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How "Caucasoids" Got Such Big Crania and Why They Shrank

From Morton to Rushton

by Leonard Lieberman

In the 19th century measurements of cranial capacity by Morton and others supported a "Caucasoid > Mongoloid > Negroid" hierarchy of intelligence. This continued through most of the 20th century but was challenged by a nonhierarchical view originating with Boas. Beginning in the 1980s Rushton correlated cranial and IQ measurements and presented a hierarchy with "Mongoloids" at the top. Each of these periods relates to its social context: the 19th-century hierarchy paralleled the height of European world domination; the nonhierarchy of the 20th century reflected world wars, worldwide depression, and the breakup of empires; the "Mongoloid > Caucasoid > Negroid" hierarchy followed the economic success of several Asian nations. Morton's cranial ranking was the result of his sampling error and his acceptance of the hierarchical thinking of his time. But how is it possible for Rushton to support the M > C > N ordering while using the data of several anthropologists who have rejected racial hierarchies on empirical grounds? The answer to this question involves a critique of Rushton's use of the race concept, his aggregation of diverse populations into three traditional races, his claim to explain differences in "cultural achievements" on the basis of variation in brain size, and a number of other problems. The study concludes by noting that the major consequence of these hierarchies is the apparent justification for the exploitation of those at the bottom.

Leonard Lieberman is Professor of Anthropology at Central Michigan University (Mount Pleasant, Mich, 48859, U.S.A.). Born in 1925, he was educated at the University of California, Berkeley (B.A., 1956; M.A., 1959) and at Michigan State University (Ph.D., 1970). He has published "The Debate over Race" (*Phylon* 39:127–41); with Alice Littlefield and Larry T. Reynolds, "Redefining Race: The Potential Demise of a Concept in Physical Anthropology" (current anthropology 23:641–55): and, with Larry T. Reynolds, "Race: The Deconstruction of a Scientific Concept," in *Race and Other Misadventures: Essays in Honor of Ashley Montagu in His Ninetieth Year* (Dix Hills, N.J.: General Hall, 1996). The present paper was accepted for publication 26 v 00.

> The first thing that brought me to my senses in all this racial discussion was the continuous change in the proofs and arguments advanced. . . . I was skeptical about brain weight; surely much depended upon what brains were weighed. [W. E. B. DuBois 1943, cited by Visweswaran 1998:76]

> First we must admire the apparent cranial expansion of Asians over the last half-century, when [earlier] researchers consistently reported their having *smaller* brains than whites. Obviously this implies the possibility of a comparable expansion in blacks. More likely, it implies the possibility of scientists finding just what they expect when the social and political stakes are high. [Marks 1995:271]

As the 20th century reached its end, a paradox emerged in which, while most anthropologists had come to reject concepts of biological races and racism (Lieberman and Kirk n.d., Lieberman, Stevenson, and Reynolds 1989), a number of psychologists persisted in the "race" idea and the "scientific" racism that had prevailed in the 19th and much of the 20th century (Herrnstein and Murray 1994; Lynn 1977*a*, *b*; Rushton 1988*b*). Of course scientific and popular racism has not been confined to psychologists. It was part of a widespread worldview that informed researchers including Samuel George Morton (1799–1851), considered by some to be one of the founders of American physical anthropology. Morton collected human skulls, measured their cranial vaults, and concluded that "Caucasoids" had the largest brains and "Negroids" the smallest, with "Mongoloids" in between (Morton 1849). A century and a half later this hierarchy would be altered by J. Philippe Rushton and colleagues, placing the "Mongoloids" in the alpha position, "Caucasoids" next, and "Negroids" last. Rushton went on to correlate brain size with IQ scores, claim a Mongoloid > Caucasoid > Negroid correlation, and use variation in IQ scores to "explain" everything from civilization to barbarism (1997*a*). Although this view has been invalidated by a century of anthropological research and theorizing stimulated by Franz Boas (Gossett 1965, Cravens 1978), Rushton (1996) dismisses this work as no more than political correctness.

This paper asks, first, why the century-old hierarchical tradition has been reversed, and to answer this question it examines the societal context, the related ideology, and the methodological practices that constitute science—in short, the social construction of scientific knowledge (Mannheim 1961, Gould 1996). The second question asks how it is possible to support 19th-century racism citing late-20th-century anthropological research that is opposed to the notion of "race," and the answer to it will involve a critique of (1) Rushton's use of "race" despite decades of findings that invalidate it (Lieberman and Reynolds 1996), (2) his use of aggregation, (3) the inconsistency of his cranioracial variation with evolutionary anthropology, (4) the fact that his collection of brain measurements fails to utilize control variables

TABLE 1
Changing Racial Hierarchies

Hierarchy	Period		
	19th Century	20th Century to 1979	1980–97
C > M > N	Morton (1849)[a] Gobineau (1854) Nott and Gliddon (1854) Broca (see Saller 1959[1914]) Davis (1869:510 ff.)[b] Darwin (1859) Topinard (1890)	Saller (1959[1914]:1210–12) Dixon (1923)[c] Coon (1962)[d] Weyl (1970–71:218–19) Swan (1964–65)	
None	Tiedemann (1830, cited by Gould 1981:84)	Herskovitz (1928) Boas (1938)[e] Kroeber (1923) Montagu (1960) Tobias (1970) Gould (1978:508)	Beals, Smith, and Dodd (1984)[f] Montagu (1997) Livingstone (1962) Brace (1964, 1998)
M > C > N		Bushmakin (1928)[g]	Vernon (1982) Rushton (1988*a*)[h] Rushton (1997*a*:130)[i] Lynn (1982; 1993:90; 1989)[j] Hernstein and Murray (1994:273, 276)[k]
C = M > N		Kroeber (1948) Hambly (1945)[l] Gould (1978:508)[m]	

[a]Caucasians 87 cu. in., Mongolians 83 cu. in., Ethiopians 78 cu. in.
[b]Europeans 1,367 g, Americans 1,308 g, Asiatics 1,304 g, Africans 1,293 g.
[c]Alpine 1,428–1,491 cm^3, Mongoloid 1,407 cm^3, Proto-Australoid 1,303 cm^3, Proto-Negroid 1,337 cm^3.
[d]Does not list cranial capacities.
[e]But Eskimo have largest crania.
[f]Climate-related: North America 1,380 cm^3, Asia 1,380 cm^3, Europe 1,362 cm^3, South America 1,350 cm^3, Oceania 1,277 cm^3, Africa 1,276 cm^3.
[g]Does not list all races.
[h]From measurements compiled by Herskovitz (1938): Mongoloid 1,451 cm^3, Caucasoid 1,421 cm^3, Negroid 1,295 cm^3.
[i]Mongoloid 1,364 cm^3, Caucasoid 1,347 cm^3, Negroid 1,267 cm^3.
[j]Mongoloids 1,415 cm^3, Caucasoids 1,362 cm^3, Negroids 1,276 cm^3.
[k]IQ: Mongoloids 103, Caucasoids 101–2, Negroids 85 (citing Lynn 1987).
[l]Caucasoid and Mongoloid 1,400–1,500 cm^3, Negroid 1,300–1,400 cm^3.
[m]Reanalyzes Morton's data: Native American 86 cu in., Mongolians 85 cu. in., Modern Caucasians 85 cu. in., Malays 85 cu. in., Ancient Caucasians 84 cu. in., Africans 83 cu. in.

identified by Tobias, (5) his failure to relate environment, nutrition, cranial size, and IQ, and (6) his claims to explain a vast array of human behavior, while ignoring sources that contradict his viewpoint and ignoring or discrediting environmental influences.

In the course of this paper I shall from time to time use the terms "Caucasoid," "Negroid," "Mongoloid," and "race," which I regard as empirically invalid and socially harmful, in order to convey the usage in certain sources. I view references to measures of IQ as claims based on performance but not measures of an intrinsic biological essence called intelligence. Similarly, while I shall refer to assertions that intelligence is about 40 to 80% heritable, it is my belief that measures of heritability rely on a dichotomy of genes and environment and ignore the extensive interaction between the two.

Changing Hierarchical Worldviews

HOW "CAUCASOIDS" GOT SUCH LARGE CRANIA

When crania were measured in the 19th-century, "Caucasoids" were consistently found to have the largest, followed by "Mongoloids" and then "Negroids" (table 1). A notable exception to the uniform C > M > N hierarchies of the 19th century is the work of Freidrich Tiedemann, who in 1836 listed data on over 200 skulls representing all five of the major "races" identified by Johann Friedrich Blumenbach (1795) and reported racial equity on the overlapping range of cranial values (he did not calculate mean scores). (Blumenbach himself had held that the "races" were not unequal in intellect, even though they departed from the physical beauty of the

"Caucasoids.") Gould (1999), using Tiedemann's numbers, has calculated the means and found a Caucasoid > Mongoloid > Negroid hierarchy but considered the differences "tiny and probably of no significance in the judgment of intelligence" (p. 69).

It was Samuel G. Morton who established the hierarchical order that many others followed during the 19th century and into the 20th. Morton, a Philadelphia physician, painstakingly collected and measured the capacity of human skulls from around the world and produced the numbers that he believed certified that "races" varied in the mean volume of their crania and could be ranked on that basis.[1] He shared in the prevailing outlook that some races were superior and that the greatest among these was the "Caucasoid," followed by the "Mongoloid" and then the "Negroid." He made significant contributions to the sciences of his day (Brace n.d.) and did not present his findings in an overtly political form, but he thought that races, being unchanging, were possibly species (Wolpoff and Caspari 1997:89). His numbers indicated that "Caucasians" had a mean brain size of 87 cubic inches, while Mongolians measured 82, American Indians 82, and Ethiopians 78 (Gould 1981:54).

Stephen J. Gould (1981) explains the methodological errors that produced this order. Morton admitted only three Hindu skulls to his "Caucasian" sample because he considered the skulls of these people "probably smaller than those of any other existing nation" (Morton 1839:261). His sample of American Indians was biased by overrepresentation of smaller Inca/Peruvian crania and the inclusion of only three large-brained Iroquois skulls. For some populations, such as American Indians, more of the crania were female, making for lower average means, while for "Caucasians" more male skulls made for larger mean cranial measurements. Gould comments (p. 60) that Morton was probably unaware of his error, since he explicitly described his samples.

Morton's procedures and conclusions, however erroneous, had broad impact, becoming the allegedly scientific foundation for the idea that races were unequal. In *The Inequality of Human Races* (1966[1854]:111), Arthur de Gobineau presented a summary of Morton's measurements to support his view that "Nordics" were superior to all other races, having created "high" civilizations (Molnar 1992:258). J. C. Nott and George Gliddon included Morton's data in their *Types of Mankind* (1854:454). Gliddon was an amateur Egyptologist who used Morton's method to support the claim that the pharaohs were "Caucasoids," the only race then thought to have been capable of high civilization (Molnar 1992: 16). Nott and Gliddon also applied Morton's scheme to the American South, hoping to justify slavery (Brace 1997:865). Morton, Nott, and Gliddon came to be regarded as the nucleus of the American school of anthropology, noted for the idea that races had separate origins (Erickson 1997:65). It should be noted, however, that Southerners did not accept this polygenic view because it clashed with their biblical belief in the creation of Adam and Eve.

Popular and academic thought reinforced each other (Baker 1998). Much research on cranial size ignored "Mongoloids" and concentrated on "whites" and "Negroes" (Bean 1906). Although slavery was in the past, Jim Crow segregation provided a context in which the exploited status of "Negroes" still needed justification (Baker 1998). Part of that justification came from scientists in the form of the "racial" hierarchy just described. The uniform support for this hierarchy coincided with the dominance of Europe and its colonial offshoots over most of the world's darker-skinned people. For Morton and most other writers of the early 19th century, the assumed racial hierarchy was part of the divine order. From the 1830s on the expansion of the power of the United States was considered an expression of manifest destiny. In the second half of the century evolutionary ideas emerged, and the differences between "races" and their cultures began to be seen as stages of progressive evolution. Anthropology emerged in the 19th century as the study of evolution from primitive barbarism to advanced civilization. It was a point of view that assumed the superiority of Europe and the "Caucasoid" race. This paradigm of linked biological and cultural evolution supported the hierarchical ordering of the races.

20TH-CENTURY HIERARCHIES

In the 20th century, although the anthropologist Roland Dixon (1923) and others maintained the traditional Caucasoid > Mongoloid > Negroid hierarchy, it began to be reported that "Mongoloids" had larger brains or that "Mongoloids" and "Caucasoids" had the same brain size. Bushmakin (1982:224) reported that the Buriats, of the "Mongol race," had mean brain weights of 1,508 g for males and 1,439 g for women, heavier than most Europeans'. Similarly, Boas (1938:115) reported, without asserting their superiority, that Eskimos had the largest brains. Kroeber reported the mean cranial capacity of European males as equal to that of the Chinese (1948: 123); he was one of the prominent anthropologists, mostly students of Franz Boas, who rejected racial hierarchies (Smedley 1993:294). In 1923 he wrote that "it is a difficult task to establish any race as either superior or inferior to another, but relatively easy to prove that we entertain a strong prejudice in favor of our own racial superiority" (p. 85). After World War II interest in the study of "races" as biological units continued for a time, but "racial" hierarchies in anthropology became rare.

Whereas the "Caucasian"-dominated hierarchical view of the 19th century mirrored the extraordinary and triumphal territorial expansion of Europe and the United States, the diversity of hierarchies of the 20th century reflected many challenges to "Caucasoid" domination. Colonial expansion had ended, and a fruitless world war had been followed by the worldwide depression of the

1. The internal capacity of each skull was measured by first sealing internal openings with cotton and then filling the cavity with mustard seed. However, the seed packed down too much, so Morton switched to 1/8-inch-diameter lead shot, thereby achieving greater consistency on remeasurement (Gould 1981).

