are contained in hereditary and occasionally surface. This is the "born criminal" and is behavior based on hereditary.

Gunnar Myrdal

Myrdal is a Swedish sociologist who wrote the book An American Dilemma in which he examines the biological arguments. He claims that the Americans and others accepted

the biological arguments and wouldn't consider the social factors unless they were forced to. The facts pretty much supported his contention.

L.M. Terman

Terman is the scientist who developed the Stanford-Binet scale and made the Binet scale popular. Terman made a score for each age level and assigned a standard deviation of fifteen or sixteen points to each chronological age. He then mass marketed the Stanford-Binet test that became the basis for a lucrative industry.

Catherine Cox

Cox was an associate of Terman who, along with others, thought she could determine the IQs of various historical figures by examining the details of their lives. What she really measured was the amount of relative data available as a large quantity of data led to high IQs and small quantities of data led to low IQs.

R.M. Yerkes

Yerkes is the scientist who caused the army to test 1.75 million men during the First World War. He was a Harvard psychologist who wished to prove that psychology was a rigorous science. He succeeded in having the Army test its recruits and helped to devise a series of three tests of intelligence. The Army Alpha was for those who were literate. The Army Beta was for those who were illiterate or who failed the Army Alpha. An individual test was administered for those who failed the Army Beta.

Sir Cyril Burt

Burt was a medical tester who lived in London. He oversaw all of the testing of the London County Council which was in charge of mental tests for London schools. Burt studied twins, and his work underwent intense questioning and was found to be questionable and containing many fabrications.

Socrates

Socrates was a philosopher of ancient Greece. He is one of the first to say that the belief that intelligence is based on innate characteristics is false.

Charles Spearman

Spearman is the developer of the statistical technique of factor analysis. This is the methodology that Burt claimed to have developed.

Objects/Places

Biological Determinism

Biological determinism is the object of this book's attention. This is the belief that intelligence can be accounted for by biology and that a particular group's fate is determined by biology.

Ancient Greece

The book opens with a scene from ancient Greece, with Plato giving his opinion about the nature-nurture question.

Sweden

Sweden is the home of Gunnar Mrydal and the place where his studies took place. Mrydal was active in the biological determinism movement in the 1940s.

Harvard University

Harvard is where Louis Agassiz taught. Agassiz was the leading theorist of the American movement for polygenism.

Philadelphia, Pennsylvania

Philadelphia is the home of Samuel George Morton who did empirical work on polygenism by measuring skulls in the mid eighteen hundreds.

Ellis Island

Ellis Island, in New York harbor, was a place of entry for immigrants. It was also a place where some immigrants were selected for intelligence testing in Goddard's study.

Paris, France

Paris is the home of Broca and Gratiolet who had a dispute about the brain sizes of blacks and whites and the affect on intelligence. Paris is also the location of the Sorbonne where Alfred Binet conducted his intelligence testing.

New Jersey

New Jersey is the site of the Vineland Training School for Feeble-Minded Girls and Boys. This is the place where H.H. Goddard was the director of research.

London, England

London is the home of Sir Cyril Burt who was the psychologist in charge of testing for the London school system.

Chicago, Illinois

Chicago is the home of the University of Chicago and the place of birth of L.L. Thurstone.

Themes

The Development of Theory

This book is a good study in how theory comes into being. Scientists, influenced heavily by Darwin's Theory of Evolution, feel that there has to be a biological basis for intelligence, and they being to look for it. That is what this book is about. The early theories were based on biological determinism, or the belief that intelligence was biological. If intelligence is an inherited trait, then there has to be a way to measure it. This is what early scientists try to do with craniometry, which was the measuring of the brain size that was used as an indicator of intelligence.

