

Book Reviews

Race and IQ: A Survey and Assessment

Race Differences in Intelligence. JOHN C. LOEHLIN, GARDNER LINDZEY, and J. N. SPUHLER. Freeman, San Francisco, 1975. xiv, 380 pp., illus. Cloth, \$12; paper, \$5.95. A Series of Books in Psychology.

This book is the most comprehensive, critical, and balanced review of the race-IQ issue ever to be published. Meticulously written by three cautious, qualified scholars with backgrounds in psychology and anthropology, it should help reduce the fervor that the controversy has generated in recent years and help move the central question it addresses out of politics and back to science where it belongs. The book could be misread, misinterpreted, and misquoted, given the inconclusiveness of the available evidence, but only if readers insist upon using it mischievously to continue the holy war between hereditarians and nonhereditarians.

Race Differences in Intelligence is likely to be the basic reference on this topic for quite some time, partly because it is dispassionately written, partly because it may be decades before we come much closer to resolving the issue than we are today, and partly because Loehlin, Lindzey, and Spuhler argue from a perspective different from that of most previous writers on the subject. They start with the major premise (more implicit than explicit) that some group differences in polymorphic traits with moderate to strong heritabilities, like intelligence, quite probably can be explained to some extent by genetic inheritance just as some individual differences can be partially explained. Given what we know today about natural selection, migration, mutation, and other processes that lead to genetic differentiation between breeding populations on a variety of human traits, there should be nothing particularly surprising about the likelihood that different racial and ethnic groups might have different distributions on some genes related to such a multidimensional and adaptive trait as intelligence. Indeed, any claim to the contrary would contravene prevalent theory and evidence from population genetics, physical anthropology, paleontology, and other sciences that bear di-

rectly on the subject. The research question then becomes not whether biological inheritance contributes to group differences in behavior, but in regard to which traits, in what direction, and how much.

The authors note in their preface that this book is a lineal descendant of Woodworth's 1941 monograph *Heredity and Environment*, also a major critical review of the nature-nurture question in relation to intellectual performance prepared under the auspices of the Social Science Research Council. With summaries strategically placed, a glossary of terms, and an index, and with most technical discussions referred to appendices, the book is well suited for the general reader. It may be of even more value to those who have been following closely the debates on the biological meaning of race and the meaning of concepts like intelligence, heritability, and gene-environment interaction, and, of course, current interpretations of the evidence that link the former with the latter.

Well aware of the possibility that ideological bias can affect the conclusions a researcher draws from his own data, the authors have reanalyzed the original evidence when it appeared appropriate and possible to do so, and not surprisingly their interpretations are sometimes different from previous ones. The authors, too, do not rely on any one study or any single set of studies in reaching their conclusions. Their assessment is based on the consistency of evidence (or lack of it) from numerous sources and from studies taking quite different approaches to the problem.

The authors appropriately open with a brief historical account of concern with the race-IQ issue. Interwoven with an account of the flurry caused by Jensen, Eysenck, and Shockley, each of whom supports the claim that the average black-white difference in intelligence test scores has a substantial genetic component, is discussion of the highly publicized work of Coleman *et al.* in *Equality of Educational Opportunity* (1966) and Jencks *et al.* in *Inequality* (1972). Although neither Coleman nor Jencks dealt directly with the race-IQ issue, both indirectly lent credibility to the genetic hypothesis by convincing many

readers that schools have little effect on academic performance and that the observed variation in performance more reflects differences in the pre-existing attributes of the students than differences in the characteristics of the schools they attend. Since such individual attributes were tied to family background, some found it easy to presume that the differences were genetic in origin. (The home environment is still the explanation preferred by Coleman and Jencks, as well as by most others.)

The next three chapters deal with the key concepts on which the controversy is focused: race, intelligence, and heritability. How old are the major races of modern mankind and what accounts for genetic differences between populations? Very few discussions of the race-IQ debate deal with these questions, yet they are the obvious ones with which to begin.

There are, of course, many, including some anthropologists, who claim that the concept of race serves no useful scientific purpose, thus refusing to engage in race classification. They do so on several grounds. Some argue that races are not reproductively closed populations and the amount of gene flow between groups makes the present distribution of genes within groups too transitory for meaningful comparisons; some make special note of the fact that the assignment of individuals to one group or another in most studies is socially not biologically defined; and some dismiss the use of racial taxonomies by maintaining that the concept of race is simply an ideological invention of Europeans to help them feel virtuous about exploiting other people, a view that no doubt has some validity.

