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JONATHAN MARKS
Yale University

The scientific study of human biological variation has consistently produced knowledge that contradicts widespread popular, or folk, wisdom. Although people and the populations they belong to certainly differ from one another, they do not appear to do so in such a manner that permits the identification of a small number of human subspecies or races. Classification of people into races involves cultural, not biological, knowledge; and race is inherited according to cultural rules that stand in opposition to biology. Thus race is not a useful biological concept. To understand whether differences exist between populations in cognitive ability (or any other inherent "gifts") requires confronting the limits of scientific knowledge.

From the standpoint of biological anthropology, there are two general contributions we can make to the discourse of race in America. The first is to understand the empirical pattern of biological or genetic diversity among indigenous human populations, and its relation to structured behavioral or cultural variation. The second involves demonstrating that the focus on human biological variation in American society represents simply one more example of how biology has been regularly recruited into discussions of social issues as a means of falsely justifying a position.

RACE AS AN EMPIRICAL ISSUE

Teaching that racial categories lack biological validity can be as much of a challenge as teaching in the 17th century that the earth goes around the sun—when anyone can plainly see the sun rise, traverse a path along the sky, and set beyond the opposing horizon. How can something that seems so obvious be denied?

Of course, that is the way all great scientific breakthroughs appear, by denying folk wisdom and replacing it with a more sophisticated and analytic interpretation of the same data. We can break down race into four separate

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empirical issues, each of which has been comprehensively answered by anthropology in this century.

IS THE HUMAN SPECIES NATURALLY DIVISIBLE INTO A SMALL NUMBER OF REASONABLY DISCRETE GROUPS?

Whether we examine people's bodies or sample their genes, the pattern that we encounter is very concordant. People are similar to those from geographically nearby and different from those far away. We refer to this pattern as *clinal,* a cline being simply a geographic gradient of a particular biological feature (Huxley, 1938; Livingstone, 1962).

Dividing human populations into a small number of discrete groups results in associations of populations and divisions between populations that are arbitrary, not natural. Africa, for example, is home to tall, thin people in Kenya (Nilotic), short people in Zaire (Pygmies), and peoples in southern Africa who are sufficiently different from our physical stereotypes of Africans (i.e., *West* Africans) as to have caused an earlier generation to speculate on whether they had some southeast Asian ancestry (Hiernaux, 1974). As far as we know, all are biologically different, all are indigenously African, and to establish a single category (African/Black/Negroid) to encompass them all reflects an arbitrary decision about human diversity, one that is not at all dictated by nature.

Further, grouping the peoples of Africa together as a single entity and dividing them from the peoples of Europe and the Near East (European/White/Caucasoid) imposes an exceedingly unnatural distinction at the boundary between the two groups. In fact, the "African" peoples of Somalia are far more similar to the peoples of, say, Saudi Arabia or Iran—which are close to Somalia—than they are to the Ghanaians on the western side of Africa. And the Iranis and Saudis are themselves more similar to the Somalis than to Norwegians. Thus associating the Ghanaians and Somalis on one hand and Saudis and Norwegians on the other generates an artificial pattern that is contradicted by empirical studies of human biology.

The reason why this clinal pattern exists lies in the processes of microevolution in the human species. Natural selection adapts people to their environment, yet environments generally change gradually over geography—consequently, adaptive differences in the human species might be expected to track that pattern. In addition, people interbreed with people nearby, who in turn interbreed with people nearby, and over the long run this reinforces the gradual nature of biological distinctions among populations. Indeed, the "isolation" of traditional indigenous peoples is a feature that has been consistently overestimated in the history of anthropology—all peoples trade, and where goods flow, so do genes (Terrell & Stewart, 1996; Wolf, 1972).

We know very little about the time frame in which these clines originated, but genetic and paleontological evidence points to a recent origin for the genetic diversity within our species. For example, we find two randomly chosen chimpanzees or gorillas to be considerably more different genetically than two randomly chosen humans, even though chimps, gorillas, and humans diverged from one another about 7 million years ago and are all consequently the same age (Ferris, Brown, Davidson, & Wilson, 1981; Ruano, Rogers, Ferguson-Smith, & Kidd, 1992). Genetic diversity in the human species is surprisingly ephemeral—only on the scale of tens of thousands of years—and seems in some large measure to have been replaced by cultural diversity.