1930s and a second world war in which Nazi Germany's genocide had made racism and racial hierarchies unacceptable. The independence movement in European colonies in India and Africa meant the end of one of the social structures that supported the 19th-century "racial" hierarchies. Among the triumphs of the 20th century was the victory in World War II and the enormous postwar prosperity centered in the United States, but it was followed by the unpopular war in Viet Nam in the 1960s (Kennedy 1999).

Ideas of the inheritance of behavior were challenged in the battle between biological and cultural explanations led by Franz Boas and his students (Cravens 1978, Gossett 1965). Boas chipped away at traditional hierarchical thinking by "distinguishing race from culture and language and by proving that racial hierarchies were scientifically untenable" (Baker 1998:100). His insistence on thorough ethnographies without ethnocentrism laid the foundations for rejecting an evolutionary explanation of cultural differences in favor of the concept of culture. Many of his students were second-generation immigrants, women, Negroes, or Jews who may have been reacting to the destructive impact of the racism and sexism they had experienced (see Lieberman 1997).

The diversity of hierarchical views and the rise of the Boasian view are linked with changes in psychology, sociology, and genetics beginning around 1930, reaction against the racism of Nazi Germany in the late 1930s and 1940s (Benedict and Weltfish 1943), and the development of empirical studies (Klineberg 1935) challenging the use of IQ scores to demonstrate "racial" superiority. Committees of the United Nations Educational, Scientific, and Cultural Organization issued four *Statements on Race* between 1950 and 1967, all of which took a nonhierarchical position (see Montagu 1972). The nonhierarchical view was expressed at the end of the century by an executive committee of the American Association of Physical Anthropologists: "The human features which have universal biological value for the survival of the species are not known to occur more frequently in one population than in any other. Therefore it is meaningless from a biological point of view to attribute a general inferiority or superiority to this or to that race" (1996: 570). A similar statement was prepared by the American Anthropological Association in 1997. During the second half of the 20th century most scientists in all disciplines had rejected racism and any hierarchy of "races," although many biologists and psychologists still supported the idea of "race" (Lieberman and Reynolds 1996).

NEW HIERARCHY, OLD RACISM

Late in the 20th century, surprisingly, some psychologists began to report that "Mongoloids" outranked "Caucasoids." Richard Lynn (1977*a*, *b*) stressed the higher intelligence of the Chinese and placed "Mongoloids" first, with mean IQ scores of 100–106, "Caucasoids" next at 100, and "Negroid-Caucasoids" in the United States 85 and in Africa about 70 (1982). The publication of these theories of East Asian superiority was preceded by Japan's becoming a "world-class economic power" (Sautman 1995:201). Japan's World War II defeat and the subsequent economic depression were followed by its growing economic achievement in the 1970s and the appearance of the explanation that this achievement was due to higher intelligence (see Lynn 1977*a*, *b*; Lynn and Jendal 1993). In order to support a hierarchy of three "races," the "race" at the top must be the most intelligent and successful. Lynn stated that "the high level of Japanese intelligence has played a significant role in the brilliant successes of Japanese industrialists" (1977*a*: 465). The shrinking of "Caucasoid" brains and cranial size and the rise of "Mongoloids" in the papers of J. Philippe Rushton began in the 1980s. Genes do not change as fast as the stock market, but the idea of "Caucasian" superiority seemed contradicted by emerging industrialization and capital growth in Japan, Taiwan, Hong Kong, Singapore, and Korea (Sautman 1995). Reversing the order of the first two races was not a strategic loss to raciocranial hereditarianism, since the major function of racial hierarchies is justifying the misery and lesser rights and opportunities of those at the bottom.

The use of IQ tests to justify the lowest position for African-Americans has occurred repeatedly over time (Gould 1996). After World War I, the very low test results of U.S. Army recruits were said to reveal a median mental age of 13, and Negroes and immigrants were said to have the lowest IQs. In 1969, Arthur Jensen proclaimed the fixity of IQ and the futility of remedial programs. In 1994, *The Bell Curve* (Herrnstein and Murray 1994) asserted that blacks had IQs 12 points lower than those of whites and asked whether their low intelligence might be responsible for most of the social problems in the United States. All these publications suggested that the situation of African-Americans was largely the result of heredity and therefore social programs could not improve it or could do so only at great cost. Gould (1996) links Jensen's paper and *The Bell Curve*: "These two most recent episodes also correlate with political swings" (p. 29) just as did the controversy over the results of IQ testing of soldiers in World War I. He views all of these instances as "resurgences of biological determinism [that] correlate with periods of political retrenchment and destruction of social generosity" (p. 28).

These psychologists whose work has seemed to some readers to validate the "racial" hierarchy (R. Travis Osborne, Clyde E. Noble, Arthur R. Jensen, Audrey M. Shuey, Richard Lynn, Linda Gottfredson, and Richard J. Herrnstein) have relied primarily on IQ tests, but Rushton has merged this tradition with the abandoned anthropological racial hierarchy based on cranial measurements. He began publishing on this topic in 1988 and by 1996 had written approximately 50 articles on it, as well as a book on sociobiological altruism (1980) and another entitled *Race, Evolution, and Behavior* (1997*a*). In 1989 he had achieved instant notoriety upon delivering a paper presenting his views at the conference of the American Association for the Advancement of Science, and ever since his papers have had wide distribu-

tion and have been the focus of protests by antiracist activists.

Late in 1999 a condensed version of his 1997 book was published in a small pocketbook edition (108 pages without bibliography but included an order form for the unabridged version). The first chapter is entitled "Yali's Question and Marco's Answer," and the question (asked of Jared Diamond by a political leader in New Guinea) is "Why is it that you white people developed so much cargo and brought it to New Guinea, but we black people had little cargo of our own?" (Diamond 1997:13). Diamond provides a multidimensional book-length answer to this question, but Rushton is pleased to quote (without citing his source) Marco Polo: "Surely there is no more intelligent race on earth than the Chinese" (1999*a*: 14). The condensation was mailed unsolicited to numerous members of the American Anthropological Association (AAA), the American Sociological Association (ASA), and the American Psychological Association. The title page was preceded by quotations endorsing the 1995 edition of the book from Charles Murray, Henry Harpending, Arthur Jensen, Thomas Bouchard, Linda Gottfredsen, Hans J. Eysenck, and Richard Lynn. Lynn was quoted as saying that Rushton "should, if there is any justice, receive a Nobel Prize" and Harpending as calling Rushton's *Race, Evolution, and Behavior* "an attempt to understand differences in terms of life-history evolution. . . . for now Rushton's framework is essentially the only game in town." Members of the AAA protested to the association's headquarters, and representatives of both the AAA and the ASA clarified that they had made their mailing lists available to the publisher for advertising purposes and the mailing did not constitute AAA endorsement of Rushton's message.

THE CONCERN OF ANTHROPOLOGY

Almost all the criticism of Rushton's work has appeared in psychological journals (see esp. Cernovsky 1990, Gabor and Robert 1990, Weizmann et al. 1989, Zuckerman and Brody 1988). Cernovsky (1992:56) lists 14 of Rushton's errors and summarizes them as follows: "Rushton resorts to substandard data, ignores disconfirmatory evidence, ignores high intragroup variance effects of restricted range on the size of correlation coefficients, and overinterprets low *r*'s" (p. 56). Frequently Rushton's writing follows the pattern of *The Bell Curve* (Herrnstein and Murray 1994), in which a qualification precedes a statement justifying the inferiority of those at the bottom: "On any single dimension to be discussed the racial differences are not large. Typically they range from 4 to 34 percentile points. Although often modest, the mean differences do exist, and they do so in a stubborn and consistent pattern" (Rushton 1997*a*:xv). Rushton goes on to caution against generalizing from a group average to "any particular individual," but he does imply that it is appropriate to generalize from aggregated population measurements to the constituent populations. I regard Rushton's style of writing as one affirming black racial inferiority while seeking the deniability of racism (see Lieberman 1995).

Most anthropological sources have been silent about Rushton's ideas, with the exception of two articles (Groves 1991, Weizmann et al. 1990) in a collection (Sussman 1999) and one brief but thorough anthropological critique (Marks 1995:271–73). Anthropologists, especially physical or biological anthropologists, should be more concerned. First, they declare themselves to be studying human biological variation (Lieberman 1968) and have debated the nature of race and the taxonomy of races. "Certainly the oldest research question in physical anthropology is the one that inquires about the number of fundamental subdivisions of the human species, and the relationships among them" (Marks 1997:52). Second, Rushton draws on the theory of evolution, which is central to physical anthropological concerns. Third, members of the discipline have contributed support to hierarchical beliefs in the past and therefore should shoulder responsibility for challenging similar efforts today (Konner 1982:439), especially since several prominent physical anthropologists are inappropriately cited. Fourth, physical anthropologists (e.g., Tobias 1970) have developed techniques for evaluating research on brain size. Fifth, physical anthropologists should be equipped to bring to this issue knowledge from linguistics, archaeology, and cultural anthropology.

The concern of cultural anthropologists, consistent with their opposition to both hierarchical ranking of cultures and the "race" concept, should be with demonstrating Rushton's errors (Baker 1998, Mukhopadhyay and Moses 1997, Shanklin 1994, Smedley 1993). Both cultural and biological anthropology have increasingly critiqued the race concept (Lieberman, Stevenson, and Reynolds 1989), and many of the introductory textbooks of both disciplines have given critical attention to the issue of "race" and IQ (Lieberman and Kirk 1997). To the critique of the revised cranioracial-IQ determinism cultural anthropologists can bring several contributions, among them the critique of IQ tests that claim to be culture-free or culture-fair, the rich comparative ethnographic record of people classified in one "race" but having very different cultures and languages, the record of colonial contact resulting in exploitation that minimizes the colonized's access to education and/or belittles their traditional culture, and the evidence of migration and interbreeding and the social process of the formation of "racial" identities, which tells us more about "race" than a mountain of cranial measurements (Moore 1994, Omi and Winant 1986). In the sibling discipline of sociology little has been said about Rushton's work, but sociologists have reanalyzed the data in *The Bell Curve* and demonstrated its fundamental errors (see Fischer et al. 1996).

To respond to Rushton is to give his views a wider platform, but not to respond implies approval. I intend to demonstrate that his methods are seriously flawed and his conclusions invalid. So in fact are Morton's, although it should be noted that there are important differences between the two. Morton carried out original research

from the mid-1820s to 1851 in geology, paleontology, and zoology displaying "state of the art scholarship" (Brace n.d.). His cranial measurements illustrate his empirical emphasis, and he describes his procedure in detail. In contrast, Rushton seldom carries out direct measurements and does not adequately explain his selective use of the research and writing of others. Further, Morton's work on "race" was done in a cultural context in which "racial" hierarchy was the prevailing conception. Morton pioneered in measuring populations in a pre-Darwinian era, writing before the culture concept provided a tool for separating learned and inherited traits. Rushton lives in a period in which there is wide awareness of biological reductionism and the idea of culture but nonetheless reverts to discredited "racial" hierarchies, aggregating all the available population data that he thinks fit into each of the three traditional "races." Whereas with Morton it is always possible to tell which population is being used, Rushton has created what Montagu (1997) calls an omlette of populations representing nothing that exists in nature.

I am not taking the extreme deconstructionist view that scientific knowledge about socially sensitive subjects changes with changing social and cultural conditions and therefore can allow us only very limited glimpses into the realities of nature. Rather, I believe that knowledge can represent nature with increasingly greater accuracy when we are aware of our methodological errors, our accumulated knowledge, and the influence of our social and historical context.

Abusing Anthropological Research

How is it possible that 19th- and early 20th-century "scientific" racism can be presented as science while drawing upon late-20th-century anthropological and other research that critiques "race" and racism? Rushton describes his data as follows (1997*a*:xiii):

> Over the last several years I have reviewed the international literature on race differences, gathered novel data and found a distinct pattern. On more than 60 variables, people of east Asian ancestry (Mongoloids, Orientals) and people of African ancestry (Negroids, blacks) define opposite ends of the spectrum, with people of European ancestry (Caucasoids, whites) falling intermediately, and with much variability within each broad grouping. . . . This racial matrix emerges with measures of brain size, intelligence, reproductive behavior, sex hormones, twinning rate, speed of physical maturation, personality, family stability, law-abidingness, and social organization.

Rushton paints the aggregated "races" with a very broad brush, using concepts central to anthropological concerns. His model can be described in terms of a causal chain. Climate variations select for a hierarchy of differences among the three "races" with "Mongoloids" being superior, "Caucasoids" a close second, and "Negroids" with the smallest brains, the largest genitalia, the lowest intelligence, the largest number of offspring, and the least parental care. These differences, especially hereditary intelligence, are said to explain variations in culture among human societies in such a way that Africans are always inferior.

I will first examine Rushton's use of the "race" concept and go on to point to a number of other problems with his work. In the sections that follow we will see that Rushton cites anthropologists including Beals, Montagu, Tobias, and others, taking their data out of context and using them in a manner contrary to the conclusions these authors reached and without informing his readers of this crucial omission. By this procedure Rushton supports his model but ignores contrary and alternative explanations that invalidate that model.

1. *Rushton uses "race" despite decades of findings that invalidate it*. Rushton's definition of "race" emphasizes that races are natural hereditary biological units and assumes that it is possible to aggregate populations and calculate a mean score to represent this conglomerate: "A variety, a subspecies . . . characterized by a *more or less distinctive* combination of physical traits transmitted in descent. *A genetically distinct inbreeding division* within a species . . . distinguished on the basis of skeletal morphology, hair and facial features, and molecular genetic information" (1997*a*:305, emphasis added). There is an inherent contradiction in his definition between "more or less distinctive" and "genetically distinct." Elsewhere it is apparent that he prefers to emphasize "distinct," but the presence of greater variation is explained to his satisfaction by aggregation. It is a 19th-century biological explanation that Rushton seeks to revive, citing Francis Galton as a founder (pp. 9–13) and characterizing Franz Boas and Margaret Mead as "powerful ideologues" who "fought against the idea of biological universals" (p. 13).