Gould presents the information that shows how theories are developed. A scientist's work is presented, another scientist duplicates the methodology and compares results. If the results are not the same, then an explanation must be offered as to why. This is what Gould does in this book with the study of craniometry. His duplication did not confirm the earlier results and the differences had to be explained. This is the way that scientific theory and other theories are developed. A theory is proposed based on a scientist's work. The theory is tested with data and the results are presented. Other scientists duplicate the methodology to see if they can confirm the results. If they can't, then the theory may be questioned, as craniometry was. Errors in procedure were discovered and presented by Gould who could not always confirm the earlier results.

Even though this book is concerned only with measures of intelligence, the procedure applies to all theories and how they are developed and tested. This is one of the reasons why this book is important. It examines the methodology involved in the development of theory and the debunking of theory, which is what Gould does when he explains not being able to confirm early skull measurement results. Lucky for Gould, he had the original skulls used in the studies available for him to examine, or he might not have been able to do such a thorough job.

The Role of Bias

An important theme running throughout the book is the role of bias. Researchers in science and all fields are supposed to be objective. They are supposed to deal only based on fact without clouding the issues with emotions. Racial prejudice stems from emotions, not facts, as this is one of the things that Gould points out often throughout the book. Many of the early studies were clouded by bias. It was assumed by society that whites were the superior group, especially white males. Almost all of the early studies done in intelligence measurement supported these views.

Gould retested the data and found the results were not as they had been presented. E discusses how bias affects the outcomes. Data is selected in such a way as to support the pre-determined outcomes. This is what Gould found in several of the studies. Bias is

something that shouldn't enter into scientific research, yet it did in most of these early studies of measures of intelligence. Even though some researchers were aware of the problem and thought they had protected against the problem, they still had the effects of bias in their works.

Bias meant selecting the data or methodology in such a way that it led to the pre-determined conclusions. Unequal and unweighted sample sizes from the different groups lead to the groups with the larger sample size being given heavier consideration. Omission of certain groups or inclusion of certain groups also affects the outcomes. This was evident in used the Peruvian Indian skulls that were known to be of small skull size. These sampling errors influence the outcome, as Gould discusses.

Researcher bias is not a sign of good research. This is one of the points that Gould makes as he shows how bias is found and dealt with in research. Debunking is the process of dealing with how results are reached in studies and what happens when they can't be duplicated. This is one of the valuable points of the book.

The Role of Numbers

Gould shows how number crunching is important in science. This was the purpose of craniometry, which sought to measure intelligence in the form of brain size and uses that information to develop a ranking of groups. Most of these rankings were based on the pre-determined racial prejudices of the experimenters. Even though number crunching was used, it still led to faulty results. This is one of the important points of the book. Numbers can be used in such a way as to prove whatever the researcher wants to prove. There is nothing sacrosanct about studies using numbers in terms of the conclusions they lead to except that the studies are usually easier to duplicate to see if the methodology and technique are proven.

The use of statistics and how statistical techniques come into being is also a feature discussed in the book. This is because Burt tired to claim Spearman's technique of factor analysis. Gould spends a lot of time showing how factor analysis was used, and what was good and bad about it. Again the point is, just because numbers or a statistical technique is used, this doesn't mean that it leads to good irrefutable results. There are disagreements about the use of and interpretations of statistical tools and procedures just as there are disagreements about other aspects of science and theory. Gould ties these pieces together in his discussions of these facts.

Style

Perspective

The author, Stephen Gould, is a scientist, a paleontologist. He is trained in research and statistical techniques so he is well qualified to tackle a subject like measures of intelligence and the use of biological determinism. He has written many books and conducted many research studies during the course of his career.

Gould's purpose in writing the book was to examine the early techniques of measures of intelligence and to expose what was wrong with them. This is what he does by duplicating the work of some of the early studies. He disputes the fact that there is one single number that can be used to rank all of human intelligence. In addition, craniometry and intelligence measuring allow different groups to be ranked on a continuum. It is not all biology, according to Gould, and this is what he brings into the discussion of the various studies. The influence of most cultural factors is overlooked in any of these studies and this is one of the causes of the erroneous conclusions.