The reason why Americans tend to see three "races" of people is simply an artifact of history and statistics. Immigrants to America have come mostly from ports where seafaring vessels in earlier centuries could pick them up—hence our notion of African is actually *West* African, and our notion of Asian is actually *East* Asian (Brace, 1995). When we realize that people originating from very different parts of the world are likely to look very different and combine that with the fact that most European immigrants came from north-central Europe, it is not hard to see why we might perceive three types of people.

If there were a larger immigrant presence in America representing the rest of the world—western Asia, Oceania, East or South Africa, the Arctic—we would be more struck by our inability to classify them easily as representatives of three groups. Perhaps the most obvious example involves the people of South Asia (India and Pakistan), who are darkly complected (like Africans), facially resemble Europeans, and live on the continent of Asia!

To an earlier generation, dividing humans into three types harmonized well with a mythical history that saw humans as descended from Noah's three sons. Although the far reaches of the continents were unknown to them, the ancient Hebrews ascribed the North Africans to the lineage of Ham, central and southern Europeans to the lineage of Japheth, and West Asians (including themselves) to the lineage of Shem, "after their families, after their tongues, in their lands, in their nations" (Genesis 10:20). This origin myth spread in the Roman Empire through the popularity of the *Antiquities of the Jews* by Flavius Josephus (Hannaford, 1996).

However, if there were three geographic types of people in nature, it is difficult to know in the light of modern knowledge what they might represent biohistorically. Did one ancestral lineage (Ham) settle near Ghana, one (Shem) settle near Korea, and one (Japheth) settle near Norway, their descendants becoming rather distinct from one another and remaining rather homogeneous as they spread outward and mixed at the fringes—as some 19th-century writers essentially believed? No; humans have always been living and evolving in the in-between places, and there is no basis on which to regard the most divergent peoples as somehow the most primordial.

Actually, our racial archetypes represent not some pure ancestors but symbolic representations of the most biologically extreme peoples on earth. We may note in this context that the father of biological classification, Linnaeus, defined Europeans as blond and blue-eyed. Linnaeus, of course, was Swedish. But people with these features are the most *extreme* Europeans, not the most European, nor the most representative.

Dividing and classifying are cultural acts and represent the imposition of arbitrary decisions on natural patterns. This is most evident in the legalities of defining races, so that intermarriage between them could be prohibited—the miscegenation laws (Wright, 1995). In general, a single black great grandparent was sufficient to establish a person as "Black," whereas seven white great-grandparents were insufficient to establish one as "White." Here, race can be seen as inherited according to a symbolic or folk system of heredity, in contrast to biological inheritance. Thus racial heredity is qualitative, all or nothing, whereas biological heredity is quantitative and fractional.

CAN WE COMPARE PEOPLE FROM DIFFERENT PARTS OF THE WORLD?

The primary basis of all science is comparison. Peoples of the world differ from one another, and to understand the nature of those differences we are obliged to compare them. The social issues overlaying such comparisons, however, necessitate considerably more introspection than would be taken for granted by a scientist accustomed to comparing spiders or earthworms (Marks, 1995).

The skin, hair, face, and body form all vary across the world's populations. In humans, these biological differences are complemented and exaggerated by differences in language, behavior, dress, and the other components of the cumulative historical stream we call culture. The skeletal differences among the world's most different peoples are actually quite subtle, however, so that although a trained forensic anthropologist can allocate *modern* remains into a small number of given categories, it is virtually impossible to do so with prehistoric remains (Clark, 1963).

The fact that skeletal remains can be sorted into preexisting categories does *not* mean that those categories represent fundamental divisions of the human species (Brace, 1995; Sauer, 1992). When asked to sort blocks of various sizes into large and small, a child can do so easily and replicably, but that is not a testimony to the existence of two kinds of blocks in the universe. It is a testament only to the ease with which distinctions can be imposed on gradients.