Loehlin *et al.* deal with most of these objections either directly or indirectly. But their main argument, if I interpret it correctly, is twofold. On the one hand, the general evolutionary history of mankind cannot be fully understood either in terms of individuals alone or in terms of the species as a whole. Individuals do not evolve and the species is too large a category to adequately account for observed genetic differences between regions or between breeding populations. On the other hand, early typological thinking was based on many erroneous assumptions regarding the process of heredity. Most contemporary biologists equate the anthropological concept of race with the zoological concept of subspecies. As such, a race is a genetically distinguishable subgroup defined largely in terms of reproductive isolation, which is seldom if ever complete. The members of any particular race or breeding population are not genetically all the same, nor are their differences negligible. The same conclusion holds for races or subspecies.

Races differ statistically and not typologically in their genetic composition.

Turning to the question of when the genetic differentiation between the modern races of man occurred, the authors leave much room for differences of opinion. They begin by reviewing some evidence that shows marked variations among human populations in the frequency of gene-based diseases and of various blood-group and protein genes. They later note, however, that for the majority of genes the differences between groups are relatively small, which could mean either a considerable amount of racial crossing over perhaps hundreds of thousands of years or a fairly recent segregation of breeding populations. How long the races of man have existed is then an open question, and one that seems to depend chiefly upon whether one reads ancient history, archeology, paleontology, or Carleton Coon. The authors nevertheless suggest that it is *plausible* from the standpoint of population genetics that U.S. blacks and U.S. whites could significantly differ in the frequency of one or more genes affecting intellectual performance, which of course is not saying that they do. But how do they come even to this conclusion?

First, they all but rule out the effects of mutation, genetic drift, and selective migration, noting in regard to the last (which previously has been cited as a possible explanation) that selective pressures would have to be extremely severe to bring about any appreciable average difference between large populations due to the movement of individuals. The only other basic evolutionary mechanism remaining, that is, natural selection, is far more plausible, since even very small differences in reproductive advantage could produce very large genetic effects, given a sufficient span of time.

In one of their appendices the authors present some hypothetical figures on how a reproductive differential could lead to average differences in ability between U.S. blacks and whites. Should mothers below the mean in IQ have twice as many children as those above the mean, and with regression toward the mean taken into account, a decline of about 2 or 3 IQ points per generation would be predicted. Although no direct evidence is available on differential fertility by IQ for blacks, the authors note in the same appendix that 1960 U.S. census data yielded a ratio of about 2 to 1 between nonwhite women who had not gone beyond elementary school and those who had. No conclusions about what actually may have occurred can safely be drawn here, however, since, as the authors note, there are a number of conditions that have not been taken into account

that could significantly affect these estimates, including the fact that earlier data on whites showed a similar reproductive differential, which was taken by some as evidence for a decline in the general level of intelligence in Western cultures.

The discussion of the meaning of intelligence and its measurement begins much as any standard textbook on the subject might. Intelligence is developed, whatever its genetic base. (Intelligence must be the most socioculturally saturated of all human capacities if we place any stock at all in the thesis that mind and self are products of society.) The mode of inheritance is polygenic, meaning that it is influenced by more than one gene, but we don't know how many or which ones. It is sometimes useful to distinguish between intelligence as a single general ability and as a number of correlated special abilities, although this distinction and the exact number of special abilities are sometimes arbitrary. There is some amount of cultural bias in IQ tests for intergroup comparisons, but we don't know how much. These all are rather commonly held views. In separate appendices the reader also is presented with detailed reviews of cross-cultural studies of sensory perception, where the connection between gene action and behavior is fairly well documented, and of Piaget's stages of cognitive development, where the connection is quite ambiguous. The authors conclude in both cases that these comparative studies shed little light on how genetic factors might explain group differences in the United States, which perhaps is why they appear in the appendix.

On the meaning of heritability, we are reminded that it describes the proportion of the variation of a particular trait in a particular population that is attributable to genetic differences among individuals in that population. In other words, heritability is strictly a statistical term that represents the correlation between genotype and phenotype. The concept does not tell us in any *absolute* sense how important genes may or may not be for any individual or group of individuals in the development of intelligence or any other trait. We are also told that within-population heritability estimates, most of which range from .60 to .85, need not and may not have value for interpreting between-population differences on a trait. A technical treatment of the relationship of within- and between-group heritability is found in an appendix.

Their discussion in this section of such concepts as the covariance of heredity and environment, interaction, additivity, dominance, epistasis, and the broad and narrow definitions of heritability is admirably intelligible. And the reader should pay close

attention here because an understanding of these concepts is important for understanding other aspects of the primary issue confronted in this book.

