

# Untangling Biological Reality from The Social Construction of Race

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## **Abstract**

*Race is unquestionably a “loaded” term, rich with socio-cultural power and laden with scientific ambiguity. Race has always been obscured in biological education, and since most people do not understand the fundamental basis of human similarities and differences, they are unable to recognize how scientific information has been misused as part of racial propaganda. There is a tendency to confuse the fairly consistent genetic transmission of inherited morphological features with the much more complex multifaceted determination of social characteristics. For the sake of inclusive teaching, it is critical to find productive ways to interrogate this persistent biological distortion of race. Race takes on a very different meaning when viewed in light of the current understanding of inheritance and population genetics. Dissemination of a more scientifically accurate interpretation of race is a key step toward the development of both equitable learning environments and scientifically literate citizens.*

Historically, required courses for non-majors have been one of the lowest priorities in college science departments. In the sciences, research always comes first. Teaching and service activities are rarely even mentioned in the same breath, much less given the attention they deserve. Even at primarily undergraduate institutions with an emphasis on teaching, science majors take the “important” courses and the core or

liberal arts courses are taught with whatever instructor energy is left over. The primary departmental focus is on the importance of producing the next generation of technologically trained researchers. Non-major courses chronically suffer from watered-down versions of the standard content delivered in the majors’ introductory courses rather than information that is likely to reflect the interests or the needs of these students. We can hardly be surprised that students widely report hating most science courses because they were boring, difficult, and covered very little relevant scientific information.

Recently, concern over the need for scientific literacy in the general populace has brought much-needed attention to the role of college science courses for non-majors. These underserved courses have benefited greatly from broad calls for the reform of science education. Departments are beginning to care about the reputation of their teachers, and administrators often notice which units are serving the general student population well. New recognition of the importance of these classes has led to curricular changes that are likely to enhance the quality of instruction. Student satisfaction matters and we are all looking for strategies that might enhance the relevance of the subjects that are covered. I accidentally discovered that I could dramatically increase interest in genetics and heredity by focusing on the subject of human race. Actually, I have developed an

antiracist approach that teaches how little biological validity “race” really has.

### **Inscription of Human Difference**

It would be ridiculous to dispute the idea that there is a great deal of difference between groups of individuals all over the world. People dress differently, eat different foods, and have established cultures with diverse traditions, religions, and social structures. Lifestyles range from the quiet simplicity of hunter-gathering societies to the frantic complexity of urban populations. Beyond the many socio-cultural distinctions, there are obviously disparities in physical appearance. Visible markers such as skin coloring, facial features, and body structure vary consistently and noticeably between people from different parts of the world. These traits were used in early attempts to categorize people and led to the idea that there is a racial basis for biological difference. Racial typing was extended with unfounded implications that social behaviors were inherited along with physical appearance. Assumptions of fundamental disparities grew into a mistaken belief in typological morphology, or the expectation that fixed and invariant traits characterized human populations. One ideological foundation of race is the misconception that external features characterizing groups of people with common ancestry are genetically linked to cultural tendencies.

Skin color is both the primary marker of racial categories and an excellent example of racial misconceptions. Color has been used as the single criterion for dividing people into “Black, White, Yellow, Brown, and Red” races. The fallacy of such a system is the absence of any lines of demarcation. Skin colors actually range across a broad spectrum from dark to light and also spread out to include a wide variety of differing tones or hues. People with common

ancestry, even full siblings, often have somewhat different skin colors. Other people, such as Africans and Australian Aborigines, can have similar skin color in spite of having little recent ancestral connection.

Scientists and biology students who have been exposed to the most basic training in genetics know that skin color is not determined by the simple inheritance of different versions of a single gene. The amount of the dark skin pigment, melanin, is regulated quantitatively by the additive effects of several genes. The shade is influenced by other genes which modify enzymes regulating the type of pigment that is produced. Skin color is not linked any more directly to common descent than traits such as hair (color/texture), facial features (nose shape, lip size, or epicanthic eye folds), or body type (size and build) which also vary dramatically among different groups of people.

