Introduction: The Problem, Simply Stated

The traditional concept of race as a biological fact is a myth. I am going to show you that nearly everything you think you know about race is a social construct. You don't have to be a racist to be wrong about what race is. That doesn't make the effects of a belief in race any less damaging, or the situation any less perilous. Most Americans still believe in the concept of race the way they believe in the law of gravity—they believe in it without even knowing what it is they believe in.

If you ask the average American college student if biological races exist, most will say *yes*. In my classes, when I asked students to identify their own race, most couldn't be any more specific than a vague catchall like "white." They couldn't say what the criteria are for membership in a racial group, and most believed that black, white, Asian, Hispanic, and American Indian are biological races. Some of them thought that every country has produced its own biological race.

A few students responded that races had existed since the beginning of time. I asked them if they meant 1980, when the universe began for them, or 19 billion years ago, in the big bang? Several had to think about it for a while. Some thought races had existed since the breakup of Pangaea, around 300 million years ago—which would have been tough, since humans didn't evolve until 299,999,999 years later! Some thought that races were

formed in antiquity at about the time of the fall of the Tower of Babel, as described in the biblical book of Genesis. (Surprisingly, none related the curse of Ham as a source of modern human races.)

Many also believed that race determined intelligence quotient (IQ) and other personality traits, as well as sexual characteristics, athletic ability, and disease predisposition, following commonly held social stereotypes. When asked about intellect, most cited the superior performance of their Asian classmates in their science courses. When asked about sex, most stated that blacks had higher sexual appetites and larger genitals. When asked about athletic ability they again cited the superior performance of black basketball and football players. Finally, almost all agreed that sickle cell anemia, Tay-Sachs, and cystic fibrosis were all proof positive of the existence of racially defined disease.

These examples clearly show the prevailing ignorance that our society exhibits about the definitions and significance of human biological diversity, and its confusion with socially constructed races. In this book, I'm going to show you in detail how to tell the difference, and why it's so important.

How We Got Here

It was the ultimate missed opportunity, with devastating consequences. The European colonists who founded the United States had a chance to start over with an egalitarian social order, but they blew it: They accepted the idea of racial hierarchy that was prevalent in Europe at the time. It was just too convenient: The socially constructed concept of race was a powerful tool that aided them in the conquest of the continent.

This concept allowed them to build a society in which superficial physical differences would be used to determine an individual's worth. It justified *racism,* the belief that groups were different in their very natures, and that these differences should be used to stratify society.

The colonists did not see themselves as racists, nor did many question their treatment of non-Europeans. They saw what they were doing as good, necessary, and even unavoidable. It is ironic that many of these people were outcasts from Europe, who came to the New World seeking religious freedom. Yet they brutally conquered, then imposed their civilization upon, the native people that they called Indians in the New World.

Because they believed that races were genetically different (although they didn't describe it in those terms), many saw the exploitation of the Indians and Africans as no different from the use of farm animals. For such thinkers, the fact that the Bible had no explicit proscription against slavery justified the importation of millions of slaves from the western shores of Africa to meet the growing needs of agricultural production in the colonies.

Even if we accept conservative estimates of the loss of life that resulted from the slave trade, it is still the greatest sustained act of genocide in the history of our species. Those who survived the passage to the New World were gradually transformed into a new biological and cultural population. They had been gathered from different ethnic groups along the western coast of Africa (Fula, Jolla, Mandinka, Manjago, Wolof, and many others); some were African spiritualists, some Islamic, and many of these groups spoke different languages. In America, they would be both genetically and culturally hybridized amongst themselves and with Europeans and Indians.

The economy of the English colonies, and in turn, that of the new American nation, was wedded to chattel slavery. The African descendents enslaved in America would be denigrated, exploited, tortured, and murdered. They would be culturally and scientifically relegated to the bottom of American society. They would be called a variety of names: nigger, mulatto, Nigra, and Negro.

Later, new groups of immigrants from Europe and Asia would arrive. Irish, Poles, Italians, Chinese, Japanese, and (eventually) virtually every nation of the world would send people, bringing both their genes and culture to America. The early pioneers had

been predominantly Protestant; Catholics and Jews would later add to the American tapestry. These people would also be named: Paddies, Polacks, Wops, Chinks, Nips, and so forth.