Ashley Montagu (1941) challenged the 19th-century view of "race" partly on the basis of the Mendelian principle that traits are not transmitted as complexes of characters, and confirming data were developed in the decades that followed. Frank B. Livingstone (1958, 1962), using Julian Huxley's (1938) cline concept, presented data on the gradual change in frequency of sickle-cell genes over a wide geographic area of Africa, the Mediterranean, and South Asia. Clines provided a concrete alternative to thinking in terms of races. Identifiable traits were not confined to one "race" and were not uniform in frequency within a geographic area. C. Loring Brace (1964) made a persuasive case for studying human clinal variation one trait at a time.[2] The new views were

2. In biology, Edward O. Wilson and William Brown (1953) had already presented "the case against the trinomen" (subspecies) for very similar reasons but based on studies of frogs, which migrate and interbreed far less than humans. Also in biology, Paul Ehrlich and Richard Holm (1964), making a strong case for examining several clines at a time, revealed that "racial" traits did not covary in their geographic distribution. The geneticist Richard Lewontin

intensely debated in anthropology beginning in the 1960s, and by 1985 anthropology's core concept of "race" had been rejected by 41% of physical anthropologists and 55% of cultural anthropologists (Lieberman 1968; Lieberman, Stevenson, and Reynolds 1989:69). A similar survey in 1999 found that the concept of race was rejected by 69% of physical anthropologists and 80% of cultural anthropologists (Lieberman and Kirk n.d.). During the period 1975–79, twice as many university textbooks of introductory physical anthropology rejected the concept as accepted it (Littlefield, Lieberman, and Reynolds 1982:642), and during the period 1990–99 no text explicitly supported the concept (4 of 20 presented the topic as a debate, and 2 rejected typologies of race). Rushton does not discuss the weaknesses of the race concept.

2. *Rushton's use of aggregation is invalid.* Despite the loss of support of the "race" concept among anthropologists, Rushton identifies three major "races" by reducing measurements of diverse populations to the mathematical mean, aggregating many populations from diverse studies. Aggregation is more than a casual term for Rushton; he raises it to the level of a principle: "Focusing on correlations between just two items or situations can lead to major errors of interpretation. The more accurate assessment is to use a *principle of aggregation* and average across a number of measures. . . . this is because the randomness in any one measure . . . is averaged out over several measures, leaving a clearer view of underlying relationships" (1997*a*:20). Rushton applies this principle of aggregation to measurements of cranial capacity, races, IQ, and social traits.

Several objections can be raised to this procedure (see also Cernovsky 1993). The first objection is to the assumption is that there is an "underlying relationship" shared by the "races," a Platonic essence obscured by the variation within each "race." In fact, the variation itself is the empirical reality; mean scores are useful data points when used in conjunction with the range of variation. The second objection is to the failure to establish the *construct validity* that the aggregation is supposed to produce. The various types of validity used in psychology—criterion validity (predictive and concurrent), content validity, and construct validity (American Psychological Association 1985)—all depend on measuring behavior that is directly or indirectly observable and verifiable. Content validity concerns "how well the various items on a test correspond to the behavior the test is designed to measure" (Chaplin 1985:103). Construct validity is established when one valid test can "converge or correlate with another test that measures the same or a similar construct" (Meier 1994:122–23). Meier points out that "no specific level exists for determining when differences between correlations are sufficient to proclaim a test-construct as possessing adequate convergent or discriminant validity" (p. 130). Rushton, Brainerd, and Pressley (1983:23) claim that aggregated measures give rise to correlations of .50 and .60 rather than the correlations of .20 and .30 produced when only two measures are correlated. Rushton and Ankney (1996:27–32) review correlations between brain size and intelligence in 47 studies, which range from .08 to .69. Applying Rushton's principle of aggregation, the mean of the 47 correlations is 0.24. It has been observed that the coefficient of correlation (r) tends to overestimate the degree of relationship between x and y variables. For example, if r^2 equals 0.50, indicating that 50% of the variation in x can be attributed to y, then r equals 0.71; accordingly, r^2 is the more conservative statistic (Bechtold and Johnson 1989: 447). Rushton and Ankney's 0.24 squared equals .058. While r at 0.24 is weak, r^2 at .058 is extremely so, clearly failing to fulfill Rushton, Brainerd, and Pressley's (1983) claim that aggregation leads to a level of .50 or .60.

I agree with Meier that there are no absolute rules about the level at which differences between correlations indicate construct validity, but the higher the correlation the greater is the confidence that measures converge on a regularity in nature, providing that observers agree on the content validity of the tests being correlated. Construct validity is a mechanical tool that is irrelevant without content validity, and content validity is also lacking in Rushton's claims. In other words, Rushton's correlations are not only low but spurious in the sense that they are not based on valid measurements (i.e., diverse cranial measures, IQ assessments, and racial typologies). Many of the 47 studies cited range from head perimeter measurements to MRI data, and these data are then correlated with a variety of measures of intelligence ranging from "teachers' estimates," "officers' ratings," "grades," "occupational status," and "educational level" to scores on various standardized IQ tests (pp. 34–36). It appears that the claims made by Rushton about cranial size and IQ are based on a hodgepodge of cranial measurements and a stew of intelligence assessments that lack both content and construct validity.

A further objection to Rushton's use of aggregation relates to the conclusions he presents in tabular form in several publications (1988*a*:1010; 1997*a*:5; 1999*a*:19; see fig. 1). I suggest that empirical similarity has not been established between the populations that Rushton aggregates into three "races," and therefore aggregation of mean IQ scores or correlation is not justified. In order to establish substantial empirical similarity it would be necessary to present morphological and molecular data establishing that the populations aggregated as "Mongoloids," "Caucasoids," or "Negroids" do in fact belong together biologically and differ significantly from other aggregates. Rushton (1997*a*:91) states that he uses the three major subdivisions of "Negroid, Caucasoid, Mongoloid." His glossary describes "Caucasoids" as including the original inhabitants of "Europe, North Africa, Western Asia, and India" (p. 300), "Mongoloids" as "a major racial division of mankind found in all Asia except the west and south (India), in the northern and eastern Pacific, and in the Americas" (p. 304), and "Negroids" as "originating and predominating in sub-Saharan Af-

(1973) added to the case against "race" with data on 17 blood-group genes showing that 85% of variation was within a population (or so-called race), 8.3% between populations within the "race," and only about 6.3% among "races."

Chart 1

Where Blacks, Whites, and Orientals Fall on Various Traits

Trait	Blacks	Whites	Orientals
Brain Size:			
Cranial capacity	1,267	1,347	1,364
Cortical neurons (millions)	13,185	13,665	13,787
Intelligence:			
IQ test scores	85	100	106
Cultural achievements	Low	High	High
Reproduction:			
2-egg twinning (per 1000 births)	16	8	4
Hormone levels	Higher	Intermediate	Lower
Sex characteristics	Larger	Intermediate	Smaller
Intercourse frequencies	Higher	Intermediate	Lower
Permissive attitudes	Higher	Intermediate	Lower
Sexually transmitted diseases	Higher	Intermediate	Lower
Personality:			
Aggressiveness	Higher	Intermediate	Lower
Cautiousness	Lower	Intermediate	Higher
Impulsivity	Higher	Intermediate	Lower
Self-concept	Higher	Intermediate	Lower
Sociability	Higher	Intermediate	Lower
Maturation:			
Gestation time	Shorter	Longer	Longer
Skeletal development	Earlier	Intermediate	Later
Motor development	Earlier	Intermediate	Later
Dental development	Earlier	Intermediate	Later
Age of first intercourse	Earlier	Intermediate	Later
Age of first pregnancy	Earlier	Intermediate	Later
Life-span	Shortest	Intermediate	Longest
Social organization:			
Marital stability	Lower	Intermediate	Higher
Law abidingness	Lower	Intermediate	Higher
Mental health	Low	Intermediate	Higher

Chart shows average for each race. There is variation within each race as well.

Source: Unabridged edition, *Race, Evolution, and Behavior* (p. 5).

FIG. 1. *Rushton's Chart 1 (1999a:19, reprinted by permission of the author). The version appearing in Rushton (1998a:1010) lists rankings by using Arabic numerals 1, 2, and 3. Present in that earlier version and omitted in 1999 are "brain weight" and "size of genitalia"; new to this version is "cultural achievements."*

rica" (p. 304). Adjacent geographic location seems to be the only empirical similarity except for brief descriptions of stereotypical features such as hair texture, face width, nose width, lip thickness, and epicanthic fold. Considering the many diverse populations in these broad geographic areas, much variation is ignored. Similarly, there are geographic areas not embraced in the definitions—notably Indonesia, Australia, New Guinea, and Micronesia. In his use of geographic areas to support his typology of three "races," Rushton has ignored the nine geographic races proposed by Garn (1971:155) and Garn's 32 local "races," 7 of which are in sub-Saharan Africa (p. 170). Rushton (1988*a*:1017) is not unaware of the contradictions posed by aggregation and the extensive variation found within populations: "There is, of course, much within-population variance on all the measures. On the other hand, by particularizing sufficiently, *any* general statement can be defeated. It is for this reason that aggregated measures are preferable (Rushton, Brainerd, and Pressley 1983). I have every reason to believe, therefore, that the data reported here reflect real differences."

Rushton avoids the necessity of explaining the many cases that do not fit his principle of aggregation by using the socially constructed 19th-century typology of "races." He counters the view that "race" is merely a social construct by referring to the work of "forensic anthropologists able to classify skulls by race," who report that narrow nasal passages mark a "Caucasoid," wider-based openings a "Negroid," distinct cheekbones a "Mongoloid" (1995:235). His crude classification belies centuries of interbreeding in the United States. Studies of some black populations have demonstrated that 25–30% of their blood-group genes are of European origin (Glass and Li 1953). The forensic anthropologists Stephen Ousley and Richard Jantz (1996:21) state that "social race is assigned based on phenotypes, which in the U.S. appear largely based on skin color." In the United States, those who are part African in ancestry have been classified and are expected to classify themselves as "black." The result, referred to above, has been an increasing proportion of European ancestry among African-Americans, a pattern that makes cranial and IQ measurements of dubious meaning when applied to a "race." One of Rushton's studies (1992) uses data gathered by the U.S. Army (6,324 U.S. military personnel) for which degree of mixed ancestry could not be controlled but nevertheless ranks the recruits' cranial capacity as "Asians > Caucasians > Blacks."

Aggregation is a reasonable procedure when the biological or behavioral units being collected are shown to be essentially the same. Rushton does not list the specific populations or indicate how forensics would justify the inclusion of each in one of the three races. He is aware of the objections to his use of the concept of "race"; indeed, they have been raised by critics in his own discipline, who have argued that the aggregation of populations loses much genetic data and explains little, that his approach requires representative samples based on a scientific definition of race (Cernovsky 1993:286), and that he should systematically compare populations in the same environment and "hybrids in all environments" (Weizmann et al. 1989:81). Rushton's comparisons between "races" have been criticized for assuming that each is homogeneous or "pure" (Roberts and Gabor 1990:295). His claim of construct validity for race and IQ correlations lacks empirical support.

3. *Rushton's cranioracial variation is contradicted by evolutionary anthropology*. Rushton (1990:786) takes cranial measurements from a study by Beals, Smith, and Dodd (1984) without mentioning that study's finding that while climate variables were strongly correlated with cranial variation, "race" and cranial variation had low correlations. The relationship between latitude and cranial size is an example of Bergmann's principle that crania are more spherical in cold climates because mass increases relative to surface area to conserve core temperatures: "A slight increase in head size combined with a rounder cranium has a disproportionate effect upon volume" (Beals, Smith, and Dodd 1984:312). "The closer

a structure approaches a spherical shape, the lower will be the surface-to-volume ratio" affecting radiation of metabolic heat and temperature regulation, which is especially important in colder climates because as much as "80 percent of body heat may be lost through our heads on cold days" (Molnar 1998:202). Beals, Smith, and Dodd emphasize that this relationship is independent of "race." "In fact, several of their climatological-cranial correlations reach .60, much higher than any relationship Rushton has been able to report for race, except for one study" (Weizmann et al. 1996:196). Rushton argues that "Mongoloids" have superior, larger brains because in their evolution they had to adapt to a cognitively demanding but predictable cold Pleistocene climate (1997*a*). An alternative scenario is provided by Brace (1998:112): "the mode of subsistence of all human populations was essentially the same throughout the entire range of human occupation over the past 200,000 years. This was conditioned by adaptation to the selective pressure engendered by the cultural ecological niche. For these reasons, then, cognitive capabilities should . . . be the same in all the living populations of the world." Brace points out (p. 4) that 100,000 years ago early moderns at Qafza "were making the same tools, hunting the same animals . . . as their Neanderthal contemporaries," and therefore we can conclude that human cognitive capabilities are distributed in a nonclinal way. Similarly, Dobzhansky and Montagu (1947:112) had suggested that natural selection in human societies favored "maturity of judgment and ability to get along with people." The complex ability to adapt to relationships within a group was a selective factor operating everywhere. How is it possible that cranial size varies with latitude while intelligence is nonclinal in its distribution? Cranial size is a response to natural selection in a cold climate, while variations in the size of the brain do not determine intelligence within the species-normal range of 1,000–2,000 cm^3, especially considering the role of cultural environment.