The authors also include tempered but critical reviews of the recent work of Jencks (1972), Kamin (1973), and Layzer (1974). Their reanalysis of Jencks's work, for example, yields somewhat higher estimates of heritability for intelligence than Jencks calculated, estimates more in line with the figures others have reported. After a careful scrutiny of Kamin's arguments against substantial heritability, Loehlin *et al.* conclude that his critique "does not, in our view, constitute an unbiased survey of the data, and it suffers from enough logical and statistical difficulties that Kamin's 'reasonably prudent man' will want to think twice before accepting its conclusions" (p. 299).

They also take issue with Morton (1974) and Lewontin (1974), who have argued that the concept of heritability has limited value since high heritability of a trait does not mean that environmental change could not significantly modify the trait. While this is perfectly true, Loehlin *et al.* correctly point out that "most proposed policy changes involve minor redistributions of environments within the existing range, and it is precisely regarding such changes that a heritability estimate has its maximum predictive value." In other words, "minor fiddling around with environmental factors that already vary widely within the population has poor odds of paying off in phenotypic change" if the heritability is high (p. 99).

The authors subsequently conclude that, under present conditions within populations of European origin, genes tend to account for more of the individual variation in ability than does the environment. They add that better information on gene-environment correlation and interaction could lower or raise heritability estimates but that there is little direct evidence that these factors play a large quantitative role. Up to this point nothing has been said about the relative contribution of genetic and environmental factors to the observed differences between U.S. racial-ethnic groups on tasks purporting to measure intelligence, which becomes the focus of attention in the next four chapters.

First the few available twin and sibling studies with data for both blacks and whites are examined in an attempt to determine whether within-population heritabilities are comparable for each group. This is an important question; for if the heritability of IQ were substantially lower among blacks it should be easier to find environmental variables that account not only for individual differences within black

samples but for between-group differences in black and white samples. The evidence tends to be conflicting. Whereas the twin data give estimates of heritability of comparable size in U.S. white and black samples, the sibling data are less consistent, the estimates sometimes being approximately the same but sometimes being appreciably lower for blacks. Problems of sample size and standard errors of measurement probably account for the inconsistent results.

Although most research on mixed racial ancestry and intelligence also leaves much to be desired in terms of methodology and sampling design, the authors examine the evidence on the matter. The work reviewed varies from studies that correlate blood-group genes and IQ to studies on the offspring of black-white matings. The results generally admit a range of interpretations. On balance, however, they offer more support to environmental than to hereditary explanations.

Studies of the socioeconomic correlates of IQ within populations and inter- and intragenerational changes over time in IQ provide evidence that, though less direct, is also relevant to the issue. The sheer amount of evidence of this kind is overwhelming, and the authors spend much time reviewing it, including Heber's work in Milwaukee, Mayeske's reanalysis of the Coleman Report data, and Jensen's work on Level I and Level II abilities. What follows is a sampling of their main conclusions:

1) Despite the lower levels of education, occupation, and income of blacks, no large and consistent differences are found between black and white samples in the correlations of ability with these or other measures of socioeconomic achievement. In other words, individual ability is about as predictive of success for blacks as for whites. (A negligible correlation of intelligence-test performance with socioeconomic status indicators among blacks could be taken as strong evidence of inequality of opportunity and could point to an environmental explanation of the race-IQ differential. On the other hand, the finding that the influence of background characteristics like ability is about as important for blacks as for whites in status attainment cannot be taken as evidence for the genetic hypothesis, since the two groups have similar but separate opportunity structures.)

2) Stimulating environments can have substantial effects on the ability of young children but it is not clear whether the resulting gains are lasting or simply early hothouse effects.

3) Large-scale social change, such as rises in the general level of education, can affect average levels of performance on in-

telligence tests. Average racial group differences seem not to have been particularly responsive to such changes, however. Despite the increasing equalization of schooling during the present century, evidence the authors present suggests that, if anything, the ability-performance gap between U.S. blacks and whites has widened.

4) Patterns or profiles of special tests of ability, for example, quantitative and verbal performance, differ appreciably between various U.S. racial-ethnic groups and such patterns appear to be largely independent of differences in socioeconomic status; yet again there is little evidence on whether other cultural factors, genetic factors, biased tests (or all three) are responsible for the observed patterns.