Anglo-Saxon Europeans did not manage to create a racial state in their own image, although many tried hard to accomplish that goal. One, Madison Grant, would argue that the loss of so many Anglo-Saxon males in the Civil War led the country to allow in too many immigrants from non-Teutonic European countries, who were reproducing faster than the Anglo-Saxons. Another, General Francis Amasa Walker, actually stated that the idea of bringing forth sons and daughters who would have to compete with people who were clearly their inferiors had dulled the desires of Anglo-Saxons to have and rear children!

The anti-immigrationists thought that the great race was being destroyed both from within and without. Their thinking would lead to the formation of a large eugenics movement in the United States. Charles Benedict Davenport would become its chief executive officer, and his Eugenics Record Office would help enact laws that led to the sterilization of tens of thousands of Americans against their will.

Despite the efforts of the likes of Grant and Davenport, the Klan, and the segregationists, European Americans who once had sole dominion over America's social and political life now wake up each day in a nation that has been both biologically and culturally hybridized. The founding fathers would not recognize the racial and social composition of today's America.

Today's Euro-American youth idolize Shaquille O'Neal, look up to the great neurosurgeon Dr. Ben Carson, and read Toni Morrison. Thomas Jefferson would have never thought it possible that we could have both a secretary of state and a national security advisor of African-American ancestry.

However, we have paid dearly for the policies of racism, and are continuing to pay in a currency of despair, unfulfilled dreams, and blood. We paid in King Philip's War, in the middle passage, on the cotton fields, in the master's bedchamber, and along the un-

derground railway. John Brown warned us we would pay further, and we saw the fulfillment of that terrible prophecy on the battlefields of the Civil War. We paid along the Trail of Tears and at Wounded Knee. We paid at Promontory Junction: twelve hundred Chinese rail workers died building the Transcontinental Railway, but not a single person of Chinese descent was allowed to attend the pounding of the Golden Spike. We paid all through Jim Crow. We paid in the Japanese internment camps.

Yet we learned little: We witnessed the atrocities of the Holocaust, but then allowed Nazis into America to help us build rockets. We paid still more with the lives of four little girls in Birmingham, with the assassinations of John F. Kennedy, Malcolm X, and the Reverend Dr. Martin Luther King, and in the rebellions of Watts, Detroit, and Newark. We paid by sending disproportionate numbers of young African-American and Hispanic men and women to die on the battlefields of Vietnam. We damn sure paid again when the world watched Rodney King and Reginald Deny being beaten over and over again on network newscasts.

We are paying now with academic underachievement, the drug epidemic, health disparities, unequal justice, urban malaise, and the ongoing social and political division that still exists between the socially defined races. Every time we pay, we slide closer toward hell on a road paved with our racial misconceptions. We will continue to pay until we reject the notion that there are biological races in the human species, and that race determines an individual's worth.

The Essential Elements of Racist Thought

All of America's racist thinkers have relied on three unchallenged assumptions: that races exist; that each race has its own genetically determined characteristics; and crucially, that social hierarchy results from these differences. Here are the five pillars of racist thought:

- Biological races exist in the human species.
- Races have genetic differences that determine their intelligence.
- Races have genetically determined differences that produce unique diseases and cause them to die at different rates.
- Races have genetically determined sexual appetites and reproductive capacities.
- Races have genetically determined differences in athletic and musical ability.

Although not always stated openly, most or part of these views are widely held by many Americans. Not everyone who believes these ideas is an evil person, of course. Given the history of America's approach to race, many are just like my students: They accept these views because no alternative has ever been clearly presented to them. More dangerous are those who still actively use the social construction of race to advance their own economic, social, and political agendas. These individuals never tire of advancing pseudo-scientific arguments to protect the concept of race, and to argue for its utility in solving the crucial problems in our society.

I hope that this book will be the definitive statement of the difference between the biologically and socially defined concepts of race. We're going to look at each of the five pillars of racist thought in turn: the biological aspects, in both historical and contemporary settings, and the ongoing harm that is inflicted on our society by maintaining these false stereotypes. And I will outline my vision of what our society could look like if we eliminate racist thought and practice.