By the 18th century, European sailors had demonstrated unambiguously that all known human populations were interfertile and were thus biologically a single taxonomic unit in spite of the perceptible differences among them. Indeed, reconciling the obvious differences among humans to a single creative act in the Bible led 18th-century European scientists (such as Buffon) to the first theories of microevolution. On the other hand, theories of multiple origins of different peoples (polygenism, as opposed to monogenism) persisted in the United States through the Civil War. These biological theories helped to justify the subjugation of non-Whites by emphasizing their biological separation (Stanton, 1960). In the 1920s, geneticists still debated whether race-crossing might be genetically harmful because of the apparently profound differences among human populations (Davenport & Steggerda, 1929; Provine, 1973). Those differences are not so genetically substantial, however, for such interbreeding among human populations has not shown evidence of biologically harmful effects (Shapiro, 1961).

ARE CONSISTENTLY DETECTABLE DIFFERENCES BETWEEN HUMAN POPULATIONS GENETIC?

This is quite possibly the most widely misunderstood aspect of human biology, in spite of nearly a century of study. If I study 1,000 Ibos from Nigeria and 1,000 Danes from Denmark, I can observe any number of differences between the two groups. One group, for example, is darkly complected; the other is lightly complected. This difference would probably be the same whether I selected my sample in the year 1900, 2000, or 2100, and it is presumably genetic in etiology.

On the other hand, one group speaks Ibo and the other speaks Danish. That difference would also be there if I selected my sample in 1900, 2000, or 2100, but it is presumably *not* genetic. At least, generations of immigrants attest to the unlikelihood of a genetic component to it.

How, then, can we know from the observation of a difference whether the difference is biologically based or not?

European explorers were well aware that the people who looked the most different from them also acted the most differently. Linnaeus had invoked broad suites of personality ("impassive, lazy") and culture traits ("wears loose-fitting clothes") in his diagnosis of four geographic subspecies of humans in 1758. The next generation of researchers recognized that these traits were both overgeneralized (if not outright slanderous) and exceedingly malleable, and they sought to establish their formal divisions of the human species solely on biological criteria. (One can also observe that cultural boundaries [political, linguistic, etc.] are generally discrete, in contrast to clinal biological variation, which makes it unlikely that the two are causally connected.)

It was widely assumed by the middle of the 19th century that regardless of the degree of malleability of mental or behavioral traits of human groups, the features of the *body* were fundamentally immutable. Thus traits like the shape of the head could be taken as an indicator of transcendent biological affinity—groups with similarly shaped heads were closely related, and those with differently shaped heads were more distantly related (Gould, 1981).

The first to challenge this assumption empirically was Boas (1912), who measured skulls of immigrants to Ellis Island and compared them to those of relatives already living in the United States. He found that the human body is indeed very sensitive to the conditions of growth and that there was a decided tendency of diverse immigrant groups to become more physically convergent in America—in spite of marrying within their own groups—than they were when they arrived.

In particular, the shape of the head turned out to be very malleable, and not at all a reliable indicator of genetics or race. Subsequent studies of other immigrant groups, notably Japanese immigrants to Hawaii by Shapiro and Hulse (1939), supported this discovery. Thus the observation of consistent difference between groups of people—even of the body—is not necessarily indicative of a genetic basis for that difference (Kaplan, 1954; Lasker, 1969). This work effectively shifted the burden of proof from those who *question* a genetic basis for the observation of difference to those who *assert* it.

To establish a genetic basis for an observed difference between two populations, therefore, requires more than just observing the difference to be consistent. It requires presumably genetic data. The inference of a genetic difference in the absence of genetic data thus represents not a scientific theory of heredity but a folk theory of heredity. To the extent that behavioral and mental traits—such as test scores and athletic performances—are even more developmentally plastic than are strictly physical traits, the same injunction must hold even more strongly for them. Genetic inferences require genetic data.

DO DIFFERENT GROUPS HAVE DIFFERENT POTENTIALS?

One of the catch-phrases of 1995's best-selling *The Bell Curve* (Herrnstein & Murray, 1994) was "cognitive ability." Eluding a scientifically rigorous definition, the phrase is left to be explained by a commonsense or folk definition—cognitive ability presumably means the mental development possible for a person under optimal circumstances. But it would take an extraordinarily naive or evil scientist to suggest seriously that such circumstances are, in fact, broadly optimized across social groups in our society. Consequently, not only can we not establish *that* abilities are different, we have no reliable way even to measure such an innate property in the first place. What we have is performance—on tests or just in life—which is measurable, but which is the result of many things, only one of which is unmeasurable innate ability.