Rushton (1997*a*:217–33) also discusses the controversy over whether the origin of modern *Homo sapiens* is best explained by the multiregional model (Wolpoff, Zhi, and Thorne 1981) or the mitochondrial model (Cann, Stoneking, and Wilson 1987), both of which invite (nonracist) racial distinctions (Lieberman and Jackson 1995). He decides in favor of the more genetically based mitochondrial model. Citing a follow-up study with an expanded number of participants (Vigilant et al. 1991), Rushton offers this interpretation: "That the human DNA closest to that of apes occurs most commonly in Africa implies an African origin for human mtDNA" (Rushton 1997*a*:221). In regard to the first phrase, Vigilant and coauthors say no such thing. What they do say is that "human-chimpanzee mtDNA divergence is about 4 to 6 million years ago" (p. 1506). They also conclude that all humans have a common ancestor at 172,000 years ago (p. 1506). It is from this date that the mitochondrial model holds that "races" began to accumulate mitochondrial sequence differences. Africans accumulated more, other populations less, possibly because of differences in population size. While humans and chimpanzees differ by slightly more than 1% of their genomes and overlap in some behaviors, humans differ from apes in their cultural and linguistic behavior by an enormous degree that cannot be expressed in percentages. No human population is closer to the apes than any other.

4. *Rushton's collection of brain measurements fails to utilize control variables identified by Tobias*. Rushton's data measure brain size in four ways, one of which is brain weight. Tobias (1970) reviewed 14 variables affecting the measurement of brain weight: sex, body size, age at death, early-life nutrition, early-life environment, source of sample, occupational group, cause of death, lapse of time after death, temperature after death, anatomical level of severance, presence or absence of cerebral spinal fluid, presence or absence of meninges, and presence or absence of blood vessels. Twenty-five years after Tobias's publication, Rushton (1997*a*:131) lists 38 studies of autopsied brain weight (converted to cubic centimeters). Very little information is provided as to what variables were controlled. Tobias, after a review of research on the subject, concluded that "brain weight depends significantly on body height but not on body weight" (Tobias, p. 7, citing Pakkenberg and Voight 1964: 303). He then suggested that "unless corrections have been made for differences in body height . . . all comparisons between Negro and white brain size to date are invalid" (p. 9). Only 3 of the 38 studies by other scholars listed by Rushton include corrections for "body size" (1997*a*:131).

Tobias concluded his study on brain weight with this comment in relation to studies of blacks and whites (1970:22): "I have emerged with the conviction that vast claims have been based on insubstantial evidence. I conclude that there is no acceptable evidence for such structural differences in the brains of these two racial groups; and certainly nothing which provides a satisfactory anatomical basis for explaining any differences in IQ or in other mental and performance tests, in temperament or behavior." Rushton cites this paper but does not report that Tobias's conclusions contradict his own.

Tobias also asked about the number of excess neurons among human populations. Excess neurons are those said to be available for intelligent adjustment to the environment over and above those needed "for transmitting impulses to and from the integrative centres" (Lashley 1949:33). Using a method devised by Jerison (1963), it is estimated that African great apes have 2.4–3.6 billion excess neurons. Tobias (1970:9) lists the excess neurons for various human populations. Rushton (1988*b*:1036) aggregates these in millions as follows—Africans 8,550, Europeans 8,650, and Asians 8,900—but in contradiction to his thesis asserts that differences of 100 to 200 million neurons are sufficient to "underline many of the cultural differences observed" (1988*b*:1036; 1997*a*: 113). In order to arrive at the Negro figure, he aggregates Kenya's 8,400 and the American Negro's 8,700, but the American Negro at 8,700 exceeds the American white at 8,500 and the French and the English at 8,600 each.

Once again aggregation serves Rushton's purpose well,

but fallaciously. In rats, normal variations within a population in brain size of male or female were not related to variation in the combined number of neurons and glial cells (Zamenhoff, Van Marthens, and Bursztyn 1971). Holloway (1966:107) reports studies of the cortex in which the "packing distance between neurons decreases as the brain increases" and points out that large numbers of neurons can be removed in surgery "without converting the patient into a new species." The anatomist Herbert Haug (1987:135) found that women have 4,000 more neurons per cubic millimeter in their cerebral cortexes than do males; they just pack all their neurons in less space. Tobias's conclusion of 1970 was that "vast claims have been based on insubstantial evidence'; this is no less true of what Rushton has aggregated over a quarter-century later.

Rushton and Ankney cite studies of endocranial volume using seed or lead shot, perimeter and length-width measures and techniques such as magnetic resonance imaging (MRI) and computerized axial tomography (CAT scanning). They report on eight nonclinical adult samples (1996:36) and seven adult clinical samples (1997:30) using MRI. The correlations with intelligence scores cited are 0.07 to 0.38 for the clinical studies and 0.33 to 0.69 for the nonclinical studies. Most of these studies are of European, British, and Canadian populations; five of them include populations of two or more "races." The MRI data do not show a systematic relationship to the three "races" but do provide part of the blizzard of data that obscures the lack of such relationship (Zack Cernovsky, personal communication, 1998).

Rushton has done almost no direct research on brain weight or size. Rather, he assembles studies done by others in which only one or none of the variables identified by Tobias has been controlled. In brief, his racial hierarchy is based on studies that are not controlled and not comparable. Even if Rushton's racial hierarchy were based on controlled studies, the difference in mean cranial size between Asians and Africans is 97 cm^3, which is a small portion of the range of 1,000 cm^3 to 2,000 cm^3 among humans (Lieberman 1999).

5. *Rushton does not relate environment, nutrition, cranial size, and IQ*. Nutrition is an important environmental influence on brain size and on IQ. Inadequate nutrition is more likely to affect children living in poverty in the United States and the Third World, and it is very likely to reduce IQ scores. Environment and genes interact, but optimum nutrition maximizes each child's potential. Although Rushton refers to environmental influences, he traces them to genetics: "When there is a correlation between genetic and environmental effects it means that people are exposed to environment on the basis of their genetic propensities" (1997*a*:66). It is a great distance from so sweeping a statement to actual environmental interactions such as the relationship between nutrition, cranial size, and IQ. Rushton's comparison of races pools American blacks with several samples of African blacks, but one study found that blacks living in countries with superior nutritional standards do not differ from whites in cranial size. Cernovsky (1992:60) reports that the average cranial capacity of nine samples of "Caucasians" (1,621 cm^3) is similar to that of American Negroes (1,600 cm^3) and superior to that of "Caucasians" in Cairo ($N = 802$). In their review of research, Morgan and Gibson (1991:97–100) report that malnutrition during the first two or three years of postnatal life may have a negative effect on brain growth. They also report on studies (Winick 1976) of undernourished Serbians, Indonesians, South Africans, Mexicans, Guatemalans, and Americans indicating lasting deficiencies in intelligence but conclude that with nutritional and environmental rehabilitation "even severely deprived infants can achieve normal IQs" (p. 100).

Isolating the effects of undernourishment is difficult because it is accompanied by many other deprivations, including child neglect or abuse, that obscure or compound its biological consequences (Stinson 1998:148). In a longitudinal study on malnutrition in Guatemala, Pollitt (1993:71) used Atole, a protein supplement, for children in one village and Fresca for the controls in another village. In tests of numbers, knowledge, vocabulary, and reading the Atole children improved 1–4%. With a full model involving more environmental influences, 55% of literacy improvement was accounted for, as well as 2–10% of variance in information processing. A longitudinal study in Tezonteopan, Mexico, compared one nutritionally supplemented group of six- and seven-year-old schoolchildren with a nonsupplemented group on a series of written tests. Their teachers were unaware of which children received the supplement. The grades of children who did not receive the supplement averaged 6.5 out of 10, with 38% failing. None of the supplemented children failed, and their average grade was 8.1 (Chávez, Martínez, and Soberanes 2000:249).

Richard Lynn (1989:373), who shares many of Rushton's views, writes that with regard to brain size and IQ, improved nutrition in Britain since World War II has been accompanied by increased living standards, an increase in height of 7–8 cm, increased head size, and a steady gain in IQ scores. Lynn (1998:207) also writes that nutrition is "the sole factor responsible for the secular increase in intelligence" that was reported by Flynn (1998). This would appear to be an environmental explanation, but Lynn views the change as resulting from an increase in brain size which in turn determines intelligence (p. 211). He also argues that genotypic intelligence is declining because those of lower socioeconomic status have greater fertility, as Galton had long ago predicted (p. 336). Intelligence test scores continued to rise both in northern Europe and the United States into the late 1980s after the nutritional deficiencies had been overcome (Martorell 1998:201). Barker's (1998) longitudinal study of mothers in northwestern England suggests that more than one generation of good nutrition was required to overcome the effects of malnutrition passed down from the mother to those daughters who later become pregnant. A rise in test scores may therefore continue for more than one generation after normal nutrition is first established. Possibly other environmental changes were occurring, such as an expansion in the proportion

of people living in a middle-class environment or the acquisition of greater skill in test-taking. Several studies indicate that nutritional rehabilitation is possible, suggesting that better school performance is possible with better nutrition for millions of undernourished children in developing nations as well as the one in five children living in poverty in the United States.

6. *Rushton claims to "explain" a vast array of human behavior*. Just as Rushton aggregates data from diverse populations to create "racial" categories, he aggregates diverse behaviors under one label to identify traits on which his "races" differ (fig. 1), which include "aggressiveness," "impulsivity," "permissive attitudes," and "law-abidingness." What are the diverse indicators of these behaviors in various reports and for various populations? Were they consistently measured? What is the meaning of these traits in different cultures? Do they in fact share an empirical essence? Most of the same questions can also be asked of several of the listed biological features, such as twinning, age of first intercourse, and cranial capacity. Rushton describes some of his empirical data as follows (1995:159):

> Obviously the groupings shown do not represent in any sense "pure types" and there is enormous racial and ethnic variation within almost every country; moreover, each country undoubtedly differs in the procedures used to collect and disseminate the crime figures. Certainly within each racial grouping are to be found countries reporting both high and low crime rates. The Philippines, for example, a country grouped as Mongoloid, reported one of the highest homicide rates in the world, 43 per 100,000 in 1984; Togo, a country grouped as Negroid, had the lowest reported crime rate in the world, a "rounded down" 0 per 100,000 in all 3 crime categories in 1984.

In other words, at least one "Mongoloid" population has one of the highest crime rates while at least one "Negroid" population has the world's lowest rate. How many other contradictions exist and are obscured by the principle of aggregation? The weakness of Rushton's data is best portrayed in his own words: "While fewer systematic studies have been carried out on Africans and black Americans, many imply greater aggression, dominance, impulsivity, and displays of masculinity compared to whites" (Rushton 1997*a*:154, citing Dreger and Miller 1960, Wilson and Herrnstein 1985). Implications drawn from a few systematic studies do not provide the evidence that would permit these sweeping conclusions.

Rushton supports his hierarchy by reference to Baker's (1974:507–8) 21 "criteria of civilization"; Europeans and Asians are said to have "developed all 21 characteristics, the Maya about half, and (sub-Saharan) Africans none" (Rushton 1997*a*:142). Among Baker's criteria are disposal of waste products, absence of torture to extract information, and a system of laws. Yet, effective disposal of waste in many urban centers is just a few centuries old and torture is still practiced, and what human society is without laws, written or unwritten? Anthropologists will recognize that Rushton is using ideas similar to the long-discredited idea that "races" and cultures coevolve from savagery to civilization.

Rushton ranks "races" on a number of variables including cultural achievements, personality traits, marital stability, law-abidingness, mental health, and administrative capacity. These variables are usually not defined, and each represents reified aggregations of diverse behaviors that vary in their causation. To "explain" these differences, Rushton (1995) uses another evolutionary scenario, the concept of *r*/*K*-selection (attributed to MacArthur and Wilson 1967). He asserts that a set of life-history differences is determined by evolution in either a *K* environment (colder and predictable) or an *r* environment (tropical and unpredictable). *K*-selected species, among them humans, are said to produce fewer offspring and exhibit high levels of parental care, while *r*-selected species emphasize large numbers of offspring and little or no care. According to Rushton, European and Asian peoples adapted to survival in "predictable cold environments" requiring increased brain size and parenting behavior. Asians became "more *K*-selected than Caucasoids, who in turn are more *K*-selected than Negroids" (1995:199). For this reason, he argues, Negroids have more offspring, more twinning, more intercourse, larger penises and vaginas, and less intelligence (p. 214)—in short, are more animal-like.

MacArthur and Wilson, however, proposed that tropical rain-forest conditions, being more constant, would favor *K*-selection, while seasonal arctic environments would be less predictable and associated with *r*-selection. Primates, for example, evolved and for the most part live in tropical conditions, and most species of primates have only one infant at birth (Martin 1998:144; Graves 1999). Moreover, Stearns (1992:206) reports that where the data are adequate *r*/*K*-selection theory fails for about 50% of species. Rushton (1997*b*:249–50) responds that his critics have an incomplete understanding of MacArthur and Wilson's work, arguing that the East African savannah, in which the genus *Homo* began its evolution, is and was characterized by unpredictable "disease epidemics and prolonged droughts," whereas the arctic environment is "highly variable and more importantly, is highly predictable as well" (p. 249). He places the origin of "races" within the last 140,000 years (p. 219). During that period humans had spread over a wide variety of habitats. To reduce the evolution of "races" and degree of *K*-selection to arctic and savannah ecosystems fits Rushton's aggregational analyses but ignores culture as a mode of adaptation and the diversity of habitats in which many populations lived in Africa, Europe, and Asia. Rushton does not meet the test proposed by Boas (1965[1911]:227): "If the defenders of race theories prove that a certain kind of behavior is hereditary and wish to explain in this way that it belongs to a racial type they would have to prove that the particular kind of behavior is characteristic of all the genetic lines composing the race. . . . This proof has never been given."

A second test is provided by history. In order for the traits in his chart to have empirical validity it must be demonstrated that a population's "physical type and culture have co-evolved" (Moore 1994:925). The same population line should show consistent behavior over a span of historical time. History provides a multitude of contrary examples as one after another society builds an empire and then declines in power. Similarly, IQ scores have increased in this century for both blacks and whites (Grissmer et al. 1998). Aggregation of populations is an obstacle to knowledge both for physical anthropologists, who must study and compare diverse populations, and for cultural anthropologists, who must study and compare patterns of human behavior in different societies. Rushton's procedure fails to meet both the synchronic test and the test of history.