Gould shows how studies are conducted and what problems can arise to lead to faulty questionable results, which is what his own duplication of several studies does. His work is good, because he shows how theory is developed, how debunking takes place. He shows how scientists can reach pre-determined results by selecting their subjects and arranging their data.

Tone

The book is written in the third person in an objective academic manner. The author is an academic researcher and this comes across in the tone of the book. His arguments are not base on emotion, but on fact as he points out how racial prejudice clouded the early results in the field of intelligence measurement. Researchers may have biased samples and methodologies that lead to biased results without consciously intending it to be this way. This is what Gould points out throughout the book.

The reader has to appreciate Gould's approach to the problems and his manner of presenting the material. He is unemotional, as a researcher should be, as he points out the errors of the earlier studies. His manner illustrates to the reader how theory is developed over time and how faulty results will eventually be found by someone in the field who duplicates the study. All studies must be done and presented in a way in which they can be duplicated by other researchers. This is one of the most important rules of research and Gould shows why when he himself finds the errors in the earlier studies and explains them. This is a check and balances system that exists in research.

The reader has to appreciate this book and Gould's technique for what it shows them, because it is showing them how theory comes into being and how bad theory is found

out and debunked. It also shows how careful valid researchers have to be to guard against bias, because numbers can be used to prove anything.

Structure

This book began with a simple structure that became more complex with revisions. It now has an introduction that precedes the Chapter 1 Introduction to the book. There are a total of seven chapters and an Epilogue to the book. Each of the chapters has a distinct topic that it sticks to. There is also a bibliography and an index. When Gould rewrote the book, he decided to add articles at the end of the book. These articles are not contained in numbered chapters and are additions to the book. These articles have to do with the subject of intelligence testing and measurement since they cover the bell shaped curve and perspectives on racism. These articles don't detract from the book, but they are stuck on at the end after the end of the book. They might have had a better place if they were additional numbered chapters.

The material in the book is more or less chronological, beginning with the early days of craniometry and leading up to the use of intelligence testing and statistical techniques. The reader does not have to backtrack in order to check facts. Gould is very good about presenting his ideas and showing how research is accomplished and how to determine the value of any research.

Quotes

"The mismeasure of man resides in the same themes - differences among individuals as the analog to variation in populations, and measured disparities among groups as the analog to temporal differences in lineages through time." (Introduction to Revised and Expanded Edition, pg. 25)

"But the basic argument has not changed: that social and economic roles accurately reflect the innate construction of people. One aspect of the intellectual strategy has altered, however. Socrates knew that he was telling a lie." (Chapter 1, pg. 52)

"Science, since people must do it, is a socially embedded activity. It progresses by hunch, vision, and intuition. Much of its change through time does not record a closer approach to absolute truth, but the alteration of cultural contexts that influence it so strongly. Facts are not pure and unsullied bits of information; culture also influences what we see and how we see it. Theories, moreover, are not inexorable inductions from facts. The most creative theories are often imaginative visions imposed upon facts; the source of imagination is also strongly cultural." (Chapter 1, pg. 53-54)

"If the cultural influences upon science can be detected in the humdrum minutiae of a supposedly objective, almost automatic quantification, then the status of biological determinism as a social prejudice reflected by scientists in their own particular medium seems secure." (Chapter 1, pg. 58)

"In assessing the impact of science upon eighteenth and nineteenth-century views of race, we must first recognize the cultural milieu of a society whose leaders and intellectuals did not doubt the propriety of racial ranking - with Indians below whites and blacks below everybody else. Under this universal umbrella, arguments did not contrast equality with inequality." (Chapter 2, pg. 63)

"The doctrine of polygeny acted as an important agent in this transformation; for it was one of the first theories of largely American origin that won the attention and respect of European antecedents, as we have seen, but Americans developed the data cited in its support and based a large body of research on its tenets." (Chapter 2, pg. 74)