Once again, we encounter the problem of a burden of proof for a biological assertion. If the concept itself is metaphysical, the burden of proof must obviously be very heavy. On one hand, it is not at all unreasonable to suggest that different people have different individual "gifts"—we all possess unique genetic constellations, after all. On the other hand, those gifts are not amenable to scientific study, for they are only detectable by virtue of having been developed or cultivated. Thus no scientific statements can be responsibly made about such genetic gifts in the absence of the life history of the person to whom they belong.

In other words, ability is a concept that is generally easy to see only in the past tense. I know I had the ability to be a college professor, because I *am* one; but how can I know in any scientifically valid sense whether I *could have been* a major-league third baseman? I can't, so it is simply vain for me to speculate on it. A life is lived but once, and what it could have been—while fascinating to contemplate— is not a scientific issue.

There is also an important asymmetry about the concept of ability. A good performance indicates a good ability, but a poor performance need not indicate poor ability. As noted above, many factors go into a performance, only one of which is ability. Thus, when we encounter the question of whether poor performance—even over the long term—is an indication of the lack of cognitive ability, the only defensible position from the standpoint of biology is agnosticism. We do not know whether humans or human groups differ in their potentials in any significant way. More than that, we *cannot* know—so this question lies outside the domain of scientific discourse and within the domain of folk knowledge.

Further, this raises a darker question: What are we to make of scientists who assert the existence of constitutional differences in ability? If we cannot gauge differences in ability in any reliable manner, it is a corruption of science to assert in its name that one group indeed has less ability than another. From the mouth or pen of a politician, the assertion might reflect ignorance or demagoguery; from that of a scientist, it reflects incompetence or irresponsibility. Scientists are subject to the cultural values of their time, place, and class and historically have found it difficult to disentangle those values from their pronouncements as scientists. We now recognize the need to define the boundaries of science in order to distinguish the authoritative voice of scientists speaking as scientists from the voice of scientists speaking as citizens. This distinction is vital to keeping science from being tarnished by those few scientists who have chosen to invoke it as a validation of odious social and political doctrines.

A reliable inference of differences in ability from the observation of differences in performance requires the control of many cultural and life history variables. The first step toward controlling those variables is to develop a society in which children from diverse social groups and upbringings have equal opportunities to cultivate their diverse gifts.

HUMAN BIOLOGY THROUGH THE LENS OF HISTORY

Because ability is a metaphysical concept, there is no valid evidence from the fields of science that groups of people have similar abilities, any more than there is evidence that they have different abilities.

There is evidence bearing on this issue from the humanities, however—namely, history. Ours is not the first generation in which the claim has been put forward that human groups are of unequal worth, ostensibly based on science. Leading geneticists of the 1910s and 1920s avidly promoted the recent discoveries of chromosomes and Mendel's laws. Breakthroughs in genetics suggested that it might be fruitful to look there for a solution to America's social problems. Crosscutting political lines, Americans widely embraced a social philosophy known as eugenics, whose cardinal tenet was that antisocial traits represented the effects of a gene for "feeblemindedness," which had a very uneven distribution in the world (Davenport, 1911). It was found commonly among the rural and urban poor, and across the world in the techno-economically backward nations.

Among the most widely cited data was the pseudonymous Kallikak family, whose 18th-century genitor had sired a child by a "feeble-minded tavern girl" and another by his lawful Quaker wife. Several generations later, the descendants of the illegitimate son were primarily social outcasts, whereas those of the legitimate sons were upstanding citizens (Goddard, 1912). This was cited for decades, even in genetics textbooks, as evidence for the transmission of feeblemindedness through one side of the family—in spite of the fact that it could hardly be diagnosed as a biological trait.

Scientific solutions to America's problems readily presented themselves on this basis: (a) restriction of immigration for the "feebleminded" hoping to enter the country and (b) sterilization for the "feebleminded" already here (Grant, 1916). The latter was upheld by the Supreme Court's 1927 decision in *Buck v. Bell*, in which the right of the state to sterilize the feebleminded, who "sap the strength of our nation," was upheld, on the grounds that "three generations of imbeciles are enough." This was not about enabling the poor to control their own reproduction, by giving them both the life options and the technology to implement them, but rather about the elimination of the gene pool of the poor, on the basis that it was irredeemably corrupt. Immigration restriction was enacted by the Johnson Act of 1924 and had an ultimate effect of denying asylum to many who would later suffer at the hands of the Nazis. Both were based on the expert voices of geneticists (Allen, 1983; Kevles, 1985; Paul, 1995).