Conclusions

That Europeans dominated the race hierarchy in the 19th century, that challenges to that hierarchy arose in the 20th, and that the claim of Asian superiority has been asserted since 1980 do not in themselves prove Morton, Boas, or Rushton incorrect. Rushton's view depends on a traditional concept of "race" that 20th-century genetics has shown to be invalid. He ignores research showing that cranial size varies significantly with latitude, not with race. He combines many populations into three races without establishing the biological similarity of the populations within each race and significant differences between them. He attributes inferior behavior to Africans and superiority to Asians without establishing that the behavior he cites is defined in the same way in different societies. He lists brain measurements for which there were no control variables and dismisses the influence of nutrition on cranial size and/or IQ. Rushton defends his approach by claiming that his critics are expressing "political correctness" and the "equalitarian's dogma" (1996), but it should be recognized that he is expressing the political correctness of the 19th century.

One of his critics states that Rushton has demonstrated a "consistently biased review" of his sources, lacks credible evidence, and "causes major psychological harm to millions of black children and adults (with respect to self-esteem, career expectations, interracial relationships, etc.)" (Cernovsky 1992:64). Given the financial support of the Pioneer Fund (see Lane 1995; Mehler 1999; Rosenthal 1995; Tucker 1994; Cernovsky 1994: 332) and the kind of conclusions Rushton reaches, it is instructive to consider his description of the purpose of his research (1997*a*:257, emphasis added):

> There are no necessary policies that flow from race research. The findings are compatible with a wide range of recommendations: from social segregation, through laissez-faire, to programs for the disadvantaged. Yet effective public policies must be based on sound scientific conclusions rather than popular assumptions or misconceptions. Social problems of poverty, crime, drug abuse, and unemployment often have an ethnic dimension. . . . As the world continues a trend toward a global village it *will be more necessary than ever to come to terms with the degree of genetic variation within the human species*.

Of course, Rushton is referring to genetic variation among "races." He claims that his research can be used to legitimate any solution from apartheid to welfare, but the final sentence clarifies the implications for social policy. According to Rushton, heritability is characteristic of 60% of our behavior and the remaining genes select from the available social environment those aspects that are favorable to the genes: "genotypes seek out maximally conducive environments" (1997*a*:68). Therefore, genes shape all or almost all of behavior. The implication is that the poor and subordinate have created their own desperate conditions and social programs to help them would be very constrained and extremely expensive.

Rushton's emphasis on brain size may mystify or mislead some into thinking in terms of cranial determinism. In doing so they will overlook the interaction of nature's endowment and the ecological and cultural environment along with the history of each society, its internal processes, and its contacts with others.

The fundamental question is not whose brain is smaller or larger but how social inequities might be reduced by social methods. The question of which "race" has the largest cranial size and the highest intelligence lacks conceptual and empirical merit. Attention to whether Europeans or Asians are number one in the hierarchy obscures the fact that the major consequence of the hierarchy is to justify the exploitation of those at the bottom.

Comments

C. LORING BRACE
Museum of Anthropology, University of Michigan, Ann Arbor, Mich. 48109, U.S.A. (*clbrace@umich.edu*).
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Anthropology has to be grateful to Lieberman for identifying the source of the collective "Caucasoid" swollen head in the latent racism that characterized so much of the profession in the past. Rushton's work is one of the most widely recognized examples of that earlier stance of "scientific racism" today, and it is high time that anthropology gave it the critical scrutiny it needs. Virtually every point Lieberman makes is fully justified and deserves to be seconded by the anthropological community. He has spelled out the basis for the assessment that Rushton's presentations represent "bad biology" and "inexcusable anthropology" (Brace 1996:176). To bolster his

overall picture, one of his points can be somewhat enlarged and a further one can be added.

The first is the matter of "heritability." While Lieberman notes that heritability estimates for cognitive capabilities vary much more widely than the Rushtons of the world acknowledge, the point needs to be emphasized that heritability is not a fixed figure or the property of a given trait. Heritability is a ratio between the variance of the genetic and the environmental contribution to a phenotypic manifestation in a population under a given set of conditions. It says nothing about mean differences in the trait in question, and it varies enormously with circumstances. Even where genetic control can be determined, it has long been noted that traits with high heritabilities are those that are of the least importance in terms of fitness (Falconer 1960:150). The supposedly high heritability of the various estimates of cognitive capacity can only indicate that whatever is being measured is adaptively unimportant. Further, there is the matter of whether anything is to be gained by positing heritability for something that involves the contribution of more than one identifiable gene. "The view that a trait is independently heritable (or heritable at all) simply because it can be separately defined and analyzed has been rendered largely obsolete by modern developments in biology" (Thorogood 1997; Lovejoy, Cohn, and White 1999:13247). Although we can perceive a phenomenon to which we can refer by the use of a given name, it may be completely unwarranted to propose that such a construct can be assessed in terms of a single heritability figure. The classic case that comes to mind is the example of Spearman's *g*—the "general intelligence" factor—and the assumptions behind its formulation and use (Jensen 1998). We know that there are inherited differences in the ability to do arithmetical calculations in the head or to remember dates and events in their proper sequence, but the assumption that there is anything significant to gain by isolating the extent to which those separate abilities vary in common is quite another matter. That one can learn much of value from a measure of the common variance shared by the entire spectrum of cognitive capabilities is unlikely in the extreme. None other than the author of multiple factor analysis, L. L. Thurstone (1947), warned that "we must guard against the simple, but common, error of merely taking a first centroid factor, a first principal component, or other mean factor, in a test battery and then calling it a general factor" (1940:208). As has been noted, "the appearance of a principal factor is a function of the factor analytic method" and does not say much about the capabilities of the people being tested and analyzed (Mercer 1988: 202). Spearman's *g*, then, is a "statistical artifact." Its importance has been accepted by Rushton, who has referred to Jensen's (1998) recent book on it as "the jewel in the crown of his 30-year research on the nature of Spearman's *g*" (Rushton 1999*b*). It may be a "jewel," but the crown of which it is a part adorns a ponderous accumulation of research of little demonstrable value (Brace 1999*b*, Sternberg 2000). The paleoanthropological record shows that human survival strategies were essentially identical from the emergence of the genus *Homo* approximately 2 million years ago until the adoption of agriculture within the past 10,000 years or less (Brace 1995, 2000). Since the selective forces relating to human decision making were of the same magnitude for at least 2 million years, our null hypothesis should be that all human groups have the same average mental capabilities despite within-group individual variation (Brace 1999*a*). To test such a null hypothesis it would be necessary to ensure that the groups being tested had recently been living under conditions of social equality for several generations. Jensen's reaction was that the insistence on such conditions before meaningful research could be undertaken "would completely preclude the possibility of researching this important question, not just for several generations but indefinitely" (Jensen 1971:24). In other words, he advocated the pursuit of research which he regarded as "important" even though there was no prospect that the results could be meaningful compared.

Rushton, for his part, has never even mentioned the problem of controlling test conditions so that the results could have any meaning. Instead, he has stressed that human populations long associated with life in the colder parts of the world would have had to face challenging but predictable problems while the subtropical savannas where humans first evolved were less predictable but less challenging (1995:7, 228–31). These are just assertions in the absence of evidence or analysis and count as analogues to the traditions represented by stories describing the expulsion from a hypothetical Garden of Eden. There is no empirical evidence that the North is more predictable than the African savanna or that it is more stimulating to the intellect. Northern mice, foxes, and deer are not better endowed intellectually than their tropical relatives, and the same is true for virtually all other animals with arctic and tropical representatives. Rushton, in making such assumptions, has produced a classic example of what Stoczkowski has called "anthropologie naïve" (Stoczkowski 1994). A full-scale antidote to Rushton's preconceived and simplistic outlook is presented as chapter 12, "The Cultural Ecological Niche," in my *Evolution in an Anthropological View* (Brace 2000). However, in attributing the cultural and behavioral differences of people of different skin color to differences in inherited capabilities, he has gone beyond the examples discussed by Stoczkowski and produced a clear-cut manifestation of what Todorov (1993:91–93) has called "racialism," in which the existence of "races" is assumed and a continuity between physical "type" and behavioral characteristics can be plotted in hierarchical fashion. Individuals can then be assessed in terms of the knowledge of their racial essences rather than of their general humanity or demonstrably unique worth. In that sense, the "racialism" of the Rushtons and the Jensens of this world is considerably less benign than the slightly dotty *anthropologie naïve*. We owe Lieberman a debt of gratitude for turning the light of his analysis on its most recent manifestation.

HENRY HARPENDING
Department of Anthropology, University of Utah, 270 S. 1400 East, Room 102, Salt Lake City, Utah 84112-0060, U.S.A. (*henry.harpending@anthro.utah.edu*).
15 VIII 00

The specter of significant gene differences among continental groups that affect aspects of culture is the worst possible nightmare for those of us who retain some shred of the old vision of a social science. For example, we have to face the likelihood that culture areas are partially determined by gene areas. I don't know what to make of all of it, but there is certainly far too much smoke for us to continue to claim that there is no fire. There is a lot of evidence and an apparently coherent pattern, and we can't make it disappear by waving our arms about the "race concept" or "construct validity."

The once proud discipline of anthropology has collapsed in the past few decades as the rift between Snow's two cultures has gotten deeper and deeper. Some of us see ourselves as humanists, often with strong social and political commitments, while others of us see ourselves as natural scientists. This was not so uncomfortable a half century ago, when there was a lively vision of social science as a sort of hybrid with its foundation the Boas hypothesis of the independence of biology and social behavior. Since then there has been withdrawal from the center in both directions. The idea of a grand unified social science has been abandoned, and the Boas hypothesis has proved wrong in every context in which it has been critically tested (e.g., Bouchard et al. 1990, Weinberg, Scarr, and Waldman 1992). The science clan in our departments is more and more like another branch of biology.

The separation has generated and continues to generate strong antipathy, mostly, it seems, from the humanists with social and political commitments. The doings of the science clan appear to have ominous political implications, implications that the science clan itself often cannot perceive. The result has been an unseemly tradition of jeering from high in the cheap seats. The silly sociobiology debate of the 1970s and the denial of the biology of sex differences of the 1980s seem sad and pointless today. In response to the jeers the science clan has made semantic accommodations: we say "behavioral ecology" not "sociobiology," "gender" not "sex," "ability tests" not "IQ tests," and "continental groups" not "races." These changes are meaningful if the Sapir-Whorf hypothesis that language guides thought is correct, but there is little evidence to support even Sapir-Whorf.

Two minor points ought to be mentioned. First, the principle of aggregation, as Rushton calls it, is in its fancy form called meta-analysis and is well established. But one does not average correlation coefficients from different studies as Lieberman seems to have done. Second, the attribution of "inferior" and "superior" to the trait lists suggested by Rushton is not in his publications, and it is unnecessarily inflammatory.

FATIMAH JACKSON
Biological Anthropology Research Laboratory, Department of Anthropology, University of Maryland, College Park, Md. 29742, U.S.A. (*fj6@umail.umd.edu*).
30 VIII 00

Lieberman's essay eloquently details the historical anomaly and scientific fallacy of continued racial profiling among contemporary "evolutionary" psychologists. It is indeed a paradox that an archaic and ill-founded concept, that of human biological races, remains central to psychology's hierarchical paradigm in spite of the mounting genetic data that challenge the very foundations of this approach. Since there are no valid scientific grounds for the application of racial (subspecific) taxonomies in reference to *Homo sapiens sapiens*, the key questions become why evolutionary psychology needs a race concept, what it is about the archaic aggregate partitioning of modern humanity that validates evolutionary psychology models, and what recent shifts in the sequence of ranked cultural and geographical groups mean for the overall dynamics of the evolutionary psychology paradigm.

Without a doubt, evolutionary psychology remains handicapped by the current primitive state of behavioral genetics and by our extremely inadequate understanding of gene-environment and gene-gene interactions. It is still a subfield that is inordinately dependent upon conjecture and extrapolation. Even in this exercise, it is hindered by an inability to understand cross-culturally most of the complex behavioral phenotypes it seeks to quantify. Its intellectual reference point is highly if not exclusively Eurocentric, and it has yet to recognize and embrace multiculturalism as fundamental to the human condition. Within evolutionary psychology, normalcy continues to be defined within a limited sociocultural context. As targeted groups deviate from a reference Caucasoid-based standard, their "pathology" intensifies.

Evolutionary psychology has yet to prove itself relevant to assessments of human biodiversity, whether this variation is expressed across geographical space or through historical time. Where evolutionary psychology and psychology in general are most effective, however, is in the analysis, interpretation, and prediction of the behaviors of Western European peoples and their cultural descendants. Many psychologists *need* the stasis of racial stratification to produce some level of validity for their models, most of which represent culture-bound syndromes. By partitioning modern humanity into 19th-century taxonomic categories and adhering to 19th-century evaluations of absolute human merit and intellectual advancement, psychologists can test and refine their Western European-oriented models of human behavior. Outliers can be minimized, type 1 and type 2 errors reduced, and statistical congruity enhanced without having to factor in the messy considerations of cultural and ecological diversity. Racial partitioning allows evolutionary psychologists to concretize a "human standard" based on a small slice of humanity which has conveniently already been preemptively placed at the apex of the mental de-

velopment hierarchy. The C > M > N paradigm reigned supreme as one biased assessment after another was designed to reaffirm it. In the dominant Western worldview, no other scheme would have made geopolitical, economical, or sociocultural sense.