For the last century, scientists have known that various physical traits are determined by the inheritance of genes that are transferred independently. Studies by the Austrian monk, Gregor Mendel, demonstrated how color, wrinkles, and other characteristics of peas are all separately regulated. It was clear from family studies that human inheritance is similar. Today, noticeable morphological differences in human groups are readily explained by population genetics. Genetic principles explain how various forces effect large groups and result in changes in a species over time. Biologists are well aware that all humans are part of a common gene pool or collection of hereditary possibilities. Processes known as microevolution led to alterations of the gene frequencies in separate populations as they responded to dissimilar environmental pressures and were superficially transformed by natural selection, over time.

If there were even any question that appearance could be a reliable predictor of race, there are modern studies that show this could not be the case. A recent study published in one of the most prestigious scientific journals in the world, *Proceedings of the National Academy of Science*, demonstrates that skin color and other features are not a reliable predictor of genomic ancestry (Parra et al., 2003). These scientists used the most sophisticated genetic techniques from molecular biology or the study of DNA to show that the appearance of a Brazilian individual does not correlate to genetic markers of African ancestry.

Historically, the wide distribution of migrating people created ancestral demes or local interbreeding populations. Geographic separation of such populations produced pockets of reproductive isolation within the species. Mutations caused by changes in the DNA created new genetic possibilities in different populations. These groups became visibly or phenotypically distinct as evolution changed gene frequencies by selection for morphological traits that conferred survival and reproductive advantages. Thus, people appear physically different because populations have been subjected to dissimilar environmental selective pressures. Patterns of skin color correspond to the latitudinal distribution of indigenous people due to variation in the quantity and type of melanin which regulates the penetration of ultraviolet sunlight. Exposure to ultraviolet radiation has been linked to birth defects and this might explain an evolutionary mechanism for geographic population differences in the genetic regulation of skin color, except for the fact that that people die of skin cancer after they usually have reproduced and therefore passed on their genes to their offspring.

Race has never been a valid biological category, because there are absolutely no genetic or physical criteria that distinguish different racial groups. Race also has never been a functional system for socially categorizing people, because there has never been agreement as to the number of races or how to distinguish them. Racial divisions have ranged anywhere from two to several hundred depending on whether the Nazis or anthropologists were counting. The concept of race was based on the completely mistaken assumption that populations could be “pure,” because they inherited a collection of distinct traits as a whole. Not only is this idea of the mode of inheritance flawed, but genetic evidence indicates that human populations have always shared genes through cross-mating. Furthermore, as geographical and social mechanisms for isolating human populations break down, genetic pools are blended and physical traits becomes even less useful as markers of difference. In this global society, populations are mixing so rapidly that intermediate gradations may eventually erode morphological distinctions that were used in attempts to define races.

### **Evidence of Human Unity**

While there is no denying some distinction between people from different parts of the world, it is important to recognize that attention to difference distracts us from recognizing the significance of the common characteristics of all human beings. The comparison of humans with other species of living organisms demonstrates how clearly the resemblance among humans far outweighs the collective differences between us. Even the great apes, with some almost hauntingly human features and behaviors, give perspective to the degree of similarity and only minor differences that exist between

members of our species. Additionally, modern genetic techniques have established that the human is one of the least diverse species of animals with only about 0.3% diversity compared to at least 3.0 % in most other species. Only the cheetah has been shown to have less genetic diversity as a species. The presumption of *Eidos*, a Platonic concept for type or essence, which should be used to describe all humans, is unfortunately more likely to be erroneously applied to racial subcategories.

On the biological level, there is far more similarity among every member of our species than there is difference between groups with dissimilar physical features and lifestyles. “Racial” characteristics are rarely discrete or completely different in separate populations. Most traits are highly variable and present in multiple geographic groups. The expression of these characteristics is distributed across a range of variation and shows considerable overlap among different groups of people. A number of facial features are often implied to be racial distinctions, but none provide a clear criterion for delineating race. The size or shape of the nose, eyes, and lips or even the facial angle range dramatically and cannot be absolutely distinguished between groups. Not only are there no purely physical distinctions, there are also no known genetic markers that can be used to resolve racial difference. Furthermore, if human DNA is more than 99% identical to the DNA of chimpanzees, how much genetic difference can really exist among members of our species?