"Sizes of brains are related to the sizes of bodies that carry them: big people tend to have larger brains than small people. This fact does not imply that big people are smarter - any more than elephants should be judged more intelligent than humans because their brains are larger. Appropriate corrections must be made for differences in body size. Men tend to be larger than women; consequently, their brains are bigger. When corrections for body size are applied, men and women have brains of approximately equal size." (Chapter 2, pg. 94)

"Science is rooted in creative interpretation. Number suggest, constrain, and refute; they do not, by themselves specify the content of scientific theories. Theories are built upon the interpretation of numbers, and interpreters are often trapped by their own rhetoric. They believe in their own objectivity, and fail to discern the prejudice that leads them to one interpretation among many consistent with their numbers" (Chapter 3, pg. 106)

"Many investigators have devoted an extraordinary amount of attention to the subject of group differences in human brain size. They have gotten nowhere not because there are no answers, but because the answers are so difficult to get and because the a priori convictions are so clear and controlling." (Chapter 3, pg. 141)

"Lombroso's theory was not just a vague proclamation that crime is hereditary - such claims were common enough in his time - but a specific evolutionary theory based upon anthropometric data. Criminals are evolutionary throwbacks in our midst. Germs of an ancestral past lie dormant in our heredity. In some unfortunate individuals, the past comes to life again. These people are innately driven to act as a normal ape of savage would, but such behavior is deemed criminal in our civilized society." (Chapter 4, pg. 153)

"But of one thing Binet was sure: whatever the cause of poor performance in school, the aim of his scale was to identify in order to help and improve, not to label in order to limit. Some children might be innately incapable of normal achievement, but all could improve with special help." (Chapter 5, pg. 182)

"The hereditarian theory of IQ is a home-grown American product. If this claim seems paradoxical for a land with egalitarian traditions, remember also the jingoistic nationalism of World War I, the fear of established old Americans facing a tide of cheap (and sometimes politically radical) labor immigrating from southern and eastern Europe, and above all our persistent, indigenous racism." (Chapter 5, pg. 187-188)

"Can the plethora of causes and phenomena grouped under the rubric of mental deficiency possibly be ordered usefully on a single scale, with its implication that each person owes his rank to the relative amount of a single substance - and that mental deficiency means having less than most?" (Chapter 5, pg. 189)

"A single gene for normal intelligence removed the potential contradiction between a unilinear scale that marked intelligence as a single, measurable entity, and a desire to separate and identify the mentally deficient as a category apart. Goddard had broken his scale into two sections at just the right place: morons carried a double does of the bad recessive; dull laborers had at least one copy of the normal gene and could be set before their machines. Moreover, the scourge of feeble-mindedness might now be eliminated by schemes of breeding easily planned. One gene can be traced, located, and bred out. If one hundred genes regulate intelligence, eugenic breeding must fail or proceed with hopeless sloth." (Chapter 5, pg. 193)

"Terman's empirical work measured what statisticians call the 'within-group variance' of IQ - that is, the difference in scores within single populations (all children in a school, for example). At best, he was able to show that children testing well or poorly at a young age generally maintain their ordering with respect to other children as the population grows up. Terman ascribed most of these difference to variation in biological endowment, without much evidence beyond an assertion that all right-minded people recognize the domination of nurture by nature. This brand of hereditarianism might offend out present sensibilities with its elitism and its accompanying proposals for institutional care and forced abstinence from breeding, but it does not, by itself, entail the more contentious claim for innate differences between groups." (Chapter 5, pg. 218)

"The proof of inadequacy lies in the summary statistics, though Yerkes and Boring chose to interpret them differently. The monograph presents frequency distributions for scores on each part separately. Since Yerkes believed that innate intelligence was normally distribute (the 'standard' pattern with a single mode at some idle score and symmetrically decreasing frequencies away from the mode in both directions), he expected that scores for each test would be normally distributed as well. But only two of the tests, maze running and picture completion (1 and 6), yielded a distribution even close to normal. (These are also the tests that my own students found easiest and completed in highest proportion.) All the other tests yielded a bimodal distribution, with one peak at a middle value and another squarely at the minimum value of zero." (Chapter 5, pg. 242)