Now pseudoscientists have seemingly shifted the sequence of the C > M > N hierarchy while continuing to remain loyal to the illogical and dysfunctional racial paradigm. This shift to M > C > N is, however, illusory. There has been no change in the power relationships among the demarcated groups. What has changed is that it is no longer essential for "Caucasoids" to be *at the top* of all-important human categories. In fact, to continue to assert such an easily falsifiable notion would be ridiculous. What is essential sociopolitically and for the psychodynamics of evolutionary psychology is for "Caucasoids" to be *at the center* of all-important human categories, to show group superiority through balance and integration (see Rushton 1996*b*). Indeed, this is the new message of the M > C > N sequence. It is deemed acceptable for "Mongoloids" to have larger brains and better performance on intelligence tests than "Caucasoids," since they are (presumably) sexually and reproductively compromised with small genitalia, low fertility, and delayed maturity. Hence, by this twisted model, they are actually unbalanced and in disequilbrium. Therefore, the craniometric and cognitive superiority of "Mongoloids," Rushton would have us believe, masks their continued overall inferiority. "Negroid" deficiencies[1] are simply the converse of "Mongoloid" limitations. If "Caucasoid" superiority is to be affirmed and stabilized, it must be wedged between the reciprocal inferiorities of "Mongoloids" and "Negroids."

There is much real science to dispute the contrived and reactionary assertions of Rushton. Lieberman has touched on many of the most salient arguments. In modern humans, intraspecific correlation between brain size and various measures of "intelligence" is nonexistent (Henneberg 1998). Furthermore, since *Homo sapiens sapiens* displays significant variability in a number of body parameters (Peters et al. 1998), we do not yet have a meaningful algorithm for the comparison of brain size among various geographical groups. What we do know is that within human families, brain size does not predict general cognitive ability; nongenetic events play a significant role in brain volume and cognitive ability associations (Schoenemann et al. 2000). Metabolic differences in brain chemistry do exist between individuals, and cortical dopamine levels have been suggested as being correlated with changes in brain size, complexity, and cognitive abilities during human evolution (Previc 1999). Yet cognitive performance differences have not been easily linked to diversity in various brain mechanisms (Deary and Caryl 1997).

1. What is interesting is the continued disenfranchisement of "Negroids" no matter what sequence of intellectual merit or civilized advancement is proposed. In spite of all the evidence to the contrary, the persistent inferiorization of "Negroids" by Western pseudoscience suggests that this practice must serve some critical function in our society.

By ignoring within-group variability and significant confounding environmental factors, Rushton's aggregate approach is deceptive. The subjectivity of his sampling strategy re-creates a North-South dichotomy in intellectual potential and attainment. The "new" cognitive sequence M > C > N is built on the same old misinterpretations and reinforces the same old lies. Lieberman's essay highlights the need for continued explicit assessments of the causes and effects of Caucasoid-centrism and Western European-oriented racialism on the conduct of science and the development of our society. Only when we identify and treat the diseased roots of Rushton's evolutionary psychology will be in a position to develop a truly revolutionary, nonracial, evolutionary science of the mind.

JONATHAN MARKS
Department of Sociology and Anthropology, University of North Carolina at Charlotte, Charlotte, N.C. 28223-0001, U.S.A. (*jmarks@email.uncc.edu*).
15 VIII 00

It seems to be necessary every generation to beat back the forces of academic racism. In 1961 Juan Comas published a scathing commentary in this journal about the odious works of a racist psychologist named Henry Garrett and the journal *Mankind Quarterly*, which persevered nevertheless and which possesses a sad continuity (through the Pioneer Fund and *The Bell Curve*) with the work currently under review, that of Rushton. What are we to do if we wish to maintain some semblance of academic rigor and at the same time defend the principles of academic freedom? The answer: precisely what Comas did there and Lieberman has done here—subject the work in question to vigorous critique.

Rushton's work has value for the anthropology of science as an example of fetishizing the brain (see Paterniti 2000 and Bower 2000 on those of Einstein and Ishi) and as illuminating the relationship between the substance and the look of science. It has no value as biological anthropology, however, which is presumably why the American Association of Physical Anthropologists took the extraordinary step of revoking his membership at its 2000 meeting.

The first thing that struck me when I read Rushton's work was how anyone today could possibly believe that "civilization" was an organic property rooted in the innate constitution of certain people. Civilization is a property of social history; genetic microevolution is too slow to account for it, and a century of acculturation studies has shown how readily "civilization" is transmitted independently of the gene pool.

The argument that civilization is a genetic property was a self-serving justification for political evils ranging from colonialism to genocide. Anthropology fought that battle many decades ago. To deny it today is like arguing that the acceleration due to the earth's gravity is not 32 feet/second/second but more like 26. Rushton's work is thus akin to modern creationism, but it claims paradox-

ically to speak on behalf of Darwin. This makes it important to expose it for the quackery it is.

The bane of such quackery is the rigorous use of scientific controls, and the better the controls, the weaker Rushton's arguments about race, biology, and intelligence are empirically. Two recent studies demonstrate this nicely.

David and Collins (1997) studied the relationship between birth weight and race, in which black Americans are at higher risk for having low birth-weight babies even when the data are controlled for socioeconomic variables. Here is a feature both evidently racial and biological. Yet when they introduced a significant control, namely, African immigrants to the United States, the racial pattern vanished; the African-born immigrants clustered with American whites rather than with American blacks. The low-birth-weight phenomenon appears to be not an endowment of the black gene pool but a consequence of the experience of growing up black in America. The obvious implication is that this experience is sufficiently different from the experience of growing up white in America as to render gross comparisons of diverse adult phenotypes entirely unrepresentative of underlying genetic patterns. This is not surprising to an anthropological audience.

The second study is relevant to Rushton's basic claim about brains. Do they differ in size across the races? Assuming that the brain secretes intelligence as the pancreas secretes insulin and therefore a bigger organ means larger thoughts, finding a difference between the races in brain size might account for, or even justify, the inequality, exploitation, or violence inflicted upon the poorer thinkers—as racists from every era have recognized. Assuming, in contrast, that variation in brain size is functionally trivial and that attempting to document it across groups is anachronistic, one might casually dismiss the endeavor. The problem is that to do so leaves Rushton arguing on the scientistic high ground that there are real, empirically valid correlations between cranial volume and IQ whose meaning is largely self-evident rather than being compelled to consider what the biological meaning of such correlations might be.

Now, of course, there is no reason to think that such a correlation would be impossible. If factors such as diet and the circumstances of life affect both brain size and IQ, then they could be correlated without being causally related. Thus, Rushton's brandishing of correlations would have little scientific merit. And, indeed, another recent study examines the relationship between brain volume and IQ (Schoenemann et al. 2000) but partitions the variation in a significant way. With three relevant variables (IQ, brain size, and conditions of life), these researchers control for the conditions of life by contrasting the relationship between IQ and brain size within families (where the conditions of life vary little) and between families (where the conditions of life vary more substantially). They find a correlation between IQ and brain size only *across* families, where both the conditions of life and the volume of the brain vary. *Within* families, where brain volume differs but the conditions of life differ much less, there is no correlation between brain volume and IQ. To the extent, then, that there may be an empirical relationship between brain size and IQ, it is far more likely to represent a spurious statistical consequence of common life circumstances than it is to represent a deterministic nexus linking size of brain and size of thought.

JOHN H. RELETHFORD
Department of Anthropology, State University of New York College at Oneonta, Oneonta, N.Y. 13820, U.S.A. (*relethjh@oneonta.edu*). 11 VIII 00

This paper is a valuable contribution to the history of misuse of the biological race concept and urges further attention to this topic by anthropologists. Anthropologists since Boas have indeed been vocal about differentiating biology and culture and noting the scientific invalidity of the biological race concept only to find that, once again, the same sorry mess has reemerged in slightly different clothes. This must be particularly discouraging to many anthropologists (it is to me), and it is tempting to ignore these new developments out of continuing frustration that the message just isn't getting through. Lieberman presents a strong case for the need for us to return to the trenches.

Lieberman's paper focuses on two concerns, both discussed in historical perspective. The first is why racial hierarchies in intelligence have switched the relative rankings of "Mongoloids" and "Caucasoids." The suggestion that late-20th-century industrial and financial success in parts of Asia is partially responsible is interesting, and I would like to see further examination of this hypothesis. Is this shift primarily associated with Lynn and Rushton, or is it found among other researchers and in other disciplines? I suggest that another possible factor is the ease with which European racially oriented researchers can now deflect charges of racism or ethnocentrism by pointing out that they no longer place themselves at the top. Lieberman aptly notes that this shift does not affect the major focus of many ideas regarding racial superiority that continue to place people of recent African descent at the bottom.

The second concern is the critique of J. Phillipe Rushton's data, methods, and models. While this critique is valuable, I would like to have seen less attention to *what* Rushton says and more to *why* he (and others) have returned to typological thinking. Many have labeled Rushton's work racist, but I think we need to move beyond labels and focus more on the dynamics that have produced a resurgence of racial classification and ranking lest (to paraphrase Santayana) we be condemned to repeat the same mistakes.

Lieberman discusses a number of flaws in Rushton's analysis and interpretation, most of which are similar to ones I raised in a review of Rushton's book (Relethford 1995). I would add to his analysis the problem that occurs when Rushton uses races as evolutionary units. Much of Rushton's discussion, including a review of the phy-

logenetic history of human races and his use of *r*- and *K*-selection, treats human races as equivalent to species. To some extent, this use mirrors the reemergence of phylogenetic trees in the analysis of human genetic history, with various writers describing and dating the "split" between Africans and non-Africans, between Europeans and Asians, and so forth (see Templeton 1999 for a review of such views). There are many methods now available for statistically analyzing genetic evidence on the relationship of different species over time. The problem with such methods as applied to living humans is that we all belong to a single species, and one cannot draw a tree with a sample size of 1. Many of these methods therefore have no utility for the study of human variation, although they continue to be quite valuable for other organisms. However, the singular nature of the human species has not stopped the application of tree-based methods to humans; since there is only one living hominid species, writers sometimes use races as the unit of analysis, effectively assuming that they can be treated as evolutionarily independent entities by ignoring gene flow between regions or assuming it to be negligible—practices that are clearly in error.

I hope that Lieberman or someone else will more closely examine the current tendency of proponents of racialism to reject the contributions of anthropology because they are "politically correct" and stem from liberal ideologies. This is a dangerous development, since it shifts discussion from the realm of science to the realm of personal beliefs, implying that opposition to political correctness is a valid argument. I wonder whether Lieberman has noticed in his research an increasing backlash against political correctness and whether he feels that this might be a factor in the greater public acceptance of the ideas of Rushton and others. I am no fan of political correctness, but I find the opposite approach (political incorrectness? anti-PC?) equally disturbing.

J. PHILIPPE RUSHTON
Department of Psychology, University of Western Ontario, London, N6A 5C2 Canada (*Rushton@julian.uwo.ca*). 21 VII 00

Lieberman claims that "race" is an invalid concept, that science is largely a "social construction," and that Franz Boas disproved the 19th-century idea that races could be "ranked" by average brain size. But if race were an invalid concept it would have little or no predictive power and the findings I summarize would not be found so consistently. Here are the most recent (post-1980) brain-size studies. Readers can check the facts for themselves.

Across a variety of research techniques and in samples from around the world, the brains of East Asians (Koreans, Chinese, Japanese) and their descendants consistently average about 17 cm^3 larger than those of Europeans and their descendants and 97 cm^3 larger than those of Africans and their descendants. A parallel pattern of differences is also found around the world on 60 other traits including IQ scores, speed of physical maturation, athletic ability, sex hormones, twinning rate, sexual behavior, personality and temperament, family stability, and rates of violent crime. *Race, Evolution, and Behavior* (2000, now in its third edition) provides an evolutionary explanation based on life-history theory and the recent-Out-of-Africa model of human origins for this consistent pattern of race differences.

Lieberman is wrong when he claims that the average correlation between brain size and IQ is only 0.24. Over the past decade, state-of-the-art magnetic resonance imaging (MRI) techniques have created, *in vivo*, three-dimensional images of the brain which show an overall correlation of greater than 0.40. Many of these are listed in Rushton (2000; e.g., Flashman et al. 1998, Gur et al. 1999, Tan et al. 1999, Pennington et al. 2000, Wickett, Vernon, and Lee 2000). They corroborate the lower but still significant correlations ($r = 0.20$) that have been found for over 100 years using external head-size measures.

Four quite different procedures, including MRI, autopsies, endocranial volume, and external head measures, all confirm these racial differences in brain size. Lieberman misinforms when he claims there are no such MRI studies. Using MRI, Harvey et al. (1994) found that 41 Africans and West Indians had a smaller average brain volume than 67 Caucasians. Lieberman misinforms when he claims that no autopsy study has controlled for all the variables mentioned by Tobias (1970). Using brain mass at autopsy, Ho et al. (1980) summarized data for 1,261 individuals and reported a mean brain weight of 1,323 g for white Americans and 1,223 g for black Americans *after carefully controlling for all the variables Tobias mentioned*. Lieberman is wrong when he claims that race cannot explain the endocranial volume data of Beals, Smith, and Dodd (1984), who analyzed 20,000 skulls from around the world. Their data show that East Asians, Europeans, and Africans averaged cranial volumes of 1,415, 1,362, and 1,268 cm^3 respectively. Lieberman also misinforms when he claims that I have not carried out original research on brain volume. Rushton (1992), for example, calculated cranial capacities from external head measurements in a stratified random sample of 6,325 U.S. Army personnel and found that Asian Americans, European Americans, and African Americans averaged 1,416, 1,380, and 1,359 cm^3, respectively.

Are these findings attributable simply to race differences in body size? The world database from (*a*) autopsies, (*b*) endocranial volume, (*c*) head measurements, and (*d*) head measurements corrected for body size is summarized by Rushton (2000:126–32, table 6.6). The results in cubic centimeters or equivalents were East Asians and their descendants = 1,351, 1,415, 1,335, 1,356 (mean = 1,364); Europeans and their descendants = 1,356, 1,362, 1,341, 1,329 (mean = 1,347); and Africans and their descendants = 1,223, 1,268, 1,284, and 1,294 (mean = 1,267). The review found the overall mean for Asians to be 17 cm^3 more than that for Europeans and 97 cm^3 more than that for Africans. Within-race differences, based on methods of estimation, averaged 31 cm^3.