The characterization of both the familiar nuclear form of DNA and the less recognized, completely different circular form of DNA in mitochondria, provide solid evidence of human similarity. Mitochondrial DNA is only transmitted in the egg cell at conception and, although the sequences differ from person to person, geneticists

have tracked the maternal lineage to a single ancestral female (Cann, Stoneking, & Wilson, 1987). Recent determination of the full sequence of the human genome answered any question of basic human similarity by spelling out the chemical details of the “Book of Life.” This information can seem rather obtuse and the numbers can be difficult to relate to human characteristics, but this accomplishment allows scientists to make precise comparisons with a high level of certainty. It is now clear that the DNA of every human is more than 99.99% identical. Of the three billion nucleotides or molecules that make up chromosomal DNA, only one in every 12,000 is estimated to be different. Since only about 10% of the total DNA is functional, many of the single nucleotide variations occur in sections that are of no consequence.

Patterns of heredity are more familiar to most people and somewhat easier to comprehend than the molecular evidence. Approximately 30,000 human genes have been identified, but 75% of these templates are monomorphic or completely identical in every individual. Therefore, only the remaining 25% of human genes are polymorphic, containing the multiple gene forms known as alleles. Within the variable portion of the human genetic script, a remarkable 85% degree of variation can occur between individuals with the same two parents. Of the remaining variation, less than 7% is possibly attributable to major ancestral groups. Thus, increases in the understanding of inheritance have shown that non-identical, full biological siblings actually differ to a much greater degree than people from different racial/ethnic groups.

Another way to demonstrate both human similarity and the illegitimacy of racial separations employs the familiar blood markers in the A, B, O blood groups. These blood types provide valuable genetic

information because the patterns of inheritance are simple, straightforward, and well-documented. Blood typing has been carried out on large numbers of people all over the world. Gene frequencies vary among different indigenous populations, but the patterns of distribution do not correspond to geographical regions occupied by racial groupings based on morphological features. In fact, the A, B, O blood markers distribute in basically longitudinal patterns that are completely different from the latitudinal distribution that is characteristic of skin colors. This demonstrates the fallacy of assuming people are genetically segregated according to skin color, because if traditional racial categories had a genetic basis, the frequencies of these blood types would be congruent with the patterns of distribution of skin color categories.

All people have the same basic genetic material and, as members of one species, humans are capable of interbreeding and producing fertile offspring. Small, gradual changes did occur in isolated human populations as adaptations to dissimilar environments. Even though the process of microevolution has led to the distinctive appearances of various geographical groups, the groups remain capable of interbreeding, and all people remain members of the same species. A species is the most specific category of biological classification and labels for subspecies are merely references to phenotypic or observable distinctions. In the same way all varieties of roses are roses or all breeds of dogs, horses, or cows remain members of their species; all humans are belong to the same group. Technically, race could have been a useful label for human subspecies if there had ever been enough difference to clarify the categories and recent blending had not made it even more difficult to make distinctions between groups.

### **Conflation of Nature/Nurture**

Attempts to racially categorize people are based on mistaken assumptions that aspects of character are governed strictly by genetic inheritance and that these qualities are inherently linked to the physical appearance of groups of people. Racialization started with a collection observable physical characteristics that are common to one particular group of people and distinct from others. The obvious transmission of these visible traits from parents to offspring left little doubt that such features are inherited. Because parents and offspring are also observed to have common temperaments and dispositions, aspects of character were presumed to be governed by similar types of inheritance and associated with particular groups of people. Since the physical traits were immutable, behavioral patterns were also assumed to be fixed at birth, linked in inheritance and, therefore, unquestionably typical of different geographical groups.

Attention to mechanisms of genetic regulation has overshadowed the fact that environmental conditions can play a critical role in the expression of inherited tendencies. Some characteristics are not indelibly determined at conception and can be modified by non-genetic factors during prenatal development and after birth. The observable constitution of an organism is known as the phenotype. By definition, this expression of variable features in individuals is a consequence of the interactions between the genotype (genetic template) and the environment. Genetically, only a limited number of characteristics are qualitatively determined strictly by the presence of certain forms of a single gene. Most variation is initiated by polygenic inheritance or the effects of several genes. When the range of expression of an inherited trait is further enhanced by a

multitude of potential environmental influences, it is known as a multi-factorial trait.