"The principal error, in fact, has involved a major theme of this book: reification - in this case, the notion that such a nebulous, socially defined concept as intelligence might be identified as a 'thing' with a locus in the brain and a definite degree of heritability - and that it might be measured as a single member, thus permitting a unilinear ranking of people according to the amount of it they possess. By identifying a mathematical factor axis with a concept of 'general intelligence,' Spearman and Burt provided a theoretical justification for the unilinear scale that Binet had proposed as a rouge empirical guide." (Chapter 6, pg. 268-269)

"With this example, we come to the heart of what factor analysis attempts to do. Factor analysis is a mathematical technique for reducing a complex system of correlations into fewer dimension. It works, literally, by factoring a matrix, usually a matrix of correlation coefficients." (Chapter 6, pg. 275)

"Since most correlation coefficient in the matrix are positive, factor analysis must yield a reasonably strong first principal component. Spearman calculated such a component indirectly in 1904 and then made the cardinal invalid inference that has plagued factor analysis ever since. He reified it as an 'entity' and tried to give it an unambiguous causal interpretation. He called it "g", or general intelligence, and imagined that he had

identified a unitary quality underlying all cognitive mental activity - a quality that could be expressed as a single number and used to rank people on a unilinear scale of intellectual worth" (Chapter 6, pg. 281)

"Why did Burt go to such lengths to develop a technique mathematically equivalent to the usually form, and generally more cumbersome and expensive to apply (since an experimental design almost always includes more people than tests)? The answer lies in Burt's uncommon focus of interest. Spearman, and most other factorists, wished to learn about the nature of thought or the structure of mind by studying correlations between tests measuring different aspects of mental functioning." (Chapter 6, pg. 322)

"We are left only with the mathematics, and therefore cannot validate either system. Both are plagued with the conceptual error of reification. Factor analysis is a fine descriptive tool; I do not think that it will uncover the elusive (and illusory) factors, or vectors, of mind. Thurstone dethroned "g" not by being right with his alternative system, but by being equally wrong - and thus exposing the methodological errors of the entire enterprise." (Chapter 6, pg. 340)

"The impact of human uniqueness upon the world has been enormous because it has established a new kind of evolution to support the transmission across generations of learned knowledge and behavior. Human uniqueness resides primarily in our brains. It is expressed in the culture built upon our intelligence and the power it gives us to manipulate the world. Human societies change by cultural evolution, not as a result of biological alteration." (Chapter 7, pg. 354)

"In short, the biological basis of human uniqueness leads us to reject biological determinism. Our large brain is the biological foundation of intelligence; intelligence is the ground of culture; and cultural transmission builds a new mode of evolution more effective than Darwinian processes in its limited realm - the 'inheritance' and modification of learned behavior." (Chapter 7, pg. 355)

If we focus on the objects and seek an explanation for the behavior of each in its own terms, we are lost. The search among specific behaviors for the genetic basis of human nature is an example of biological determinism. The quest for underlying generating rules expresses a concept of biological potentiality. The question is not biological nature vs. nonbiological nurture. Determinism and potentiality are both biological theories - but they seek the genetic basis of human nature at fundamentally different levels." (Chapter 7, pg. 360)

Topics for Discussion

Explain what is meant by the term biological determinism and how the argument is used.

What are the two arguments used in support of biological determinism?

Explain the difference between monogenism and polygenism.

What kind of inconsistencies did Gould find in Morton's work? Explain the significance of these findings.

What is IQ? What does it stand for? How did Binet originally measure it?

What does Binet mean by mental orthopedics?

What did Goddard ignore when he used Binet's work? What was the effect of this?

What is the significance of factor analysis? What was the technique used for? What did Burt and Spearman claim about its use?