Lastly, Loehlin *et al.* devote considerable attention (a lengthy chapter plus three appendices) to the question of nutrition and intellectual performance and its bearing on race differences. It is one of the few comprehensive reviews available on this topic. Two important generalizations seem to follow from the discussion:

5) While there is substantial evidence that U.S. blacks are less well nourished than whites, moderate nutritional deficiencies have only small (if any) effects on ability.

6) There is strong evidence that severe malnutrition can have adverse effects on brain and cognitive development, but severe malnutrition is uncommon in any U.S. racial-ethnic group.

On the basis of the empirical findings and the theoretical arguments they have discussed, the authors believe the following three general conclusions are warranted:

1. Observed average differences in the scores of members of different U.S. racial-ethnic groups on intellectual-ability tests probably reflect in part inadequacies and biases in the tests themselves, in part differences in environmental conditions among the groups, and in part genetic differences among the groups. It should be emphasized that these three factors are not necessarily independent, and may interact.

2. A rather wide range of positions concerning the relative weight to be given these three factors can reasonably be taken on the basis of current evidence, and a sensible person's position might well differ for different abilities, for different groups, and for different tests.

3. Regardless of the position taken on the relative importance of these three factors, it seems clear that the differences among individuals *within* racial-ethnic (and socioeconomic) groups greatly exceed in magnitude the average differences between such groups [p. 239].

These conclusions are immediately followed by a discussion organized around what the authors perceive the implications of a genetic difference in ability between populations would be for three societal goals: that racial-ethnic group membership should be the occasion for feelings of self-respect and dignity rather than for feelings

of inferiority; that members of all groups should have equal economic and political opportunity; and that members of all groups should have equal access to education and other general social benefits and services. The discussion here is brief and can be summarized as follows:

1) Considering the broad overlap in ability distributions and the fact that individual variation between racial-ethnic groups greatly exceeds average differences between groups, to label members of one group as inferior to members of another is unjust and incorrect under any circumstances.

2) Giving more attention to the multiple dimensions and patterns of intelligence may make overall distinctions of inferiority-superiority between groups harder to draw.

3) While there may be other criteria for hiring and promotion, equality of opportunity in employment should be assessed in terms of an employee's ability or trainability to do a job and not his racial-ethnic membership.

4) Although overly uniform and overly pluralistic educational strategies both are generally undesirable, balancing the needs for a common school experience and individualized instruction would likely be just as problematic if there were no racial-ethnic differences at all.

5) Although IQ is an empirically significant variable, it does not take everything into account—it is not identical with intelligence as socially defined and it is far from being all-important in determining the socioeconomic achievements of most individuals at the present time.

The authors' position then essentially is that there are no policy consequences that would follow directly from a hypothetical definitive finding that U.S. racial differences in performance on intelligence tests are wholly or partly genetic in origin or that they are completely determined by environmental conditions. Some readers, including this one, will feel that the authors have skirted the social issues. However, most will agree with them that a clearer understanding of the developmental basis of intelligence, regardless of whether the genes or the environment is now acting as the primary determinant of either individual or group differences, is surely the most promising basis for effective intervention in that process.

Loehlin *et al.* also are firmly committed to the position that it is better to conduct the basic research on this issue that would be required before coming to any firmer conclusions than to refuse to investigate racial-ethnic differences out of fear of what that research might bring to light. Such a refusal offers especially rich fare for bigots:

We consider it quite likely that *some* genes affecting *some* aspects of intellectual performance differ appreciably in frequency between U.S. racial-ethnic groups—leaving open the issue of what groups, which aspects, and which direction of difference. Thus we consider it most unwise to base public policy on the assumption that no such genetic differences exist. If someone defends racial discrimination on the grounds of genetic differences between races, it is far more prudent to attack the logic of his argument than to accept the argument and deny any differences. The latter stance can leave one in an extremely awkward position if such a difference is subsequently shown to exist [p. 240].

In the final section of the book, the authors outline ten areas of research, ranging from studies on cross-racial adoptions to studies that evaluate the effectiveness of various kinds of educational, nutritional, and other social programs, that might shed more light on the influence of environmental factors in producing differences between U.S. racial-ethnic groups in average levels and patterns of ability. Again, they believe that objection to continuing research on group differences is *not* justified if the objection is solely that it might yield an unpalatable answer.

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Intellectual Connections

Scottish Philosophy and British Physics, 1750-1880. A Study in the Foundations of the Victorian Scientific Style. RICHARD OLSON. Princeton University Press, Princeton, N.J., 1975. viii, 350 pp. \$17.50.