Many mistaken beliefs about race are based on confusion over multi-factorial influences. Human attributes have provoked considerable debate over the relative significance of innate and external influences. The matter is part of the nature/nurture controversy which questions whether genetics or the environment is ultimately more important. Actually, phenotypic variance is usually the product of the interactions of both the genetic template and environmental changes. Genetic factors create the potential for particular phenotypes. Environmental impacts can range from subtle to strong, and are likely to modify various genotypes in different ways. Thus, the complex interactions of both nature and nurture are responsible for phenotypic variance.

From an educational standpoint, one of the greatest racial problems is ignorance of the fact that intelligence is clearly a multi-factorial trait. A particularly damaging distortion of race involves the implications that certain morphological characteristics are linked to intellectual ability or academic potential. This idea has been supported by numerous attempts, under the guise of science, to make the case that intelligence is immutable, genetic and linked to race. This practice is coupled with common failure to acknowledge the significance environmental factors have on shaping intellectual ability. Whether it is the myth of the innate math/science ability of Asians as a “model minority” or expectations of lower ability in other groups, the assumptions reflect basic ignorance of the determination of academic potential. Racial links to intelligence have been made by blurring important distinctions between genetic and environmental factors, implying that questionable social science demonstrates

biological differences. After many attempts to determine the heritability or amount of variation in intelligence that can be attributed to genetic differences, estimates range from very low to moderately high values. Unfortunately, studies that contradict the idea of a racial basis for intelligence have been overshadowed by those that purport to document difference.

Since behavioral traits such as intelligence are not genetically linked to overall physical appearance or governed strictly through inheritance, racial generalizations about intelligence lack biological validity. Racial groups are supposed to be delineated and identified by the way people look, but the implications in terms of social power go far beyond mere physical characterizations. The physical features used as racial markers are not the basis of the racial hierarchies associated with them. Social rankings reflect judgments based on cultural characteristics. Racial status is based on the illusion that one group is superior to another in its collective moral and intellectual capabilities. Biological evidence shows that psychological tendencies are not related to appearance. Untangling existing confusion as to the actual biological implications of inherited traits can be one of the most effective approaches to antiracist leadership in higher education. Biology professors developers are in good positions to begin to dismantle the mistaken belief that variations in physical appearance correlate to essential dissimilarity in aspects of character.

### **Construction of Race**

It is no accident that assumptions of significant biological distinctions between different groups of people prevail. The scientific community that has provided so much information about our species has also been complicit in the social construction of

race, and the history of science reveals an unfortunate pattern of participation in the assembly of racial hierarchies. Members of the scientific community took an especially active interest in human difference during the Enlightenment of the 18<sup>th</sup> century. As part of the emerging belief that human reason could be used to provide explanations of social and natural phenomena, the idea of fundamental racial variation served as a convenient excuse for social inequities.

Scientific attention to race blossomed at precisely the same time the natural sciences happened to be moving into a position of greater academic credibility. Scientists implicitly demonstrated their usefulness by providing explanations that justified discrepant treatment of people from different ancestral groups. The construction of a biological basis for racial difference rationalized practices of segregation and discrimination in a society considered to be egalitarian. Enough racial cants accumulated under the pretext of scientific studies that it is obvious why it is so hard for the public to discern the truth about the biological reality of racial difference.

One of the earliest and most clearly documented examples of scientific prejudice can be found in the system of classification devised by Swedish scientist, Carolus Linnaeus (1707-1778). His landmark treatise *Systema Naturae* is a complex hierarchical system that provides the basis for modern taxonomy or the naming and classification of living organisms. The original version contained descriptions of groups of humans that show how science could be corrupted to support the creation of racial hierarchies. The *Homo sapiens* category is subdivided into four different groups that are described with far more than objective anatomical images. The primary distinguishing feature seems to be skin color, but Linnaeus goes on to label groups according to a variety of moral/ethical categories that appear quite

capricious. Europeans are considered gentle, acute, and inventive, while he found Asians to be severe, haughty, and covetous; Africans to be crafty, indolent, and negligent; and (Native) Americans to be obstinate, choleric, and content free. Such distorted images demonstrate how fallacious descriptions of racial character became part of mainstream scientific discourse.