Race differences in brain size and intelligence begin

early in life. The National Collaborative Perinatal Project followed more than 35,000 American children from birth to age seven. Rushton (1997*d*) analyzed these data and found that at birth, four months, one year, and seven years, Asian Americans averaged larger cranial capacities than whites and whites larger cranial capacities than blacks. In all three races, head circumference and IQ were correlated ($r = 0.20$) at seven years of age; the IQ of Asian American children averaged 110, that of white children 102, and that of black children 90. Moreover, the Asian Americans were the shortest and the lightest in weight, whereas the blacks were the tallest and the heaviest. Once again, the race differences in brain size are not due to body size.

Lieberman claims that IQ tests are culturally biased, but he does not explain how, although IQ tests were invented by whites and standardized on mainly white populations, dozens of studies now show that East Asians, whether tested in North America or in Pacific Rim countries, typically average higher than whites and in the range of 101 to 111. Caucasoid populations in North America and Europe typically average a mean IQ of 100. African populations living south of the Sahara, in North America, in the Caribbean, and in Britain typically have mean IQs of from 70 to 90 (Lynn 1997). Jensen (1998:443) calculated an "ecological" correlation (widely used in epidemiological studies) of +0.99 between median IQ and mean cranial capacity across the three populations of "Mongoloids," "Caucasoids," and "Negroids."

Changes in brain size have cascading effects on other traits, for example, running ability. East Asians have wider hips than whites or blacks, which gives them a less efficient stride. The reason they have wider hips is that they give birth to larger-brained babies. During evolution, increasing cranial size meant that women had to have wider pelvises.

Greater brain growth also relates to slower maturation. White babies are born a week later than black babies, yet they are less mature as measured by bone development. Black babies mature more quickly than white babies, while East Asian babies mature more slowly. Two-day-old African babies placed in a sitting position are often able to keep their heads up and backs straight. White babies often need six to eight *weeks* to do these things.

Lieberman is correct that it was Franz Boas who made the race and brain-size data disappear from the scientific radar screen. Initially, however, even Boas (1894) agreed that races differed in brain size, finding that only 27% of blacks exceeded the white brain-size average rather than the 50% that should have if the races were equal. Arguing that "the greater the central nervous system, the higher the faculty of the race and the greater its aptitude to mental development," Boas concluded: "We might, therefore, anticipate a lack of men of high genius [among blacks]." As Lieberman says, Boas also knew that Eskimos and other Arctic Asians averaged larger brains. Were it not for his ideology, Boas might have discovered the three-way pattern of correlated traits 60 years earlier than I did.

AUDREY SMEDLEY
Sociology and Anthropology, Virginia Commonwealth University, P.O. Box 842040, Richmond, Va. 23284-2040, U.S.A. 30 1 00

Lieberman is one of a few anthropologists who have challenged J. Philippe Rushton in his most recent proselytizing of his racial beliefs. He has done an excellent job of exposing Rushton's so-called science. My comments complement his critique with a few additional observations.

Rushton's major theory on brain size, reproductive behavior, and intelligence rests on some extraordinary assumptions. First, what it amounts to is a new theory of women's reproductive activities—that a woman's fertility is dependent on the size of her mates' sex organs. Where is there evidence of a correlation between the size of a man's penis and the number of children that a woman bears? Such a theory ignores natural variations in women's fertility as well as the existence of well-known sociocultural reasons for a woman's having few or many children. It also ignores some incontrovertible and obviously contradictory facts. The most reproductively successful population in the world is the Chinese, and they got to number over a billion with small penises and presumably little interest in sex. As late as the middle of the 20th century, they had one of the highest fertility rates in the world, which ultimately precipitated well-known government-imposed limits on reproduction.

Rushton's application of *r-K* theory to humans is an unsophisticated echo of some of the myths of the late Middle Ages. Europeans had been fascinated with the sexuality of "savages" for several hundred years before they actually came into contact with Africans (the "wild Irish" were "lewd, lustful, and lascivious," and so were the savages of the Americas). During the late 16th century, several travelers had made references to the "large Propagators" of African men with the assumption that this made them oversexed, sensuous, and lustful (Jordan 1968).

To prove that the Muslim world historically discriminated against black Africans and that Arab writers thought of them as inferior, Rushton relies exclusively on the works of Bernard Lewis, one of the few historians of Islam to have sought evidence of Arab denigration of Africans. None of the more prominent names in Muslim history are cited, nor are the anthropologists who are experts on these cultures. The reality is that many of Islam's great political leaders, artists, writers, and poets were clearly identified as African, and the Moors who conquered Spain originated in the Senegal River valley as Almoravides, gathering followers from many different ethnic groups.

For his ethnographic information on African societies, Rushton uses a notorious book entitled *Race* by John

Baker (1974). Baker was a retired professor of biology whose specialty was the structure of the cell. He stated proudly in his chapters on the cultures of the "Negrids" that he acquired all of his ethnographic information from seven 19th-century explorers whom he regarded as "unprejudiced and reliable" witnesses. Baker is noted for his racist sentiments, and few modern scholars either quote him or refer to his book. He devoted one whole chapter to describing "racial" differences in body odor, going into great detail on the varying odors of different parts of the body.

Worst of all, Rushton cites Freud as an authority on African children. He accepts without question the myth that they are raised more permissively than Asian and European children and that is why they are so uninhibited and unrestrained in their sexuality. Freud claimed that they also were toilet-trained later and thus lacked self-discipline. Even if true, which they are clearly not, all of these features are external culturally determined practices that Rushton interprets as having a genetic basis.

Rushton argues that people with *K* strategies, that is, with large brains, produce the most complex social systems, but the lineage and kinship systems of Africa are some of the most complex in the world. The use of "historical" information from questionable sources and neglect of history and ethnographic realities provide some of the weakest elements of his arguments.

Rushton identifies himself as an evolutionist, following in the tradition of Darwin, and traces his intellectual lineage from Francis Galton, the foremost British proponent of hereditary differences among individuals and groups. Galton worked during the late-19th-century peak development of the systematic ideology about human differences that I have called the "racial worldview" (Smedley 1999[1993]). "Races" had been fabricated in the Western world as separate, discrete, and exclusive populations, symbolized initially by visible physical differences. Each "race" was thought to have distinct behavioral, intellectual, moral, and temperamental qualities presumed to be innate. The belief in the ranking of "races" (more specifically in African inferiority) was unquestioned, based on the model of the Great Chain of Being and taken for granted as part of nature.

From Galton this heritage of racial ideology descends in an unbroken line to an assortment of individuals all of whom shared his beliefs about human inequality and heredity—Karl Pearson, Charles Spearman, most psychologists of the early 20th century, such as Henry Goddard, Lewis Terman, Robert Yerkes, and the more contemporary Arthur Jensen, Richard Lynn, Richard Herrnstein, and many others. Rushton frequently refers to 19th-century scientists as if the sheer power of names like Spencer, Galton, Broca, and others automatically granted them contemporary scholarly authenticity, thus disregarding all 20th-century scientific developments. His rigid typological vision of the world's peoples is in contradiction with the fluid reality of individual and group variations now well documented by science. I wonder how he would deal with the recent report that "Black Africans have emerged as the most highly educated members of British society," surpassing even the Chinese "as the most academically successful ethnic minority" (*London Daily Times*, January 23, 1994, as reported in Stringer and McKie 1997:190).

VERENA STOLCKE
Departamento de Antropologia Social y Prehistoria, Universidad Autónoma de Barcelona, Bellaterra/ Barcelona 08193, Spain. 5 IX 00

Lieberman launches a well-aimed anthropological critique at the raciocranial assumptions and methodology underlying the racist hierarchy that Rushton has developed during the past two decades. Rushton has picked up the 19th-century hierarchical raciocranial tradition which associated cranial size, intelligence, and behaviour in humans but with a new twist—reversing the traditional order of the three "races," now placing "Mongoloids" at the top of the hierarchy, followed by "Caucasoids" and "Negroids." Rushton's theory is only one alarming illustration of the fact that the notions of racism, xenophobia, and exclusion of "others" that have again become commonplace in advanced industrial society and influence public opinion through the media and certain political rhetorics can very well draw on new forms and meanings without losing their discriminatory social consequences.

Rushton's thesis has been subjected to sustained criticism by psychologists. I agree with Lieberman that anthropologists have an equal responsibility to challenge hereditarian determinisms of this kind. His article has the special merit of providing a systematic and meticulous critique of the structure of argument, the faulty scientific assumptions, and the stylistic devices used to reconcile contrary evidence with his conclusions that characterize Rushton's raciocranial model. Lieberman's rigour is to be welcomed as an antidote to the prevailing tendency in anthropological writing of denouncing all that has the ring of biological determinism as racism without undertaking a systematic analysis of the chain of assumptions on which particular manifestations are based.

Lieberman's critique is persuasive. He also addresses the broader social background of Rushton's model, however, and I find his arguments in this respect somewhat too loose and general. In my comments I will focus on some issues that have to do with how to situate racist paradigms of Rushton's type historically and gauge them sociopolitically.

The situatedness of science in sociopolitical contexts is well established, but it usually turns out to be more difficult to identify specific sociocultural factors accounting for particular scientific developments and their popular reception. Lieberman suggests that the reversal of the raciocranial order by placing "Mongoloids" at the top is associated with Japan's recovery as an economic power, which he, in addition, presumes comes at no ideological cost for the general cranial hierarchy because

the major function of the hierarchy is to justify misery. There are two difficulties here. The association of Japan's economic success with the ascent of "Mongoloids" in the raciocranial hierarchy is too simple, for the feedback between socioeconomic change and ideology is seldom that immediate. The reason for this reordering of the hierarchy could just as well be the proverbially high educational performance manifested by Asians in the United States. More research is needed here. As to the second part of the argument regarding the social meaning of hierarchy in general, it is not social inferiority or misery per se but a *relationship* of superiority-inferiority that is thereby established and legitimated. The inferior position of the poor and downtrodden can be conceptualized as such only in relation to the superior position of the wealthy and powerful, whose preeminence and privilege are simultaneously rationalized by evoking their equal foundation in nature. To read hierarchy as a strategy designed exclusively to justify the inferior position is to fail to recognize the structural and hence relational character of hierarchical thought.

There is also a broader issue that I find intriguing. Rushton seems to have been very successful in publicizing his work. The Pioneer Fund, which has provided him with sustained financial support, may account in part for this. As a European I would appreciate not only further information about the politics of this fund but somewhat more detail on the reception of Rushton's writings in general. It is debatable that popular and academic thought necessarily reinforce each other, for the mediations, be they economic, social, and/or cultural, are complex. Lieberman himself provides the interesting counterexample of a possible disagreement between academic wisdom and popular reception in the case where Southerners rejected polygenism because it contradicted another element of their worldview even though they shared the racist classifications it was intended to underpin. I am not asking Lieberman to expand an already substantial article. Yet, critical analyses of racism need to distinguish with the utmost care between developments in academic discourse and the very complex sociopolitical workings of popular opinion. Otherwise we run the risk of attributing to academia an ascendancy over the public for which we lack evidence. Incidentally, the media and the way they select and present scientific novelties play a very powerful role in this respect.

Lieberman also raises the historical question of the continuity or discontinuity of forms of racist thought in the 20th century. Jensen's classic 1969 article on IQ and scholarly performance in the United States is often presented and interpreted as the critical turning point in racist resurgence, but, sadly, there is evidence of even greater continuity. Thus, initiatives undertaken in the immediate aftermath of the horrors of the Holocaust by, for example, UNESCO to eradicate racist thought once and for all failed in the early fifties when biologists reacted to the agency's declaration on race to the effect that race rather than being a biological fact was a social myth by reinstating the category of "race" with the argument that no scientific evidence was available proving that *no* association existed between race and intelligence. The contentious issue was, of course, not ontological but ethical—what "race" was assumed to do to human freedom. This biological backlash took place at the time when apartheid was introduced in South Africa. This single example should be taken, however, not only as evidence of continuity in racist thought but as a call for more systematic historical study of biological determinism in the postwar period in old no less than in new guises.

This brings me to an even more far-reaching scientific development which is also not exempt from biological determinism. Since the discovery of the structure of DNA in the fifties a new genetic form of hereditarianism has emerged in relation to biogenetic research and technology, which is attracting massive investment because its achievements seem, in James Watson's words, to prove that our destiny is not in the stars but in the genes. I am referring to the biogenetic revolution and its brainchild the genome project, which have brought about extraordinary biotechnological "advances" in human reproductive and therapeutic medicine. The decoding of the human genome may at first sight seem rather far removed—perhaps at the opposite pole—from Rushton's raciocranial determinism, and scholars engaged in genomics research would certainly distance themselves most energetically from craniometry and racial hierarchies. Nonetheless, the two fields have in common biological determinism, that is, the debatable assumption that human morphology, behaviour, in short, destiny are rooted in the genotype and therefore hereditary, and, relatedly, both conflate form (cranial size or genetic endowment) with function (intelligence or predisposition to some kind of "pathology" or behaviour). I am not suggesting that the raciocranial and the biogenetic paradigm are conceptually indistinguishable. On the contrary, precisely because they contrast in their methods of diagnosis and explanation of the human experience they need to be compared to identify their specific structures of argument and to assess their academic standing and their sociopolitical influence so as to fathom the widening range of biological determinisms that paradoxically appear to coexist in these neoliberal times. Lieberman's analysis is a necessary condition for comparisons of this sort.