The eugenics movement was not so much racist as classist—asserting the genetic superiority of the rich over the poor—but the Depression showed widely that economic status was not a reliable basis on which to infer genetic constitution. It was, curiously enough, geneticists themselves whose blind faith in (and promotion of) their subject proved them to be the least able to distinguish their own science from the folk prejudices that merely claimed that particular science as its basis.

Nearly a century later, however, some of these ideas are undergoing a renaissance. Promoting the Human Genome Project, James Watson declared that "we used to think our fate was in the stars. Now we know, in large measure, our fate is in our genes" (Jaroff, 1989, p. 67). With such a blank check for the power of genetics, it is no wonder we now hear routinely about hypothetical genes for crime, personality, intelligence, and sexual preference—often with evidence no more substantive than was presented in the 1920s (Nelkin & Lindee, 1995).

The eugenics movement was predicated on the apocalyptic fear that high reproductive rates in the lower classes would doom the nation to ever-growing numbers of constitutionally stupid people. And yet the descendants of those poor people became educated and socially mobile, and they have shown themselves indeed capable of running the nation. Ironically, the group targeted most strongly by I.Q. zealots of that era—poor immigrant Ashkenazi Jews—are now identified in *The Bell Curve* as comprising a "cognitive elite." With such extraordinary intellectual leapfrogging documentable in the history of this subject, we are consequently obliged to regard skeptically any broad criticisms of the gene pools of large classes of people. The issue revealed itself to be a social one—how to allow the children of the poor access to the means to develop their abilities—not a biological one, their lack of abilities.

CONCLUSIONS

Racial classifications represent a form of folk heredity, wherein subjects are compelled to identify with one of a small number of designated human groups. Where parents are members of different designated groups, offspring are generally expected to choose one, in defiance of their biological relationships.

Differing patterns of migration, and the intermixture that accompanies increasing urbanization, are ultimately proving the biological uselessness of racial classifications. Identification with a group is probably a fundamental feature of human existence. Such groups, however, are genetically fluid, and to the extent that they may sometimes reflect biological populations, they are defined locally. Races do not reflect large fundamental biological divisions of the human species, for the species does not, and probably never has, come packaged that way.

Merely calling racial issues "racial" may serve to load the discussion with reified patterns of biological variation and to focus on biology rather than on the social inequities at the heart of the problem. Racism is most fundamentally the assessment of individual worth on the basis of real or imputed group characteristics. Its evil lies in the denial of people's right to be judged as individuals, rather than as group members, and in the truncation of opportunities or rights on that basis. But this is true of other "isms"—sexism, anti-Semitism, and prejudices against other groups—and points toward the most important conclusion about human biology: Racial problems are not racial. If biologically diverse peoples had no biological differences but were marked simply on the basis of language, religion, or behavior, the same problems would still exist. How do we know this? Because they *do* exist, for other groups. The problems of race are social problems, not biological ones; and the focus on race (i.e., seemingly discontinuous bio-geographic variation) is therefore a deflection away from the real issues (Montagu, 1963).

The most fundamental dichotomy we can emphasize from the standpoint of biology is that between identity and equality. Identity is a relationship defined by biology; equality is a relationship conferred by culture and society. Genetic processes operate to guarantee that we are not biologically identical to others, although we are more or less similar to others; however, our laws guarantee equality, independently of biology (Dobzhansky, 1962). A society in which individual talents can be cultivated without regard to group affiliations, social rank, or other a priori judgments will be a successful one—acknowledging biological heterogeneity while developing the diverse individual gifts of its citizenry.

APPENDIX
For Further Information

Marks, J. (1995). *Human biodiversity.* Explores the overlap between genetics and anthropology, searching for areas of mutual illumination.

Montagu, A. (1963). *Man's most dangerous myth.* A classic work by an outstanding and outspoken scholar.

Nelkin, D., & Lindee, M. S. (1995). *The DNA mystique.* A popular account of the American infatuation with heredity, and the ways in which it has been exploited by science in this century.

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