We must recognize that the underlying biological diversity of the human species cannot be artificially apportioned into races, because races are simply not biologically justified. If we can understand that all allegiance to racism is ideological, not scientific, then we may be able to silence the bigots once and for all. We may be able to construct social systems that allow all of our citizens to

actualize their biological potential. If we can live up to our creed of equality for all, then maybe we will have a chance to finally actualize the true spirit of democracy and the American dream.

A Note on Terminology

All discussions of the concept of race in America are mired in confusion by both the definition of the concept and the vocabulary used to describe it. Since race is socially constructed, various terms have come into and out of use concerning specific groups in American or world society. At any given time in our history, the motivation for these changes has come from both those describing the groups and from within the groups. Further adding to the confusion is that the terms have also included both biological and social conceptions of race at the same time. For example, when the Spaniards came to the Western hemisphere they first thought that they had arrived in India, hence the use of the term Indians to describe the people they encountered. The Arawaks and Caribe did not know that they were "Indians." The Spaniards also described the various African ethnicities they encountered as "Negroes," which comes from the Spanish word *negro,* meaning black. The English often used the term "neggars" or niggers as a derogatory form of the term Negro.

These terms were all socially constructed, but also took on some implied biological meaning. Indians were people who had descended from the original inhabitants of the Western hemisphere and Negroes had African ancestry. However, as the populations of the New World began to intermix, new terminology had to be invented to describe them, such as *mulatto, mestizo, Creole, half-breed,* again carrying some biological meaning. *Mulattoes* were the offspring of European slave masters and African slave women; *mestizo* meant offspring of Europeans and the natives of the Western hemisphere; *Creole* meant descended from the French, Spanish, or Portuguese settlers of the Caribbean; a halfbreed could refer to any mixture.

Throughout American history, various groups fought to socially define themselves, in opposition to the ideas of the socially dominant European population. No struggle is more illustrative of the confusion over racial terms than that of the African descendents in the Americas. Most likely, the first African slaves brought to the Americas considered themselves members of their own African ethnic groups, such as Fula, Jolla, or Mandinka. However, their descendents were soon stripped of African cultural identity. They became what the masters named them. The struggle for African-American social and political freedom was thus always associated with the question of how to identify. In various historical periods the terms Africans, Negroes, blacks, Afro-Americans, and African Americans have all been preferred terms. Clearly, these terms are socially constructed, but in this sense by the social movements associated with the struggle for freedom. In this book I utilize material from across the entire experience of African descendents in America and use terms that are historically appropriate for a given time period.

Other groups have faced the same issues of self-identification. Therefore I have attempted to use terms that are culturally sensitive and historically appropriate whenever possible. To redress the social dominance that European-Americans have enjoyed throughout the literature I use the principle of parallelism when comparing groups. So, socially constructed terms such as blacks, browns, reds, whites, and yellows are compared equivalently. Whenever possible I refer to recent geographic origin when referring to genetic ancestry. All anatomically modern humans are descended from ancient African populations, however, human groups did migrate out of Africa at different times and ended up in different localities (Americas, Australia, Asia, Europe, and the Middle East). Finally, I am aware that my descriptions in this work may offend some people, however this is not intentional. I am simply trying to remain intellectually consistent and to be clear about what I am and am not talking about when referring to the thorny concept of race.

THE RACE MYTH

CHAPTER 1

How Biology Refutes Our Racial Myths

Sometimes, the scientific investigation of one problem presents solutions to another. In 1986, scientists proposed a major undertaking: to sequence the entire human genome, to draw a map of the 100,000 or so genes that make humans distinct from apes or dolphins or squirrels. We knew that each of those genes could be found in a specific place on one of the twenty-three pairs of human chromosomes, but for the most part, we didn't know exactly where.

Remember those twisting ladders of DNA molecules from high-school biology? The DNA of each gene is made up of letters, which are pairs of molecule combinations. There are three billion letters in the human genome. At the Technology Center of Silicon Valley (now called the Tech Museum for Innovation), scientists built a model of what this looks like. Think of a spiral staircase and each step as a telephone directory. Now, wind a second staircase around the first to make a double spiral. Every phonebook is a gene, and the contents are the letters. If you have 100,000 phonebooks, and the information in them isn't listed alphabetically, and you aren't sure which phonebook goes where along the spirals, you've got a big project on your hands.