### **Education for Equity**

Race is virtually ignored in biological education. Widespread presumptions that people from various geographic groups are inherently different stubbornly persist because biological scientists do little to challenge the dissemination of erroneous information based on stereotypes and cultural biases. Attention to the social construction of race almost never includes scientific information that would expose the unjustified use of biology in the construction of racial hierarchies. The frequent misuse of science to legitimate the concept of racial difference has usually gone uncontested; leaving most people to assume there must be significant fundamental differences.

Furthermore, basic misunderstandings of the genetic dimensions of human difference constitute an important and often unrecognized impediment to educational equity as racial stereotypes lead to unwarranted expectations of student performance and chances of success. Biological misunderstandings are based on a tendency to confuse the fairly consistent genetic transmission of inherited morphological features with the much more complex multifaceted determination of social characteristics. Mistaken assumptions of racial variation operate in insidious ways to reinforce hierarchies of intelligence and distort perceptions of other people. Expectations of innate academic potential

can be shaped by the erroneous suppositions about particular racial/ethnic groups. Common fallacies involve the ideas that heredity is the primary determinant of intelligence and genetics prescribe a linear hierarchy of intellectual ability. For the sake of inclusive teaching, it is critical to find productive ways to interrogate this persistent biological distortion of race. Race takes on a very different meaning when viewed in light of the current understanding of inheritance and population genetics. Dissemination of a more scientifically accurate interpretation of race is a key step toward the development of inclusive learning environments.

One of the most difficult aspects of teaching about this subject is the fact that modern biology texts do not cover the subject of race. A recent survey of 20 of the leading college biology texts, for both majors and non-majors, published in the last five years, revealed that the term was not used in either the glossary or index of three quarters of the books. In one sense, this sends a clear message that biologists do not consider human race to have biological legitimacy, but it also allows misconceptions to remain unchallenged

In the five textbooks in this survey that list race as a defined or indexed aspect of biological terminology, there is further conformation that biologists do not support the common social use of the word. Johnson (2003) defines race as a general label for an ecologically distinct subspecies and makes no reference to humans. In the other books that actually used the word race in reference to humans, there were antiracist agendas that purposely deconstructed the ideas of human races and discussed that biological use of the term is inappropriate. Enger, Ross and Bailey (2005) have a small insert cautioning that two common problems with using race are that it focuses attention on difference and tends to confuse genetic and cultural differences. Tobin and Dusheck (2005)

defined the word as morphologically different populations that are capable of interbreeding. This text also has a three page section called “What Are Human Races” in a genetics chapter that goes into detail about the futility of trying to create discrete groups on the basis of human traits that show phenotypic variability spanning a continuum. Freeman (2005) defines race as a population that has different characteristics than another population of the same species, and includes an insert on “Human Races” that explains how genetic divergence among human populations is lower than almost all other species.

The most thorough treatment of race in a current biology textbook can be found in Minkoff and Baker’s (2004) *Biology Today: An Issues Approach* (3<sup>rd</sup> Ed.). This book thoroughly interrogates the idea of human races in Chapter 7 - Human Variation (pp. 203-244) which is an outstanding example of antiracist teaching. The unit employs current understanding of population biology to clearly explain biological variation between and within the species. Problematic aspects of the concepts of race are linked to social contexts. To the authors’ credit, they have compiled an outstanding collection of examples that explore not only descriptors of race, but racism itself. This interesting chapter includes a great deal of very sound science and is a model of the way biological science can be used to deconstruct race and build a more legitimate understanding of human difference in scientifically literate citizens.