Until the sixties racism was generally seen as an anachronism or some sort of survival in the modern world, peopled by free and self-determining subjects. This humanist illusion has in the meantime received a succession of painful blows from a variety of exclusivist essentialisms. It has gradually been recognized that racism and other forms of ultimate biological determinism are, after all, part and parcel of modernity. These determinisms constitute an ideological-political tool, designed in terms of prevailing criteria of truth to explain away what in principle is unjustifiable, namely, the insurmountable contradiction that prevails in modern class society between liberal professions of shared human dignity and equal opportunities for all and persisting inequalities and exclusions: "This is a central paradox,

the irony perhaps, of modernity," as Goldberg (1993:4) wrote. "The more explicitly universal modernity's commitments, the more open it is to and the more determined it is by the likes of racial specificity and racist exclusivity." Lieberman's article contributes to our awareness of the diverse shapes racism can take in this progressively more liberal but unequal world. It also contains an important plea for more fluid communication between disciplinary fields. In fact, there is an alarming connection between the power of science and the fragmentation of knowledge.

FREDRIC WEIZMANN
Department of Psychology, York University, 4700 Keele St., Toronto, Ont., Canada M3J 1P3 (*weizmann@yorku.ca*). 16 VIII 00

I am in general agreement with Lieberman's criticism of Rushton's work but would like to discuss two of the areas in which Rushton has made strong claims. The first concerns the nature of IQ. Rushton's work is based on the assumption that IQ or, more accurately, *g*, that part of IQ often taken to represent general ability, provides an accurate indicator of basic cognitive ability and is largely inherited. However, as Lieberman notes, there has been a worldwide rise in measured intelligence over the past few decades. This change, often called the "Flynn effect" after James Flynn, the New Zealand social scientist who first documented it, is quite remarkable. For example, by today's norms, U.S. children tested in 1932 would have a mean IQ score of 80 (Neisser 1997).

Although Lieberman mentions Flynn's work, he does not explore the implications of these findings for Rushton's claims about racial differences. Rushton (1996*a*), for example, accepts as evidence Richard Lynn's finding that the average sub-Saharan African ("Negroid") IQ is 70. This finding is remarkable, since it implies that by Western norms half of all sub-Saharan Africans are mentally retarded. If accurate, this would mean that a huge number of black Africans are functioning at a cognitive level so low as to render them incapable of carrying out even simple daily tasks. Despite their apparent absurdity, Rushton defends these results largely on the ground that three other studies using the Raven's Progressive Matrices, a test widely accepted as an excellent cross-cultural measure of nonverbal intelligence, report similar results.

However, as Ulric Neisser (1997), the chair of a recent task force on intelligence for the American Psychological Association, notes, scores on the Raven and other tests viewed as good measures of *g* have risen twice as much as scores on broad-spectrum tests like the WISC and the WAIS. As an example, Neisser cites data from Flynn indicating that if one sets the mean IQ from 1952 at 100, Dutch IQ scores based on the Raven rose from 100 to 121.1 between 1952 and 1982. Surprisingly, tests reflecting school content have risen least of all. Data from other countries show similar patterns, and these changes seemed to have continued into the 1990s.

Although their nature is not clear, these gains clearly reflect substantial environmental influences and not genes (Neisser 1997). If they really pointed to some dramatic increase in basic cognitive ability, one would expect, as Flynn (in Neisser 1997) has pointed out, a dramatic cultural renaissance in many societies, which does not appear evident. Speaking as a psychologist who finds IQ testing useful in some contexts, I suggest that if IQ is a conceptual rock, it is certainly not an immovable one.

The second topic I would like to discuss is Rushton's revival of the proposition that brain size in humans is correlated with intelligence and that racial differences in brain size mediate racial differences in intelligence. Lieberman and other critics have argued that the brain-size studies on which Rushton relies ignore many confounding variables, including, *inter alia*, age, sex, body-size parameters, and nutritional status.

Since the early 1990s, however, several studies using a new methodology to measure brain size, neural magnetic resonance (NMR) imaging, have appeared. Generally these studies have reported a modest but reproducible relationship (Flashman et al. 1998:148) between IQ and brain size estimates (from 0.25 to 0.40). Space precludes a detailed analysis of these studies, but Peters et al. (1998) make clear that many of the methodological problems that plagued earlier studies remain. Particularly vexing is the question of how to correct for the relationship between body size and brain size, which is particularly problematic for those wishing to compare different ethnic and racial groups. In making such comparisons, body size (height) is highly correlated with brain size, but Peters et al. show that differences in body types between groups (and sexes) make it impossible to devise a single formula applicable to different groups.

In a recent and potentially quite important NMR study of the brain-size/IQ relationship, Schoenemann et al. (2000) point out that although previous NMR studies of brain size and IQ have reported positive correlations, they have confounded environmental and genetic factors. When Schoenemann and his colleagues studied the brain-size/IQ relationship in a within-family sample of female sibling pairs, thus eliminating or minimizing such environmental factors as family environment and socioeconomic status, the correlation dropped almost to zero, indicating that nongenetic influences are largely responsible for the reported relationships. While Schoenemann et al. suggest that even very small relationships could have promoted larger brain size over the course of hominid evolution, these relationships are of minimal importance in modern populations.

Reply

LEONARD LIEBERMAN
Mount Pleasant, Mich., U.S.A. 25 IX 00

Rushton's response here follows a familiar pattern—ignoring his critics' data and theoretical frame-

work, ignoring the context of the sources of his data, and citing additional data on cranial size and IQ and the alleged inferiority of Africans that depend on the same erroneous assumptions that have repeatedly been called to his attention. He says that I claim that "science is largely a 'social construction,"' but what I said was "I am not taking the extreme deconstructionist view that scientific knowledge about socially sensitive subjects changes with changing social and cultural conditions and therefore can allow us only very limited glimpses into the realities of nature. Rather, I believe that knowledge can represent nature with increasingly greater accuracy when we are aware of . . . the influence of our social and historical context." The social context to which I referred has been described by Gould (1996:28) in terms of a "resurgence of biological determinism [that] correlates with periods of political retrenchment and destruction of social generosity." Similarly, Rushton once again cites the endocranial volumes of Beals, Smith, and Dodd (1984) without acknowledging that they report a high correlation between cranial volume and latitude and a very low correlation with "race."

His comment concentrates on supporting his claim that "races" differ in cranial size and that the crania have been correctly measured. There is little doubt that there are variations in this and in other biological traits from one population to another. However, they are not clustered in races but vary from one population to another, forming discordant geographic clines. While Rushton acknowledges variations, he persists in aggregating all the available data on diverse populations into the three traditional races that were politically correct for the past three centuries. To justify placing data from diverse populations in one or another race he would have to describe the biological research for each population, and he has not done this. No amount of accurate measurement of brain size will compensate for this deficiency.

A further example of the error of aggregation is provided by Rushton's claim that the aggregated races differ in maturation rates. He describes the maturation of African babies as very rapid and links this to lower brain size. On this idea Daniel Freedman (1974:170) writes:

> Apparently one of the difficulties in the above findings involves the ill-intentioned hypothesis that human groups which exhibit motor precocity are "less sapient." . . . It is therefore important to report a recent study by Freedman and Strieby (unpublished data, 1973) using the Cambridge National Scales with 31 newborns of Punjabi extraction. The Punjabis are a Caucasian group of Northern India who have been highly successful economically in New Delhi, where the study was done. Our data indicate that this group is the most motorically precocious of any group yet seen, including Africans and Australian aboriginal newborns. . . . Thus, within one race of Caucasians, differences wide enough to encompass the other groups have been found, and it would appear that motor precocity is related to localized adaptations rather than to broad phyletic trends. We hope these findings will help lay to rest unwarranted and mischievous speculation regarding the relative phyletic position of one or another group of mankind.

Thus, while Freedman uses the "race" concept, he also demonstrates its fundamental flaw: aggregation.

Rushton, Brainerd, and Pressley (1983:23) claim that aggregation leads to correlations of .50 and .60. Applying Rushton's principle of aggregation to 47 correlations of brain size and IQ, I calculated a mean of only 0.24. Rushton says that this is wrong because of recent MRI measurements, but in his updated summary he reports that for over 100 years of external head measurements the "still significant correlation" is 0.20. The square of this figure is 0.04, which is clearly too weak to support Rushton's claim that brain size explains "race" differences in intelligence and also fails to support his claim of predictive power for "race" differences in cranial size. He acknowledges here that correlation is not causation, but almost every one of his papers on race-IQ-craniology rests upon the erroneous assumption that it is.

I am pleased to acknowledge that Rushton has carried out his own research project on brain volume; however, the measurements were provided by a "commercial firm commissioned by the U.S. Army to conduct the survey" (1992:404). He reports on the cranial capacities of 6,325 military personnel, omitting those self-identified as American Indian, Hispanic, or mixed/other and including those self-identified as "Asian/Pacific (Mongoloids), white (Caucasoids), or black (Negroids)" (p. 404). How can this be considered a study of biological races when there has been significant gene flow, especially between the latter two of these populations? Furthermore, recent data on DNA show that so-called races do not really differ or differ so little that the race concept is of little utility (Angier 2000, quoting the director of the Celeron Genomics projects, J. Craig Venter, the geneticist Aravinda Chakravarti, and the Whitehead Institute genome specialist Eric S. Lander; the article includes a bar graph based on DNA studies in which it is estimated that 99.9% of the human genome is the same in everyone). Rushton found that the three "races" averaged 1,416, 1,380, and 1,359 cm^3. There is a difference of 57 cm^3 between the first-ranked Asians and the last-ranked Africans, all of which is best explained by Beals, Smith, and Dodd (1984) as pointed out above. It should be noted that 57 cm^3 of the Asians' 1,416 cm^3 is a 4% difference. Again, normal humans vary in cranial size from under 1,000 to over 2,000 cm^3, of which 57 cm^3 is 6%. The "races" are very similar in average cranial size.

Harpending expresses his well-known support for racial differences. He refers to Boas concerning a significant degree of independence of biology in the effort to build recognition for the idea of learned social behavior called culture. Biology and the social are related but not in a narrow, deterministic way; the variety of cultures and the choices made from the wide range of individual behaviors are not normally determined by genes. Har-

pending supports his argument by reference to Bouchard et al.'s (1990) study of identical twins. We are all impressed that identical twins after years of separation smoke the same brand of cigarette and lend support to high heritability, but were they really raised in different environments? Weinberg, Scarr, and Waldman (1992) are also referenced, but no mention is made of the Scarr et al. (1977) study that found no relation between IQ and degree of African/European ancestry. Harpending says that "one does not average correlation coefficients from different studies as Lieberman seems to have done," but this is exactly what Rushton, Brainerd, and Pressley (1983) advocate and Rushton practices in numerous papers. I agree that it should not be done, but I suggest that he tell that to Rushton. I used the procedure to show that Rushton does not meet his own standards. Harpending asserts that Rushton does not attribute "inferior" and "superior" to the traits on his list. Rushton does claim merely to state the facts, but what is the meaning of such terms as "civilization," "cultural achievement," and "law-abidingness" when ranked from 1 to 3?

Stolcke comments that the connection between Japan's economic success and the ascent of "Mongoloids" in the raciocranial hierarchy is too simple, and Relethford too calls for further development of this connection. I agree that the social context in which this change occurred should be examined more closely. The role of the Pioneer Fund may very well be part of it, along with the influence of popular opinion and the biological determinism that Stolcke suggests is part of modernism, especially given the media attention to every new discovery in genetics and the human genome. The modern penchant for quick, mechanistic explanations such as Rushton provides needs to be qualified with knowledge as the antidote. Also of concern is why this revival of typological thinking has occurred. I quoted Gould on this, and I believe there has been a backlash against efforts to reduce poverty and increase the social mobility of African-Americans. Relethford asks whether the public dismisses anthropological views because they are seen as merely politically correct. Far more significant than political correctness is whether the theory and the data are comprehensive enough to support each other.

Weizmann explores some more recent methods of testing IQ and emphasizes the Flynn effect of rising IQ scores, pointing to strong environmental influences. Weizmann et al. (1990), as we have seen, produced the earliest and most thorough critiques of Rushton's raciology, pointing out that the influence of environment on IQ scores cannot be assumed to be unchanging and that the other social variables described by Rushton must be viewed in the context of historical change in which the fates of ethnic groups and nations rise and fall.

Smedley adds valuable historical depth, finding an echo of the *r*/*K* idea in late-medieval European myths about the hypersexuality of "savages." She also points to the complexity of African lineages and kinship systems; I would add that the kingdoms and royal courts of West Africa rested upon a high degree of the law-abidingness that Rushton would attribute to other "races."

Marks brings to our attention two studies showing that racial differences (in birth weight, brain volume, IQ) vanish when the data are controlled for socioeconomic variables. A third such study is provided by Cooper, Rotimi, and Ward (1999), who examined hypertension in seven populations of Africans or African-Americans and found it highest in the United States, intermediate in Barbados, St. Lucia, and Jamaica, lower in urban Cameroon, still lower in rural Cameroon, and lowest in the world in West Africa. More than one observer has noted that environments can be improved, but genetic explanations lead to ignoring the possibility of social change.

Jackson cites several recent studies that fully disprove Rushton's linkage of brain size and cognitive ability. Most striking is the finding of no correlation between brain size and cognitive ability within pairs of siblings (Schoenemann et al. 2000:4932). Jackson refers to brain chemistry and the difficulty in linking cognitive-performance differences to a cocktail of chemicals in our brains. Hormones are also responsive to our behavior; it is another case of correlation's not being the same as causation.

Brace clarifies crucial areas that I did not emphasize and rightly points out that to test for differences in intelligence between groups (some say "races") they must have lived "under conditions of social equality for several generations." We have not yet begun the first of these generations.

Brown and Armelagos (n.d.) ask, "How can race, which represents only 5–10 percent of mean genetic variability (Lewontin 1977) in humans, be the source of all the differences . . . that have been ascribed to it?" The differences between human societies can only be explained by the collective efforts of anthropologists, historians, and geographers examining ecology, cultural contact, colonialism, and economic globalization. It is an equation in which cranial size, IQ, and biological race play no deterministic part. The most fundamental error of Rushton's work is the portrayal of the Africans as inferior. According to Brown and Armelagos, "results that seem to demonstrate genetic differences between the human races are actually quite meaningless underneath."

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