Methodological pronouncements by scientists are notoriously difficult for historians to handle because they may have served so many purposes. At one extreme they can be retrospective justifications of investments made in a particular type of career and of work; at the other they can be a priori claims about the nature of scientific activity. As in ordinary life, they can also be statements of intentions that were never realized. Consequently it requires care and subtlety to show that methodological pronouncements are commitments that have actually been effective in helping scientists to set and to solve their problems.

Olson is therefore working in a challenging genre of history when he bases his enquiry on Duhem's venerable contention that during the 19th century British physicists relied more than their Continental counterparts on geometrical arguments and on model-making. Having shown that the Scottish Common Sense school of phi-

losophers from Reid to Hamilton extensively considered the problems concerned with creating natural knowledge, Olson's chief thesis is that their leading notions were adopted and used by British natural philosophers, especially those who were totally or partly Scottish-trained. Much of his descriptive discussion can only be welcomed. He rightly sees the importance of Robison, Playfair, Forbes, and Rankine; and he has elevated what was previously a possibility into a serious case.

The book falls into two distinct parts. In the first Olson derives a by no means monolithic philosophy of science from the Scottish Common Sense philosophers. Though he stresses continuities he has to admit that on some key questions Reid and Hamilton were decidedly at odds. In the second part Olson examines the pronouncements and work of certain scientists in order to show their debt to the philosophers. Essentially the approach is to juxtapose arguments and bits of texts in order to establish similarities and hence indebtedness.

It is, however, at this tailoring level of the argument that difficulties arise. There is a difference between parallels and indebtedness: the latter is more than mere consonance, and its existence must be established by evidence additional to that of compatibility. For the period 1770 to 1815 there is the further difficulty that it is not clear whether the scientists were acting on ideas formulated by the philosophers or whether the philosophers were systematizing what the scientists had already done. In trying to find a major source for the methodological commitments of his scientists, Olson deliberately concentrates exclusively on Scottish philosophy; this procedure converts a possible source into the only possible one. Accordingly Olson lavishes attention on Reid, but ignores other possible sources such as MacLaurin and the Edinburgh medical men. It must also be appreciated that the method of juxtaposing texts gives a rather distorted picture of the work done by some individuals: Brewster's sustained scorn of Baconian inductive philosophy was only one of his many concerns qua scientist. That procedure also inevitably emphasizes the static components in a scientist's career at the expense of the dynamic ones. When Olson compares a student essay on analogy written by James Forbes in 1828 with the prizewinning papers on the polarization of heat published from the mid-1830's, he underestimates the evolving nature of Forbes's career and problem situations. Unfortunately Olson's argument is not helped by the many misprints of names and by some inaccuracies of detail.

In sum, this book presents a possible, an interesting, and in some ways a plausible case; but for the reasons given my verdict is the familiar Scottish one of "not proven."

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Visual Systems

The Compound Eye and Vision of Insects. Papers from a symposium, Canberra, Australia, Aug. 1972. G. A. HORRIDGE, Ed. Clarendon (Oxford University Press), New York, 1975. xviii, 596 pp., illus. \$46.

The task of distilling order and generality out of the complexity of nervous systems is one of the central challenges of contemporary science. One should not be surprised, therefore, that significant attention has recently flowed to the compound eyes and vision of insects, where anatomical order is so apparent and visually evoked, modifiable behavior is available to manipulate.

This book is an outgrowth of a symposium on the insect visual system that was organized by G. Adrian Horridge and held in conjunction with an international entomological congress. One characteristic of symposium volumes that frequently limits their usefulness for the nonspecialist is the sacrifice of perspective on the altar of latest research results. Owing to the active efforts of the editor, this volume is happily an exception. Except for one inadequate and out-of-date competitor, it is the only book-length treatise devoted to the subject, and, despite the pitfalls of multiple authorship, it comes commendably close to being comprehensive. Moreover, in spite of the length of time consumed in its production, the book has avoided obsolescence. It will be particularly useful as a reference source to advanced students and researchers in neurobiology, animal behavior, and entomology who are seeking something more than a superficial introduction to the rich literature on the insect visual system.

The authors, representing research groups in nine countries, have contributed 24 chapters arranged in six sections: Receptor Anatomy, Receptor Physiology, Optics, Electrophysiology of the Optic Lobe, Behavioural Analysis, and Ocellus. Space permits only a short and assuredly incomplete mention of highlights. H. F. Paulus's chapter contains an interesting synopsis of the evolution of compound eyes, and R. Menzel's chapter on the color