Outside of this effort by Minkoff and Baker, I would consider Ashley Montagu’s (1997) *Man’s Most Dangerous Myth* to be the best resource for supporting a structured classroom approach for teaching against the validity of biological race. This is the sixth edition of a book that first came out in 1942. While this is not a formal life science text, this anthropological analysis is substantiated

by the impeccable use of biological information. The late Dr. Montagu was the first person to thoroughly support an argument for the idea that race has no scientific justification for the way it has been applied to diverse human groups (Brace, 1997). The book presents the “biological facts” and untangles these from their complex intersection with social issues.

### **Socially Responsible Science**

The social power of race is supported by the unfortunate perpetuation of a mythology of fundamental biological difference. Since scientific information has been distorted to justify racial discrimination, scientists should be part of attempts to rectify this ignorance. Scientific contradictions are likely to be the only source of information powerful enough to counteract the erroneous construction of race. While there were good reasons Audre Lord (1984) cautioned that, “the master’s tools will never dismantle the master’s house,” the fabrication of racial biology may be a case where those are the only devices that can begin to undo the damage that has been done. Scientific misinformation is so firmly woven into the fabric of race that only concerted instructional efforts are going to untangle fiction from reality.

The genetic evidence of overwhelming human similarity rarely surfaces in a coherent form. Initially, it may take support from biologists or those with solid training in genetics to assemble crucial facts and figures. Beyond the obvious involvement of science specialists offering diversity workshop sessions demonstrating how good science negates the biological validity of race, there are a number of possibilities for incorporating antiracist teaching into the postsecondary science curriculum. Effective strategies for dissemination of such important information

might include interdisciplinary collaborations between biologists and cultural anthropologists for seminars on topics that examine aspects of “Nature & Nurture.”

A variety of different approaches for deconstructing race can be taken within either biological science or physical anthropology. The amount and complexity of genetic information demonstrating human similarity could easily constitute an upper level major’s course, but this would obviously only reach a very limited audience. Alternatively, race could be mentioned as an important part of the explanations of genetics in introductory biology courses, extending the exposure to a much larger group of people. However, the most significant impact will probably come from the use of race as a thematic focus for heredity in human biology courses for non-majors where social interest in the topic of race enhances the personal relevance of genetics.

Suggesting the movement of the subject of race to the forefront in biological or genetics education is likely to be perceived as a radical notion by faculty members in the natural sciences. A significant aspect of our postgraduate training as biologists involves learning to delineate social from natural phenomena. Biologists judiciously avoid anthropomorphism or the ascription of human attributes in order to accurately interpret the characteristics of other living organisms. Since biological scientists are enculturated to see our own discipline as being unrelated to social phenomena, the idea of looking at scientific information in a social context can seem inappropriate. Even though issues-based approaches have been touted among the suggestions for improving the delivery of science education, the practice has not been widely adopted. For many biologists, it will be challenging to

move outside of disciplinary boundaries and make a deliberate connection of science to this unpopular social conundrum.

Emphasis on race also calls for a fairly drastic move in biological education, because it involves a reversal of the usual style of presentation of scientific information. Most explanations of the living world are made with a reductionist approach, breaking down systems into smaller and smaller components for the sake of clarity. The human genome serves as a classic example, since knowledge of the complete sequence allows for description of structural genetic regulation down to the level of every atom in DNA molecules. The explanation of the biological fallacy of race calls for an explanatory shift to a holistic method that assembles selected genetic information regarding heredity and relating it to the construction of a larger concept of humanity. Ultimately, holistic approaches are not unprecedented, and this examination of the similarity and differences of humans can be seen as a different way to look at the classic topic of “the unity and diversity of life.”

Progressive movement toward a more equitable educational system depends on the development of a more sophisticated understanding of the nature of race. Currently education provides little explicit distinction between the biological and socio-cultural components of race. One of the first steps for every individual must be the construction of a solid understanding of the basic biological information that is available regarding human similarities and differences. Most people have an intuitive understanding of race, but few people are comfortable articulating an answer to the question “What is race?” Confusion over the conflation of nature and nurture in the

social construction of race demonstrates a very important lack of scientific literacy. Recognizing that this important topic is neglected in biological education can prompt us to assemble and disseminate concrete information about the extent of human difference.

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