Producing all three billion letters of the human genome might be the greatest achievement in the history of biology, possibly of all science. The human genome map could tell us about the origin

of human disease, the general function of our bodies, and possibly what it means to be human. A number of theoretical and technical problems had to be solved to sequence the genome, not the least of which was whose genome should be read. The scientists directly involved with the genome project immediately began to wrestle with the problem of human genetic variation and the concept of race.

For Every Discovery, a Controversy

Celera Genomics was the only major private corporation in the quest to map the human genome. In February 2001, Celera's CEO, Craig Venter, touched off a minor firestorm when he commented that "race is not a scientific concept."[1] He knew that it wasn't possible to distinguish people who were ethnically African American, Chinese, Hispanic, or white at the genome level. Celera's sequencing of the human genome showed that the average pair of human beings who are not close relatives differ by 2.1 million genetic letters out of those 3 billion, yet only a few thousand of those differences account for the biological differences between individuals.

Venter argued that we all are essentially identical twins at the level of the genome. Celera used DNA extracted from five volunteers, three women and two men, who were ethnically African American, Chinese American, Hispanic, and Europeon American. Their results showed that at the DNA level you could clearly tell the females from the males (due to the genetic differences in the X and Y chromosomes), but you could not identify the race of the individual from the DNA.

Venter's comment should not have been controversial. The Celera study only confirmed at the molecular level something population geneticists and physical anthropologists had recognized for well over fifty years: the nonexistence of biological races in the human species. Still, some prominent biologists felt compelled to

attack Venter and defend the race concept in biology. Among them was James Crow (yes, that is his name), who in early 2002 defended the legitimacy of identifying races in humans. In the publication of the National Academy of Arts and Sciences, *Daedalus,* he commented: "Whenever an institution or society singles out individuals who are exceptional or outstanding in some way, racial differences will become more apparent. That fact may be uncomfortable, but there is no way around it."[2]

In support of this notion, rather than citing scientific evidence, he gave as an example a social phenomenon: the overrepresentation of African Americans in track and field, and their underrepresentation in physics and engineering, relative to Asian Americans. His exact comment was: "A stopwatch is colorblind." It's amazing when geneticists of James Crow's stature demonstrate this blind spot when it comes to human variation and the concept of race. It still happens because the social construction of race is deeply ingrained in the thinking of most American intellectuals, including biologists and medical practitioners.

The bias that biologists have shown when they try to explain the importance of genetic variation in humans has been well established. In this book, we're going to focus on the impact that the belief in biological races has on society. To do that, we first need to make sure we all understand what a biological race is, and why human groups don't qualify as races. The starting point for this is looking at how we came to understand the origin of biological species.

Darwin 101: A Race Isn't a Species

How species developed was the most important problem for biologists of the mid-nineteenth century, the equivalent to the twentieth-century discovery of the structure of DNA, or the publication of the human genome in 2001. To solve this problem, scientists first had to see what was so important about biological

varieties (*races, subspecies*—the terms are interchangeable), for reasons that will become apparent. Without knowing it, Charles Darwin provided the basic ideas that were needed for a correct definition of biological races when he asked how new species arose in nature.

In *Origin of Species* Darwin described how people had systematically bred domestic pigeons into numerous varieties. He reasoned that all of the existing pigeon varieties must have been derived from one ancestral stock, one that contained all of the characteristics that breeders selected from as they developed the variations. He argued that such a process in nature could eventually produce varieties that were different enough to no longer be able to breed with each other successfully. If they couldn't do that, they would be new species.

Darwin said that a process called *natural selection* was the chief mechanism responsible for these changes. Natural selection, commonly known as *survival of the fittest,* is what happens when certain traits win out when it's time to reproduce. If an organism has a trait that helps it survive, it's more likely to reproduce more, so more members of its species share the same traits. If enough members end up with the same set of traits, you have a new variety. Keep on specializing, and you have a new species.

Darwin recognized that the formation of biological varieties was an essential step on the way to the formation of new species—an intermediate step. Varieties can still interbreed, but distinct species cannot produce fertile offspring, even if they manage to mate, as in the case of horses and donkeys, which produce mules, which are sterile. Gorillas and chimpanzees are separate species; mountain and forest gorillas are subspecies (or geographical races, because they are separate races that arose through geographic isolation).

Darwin and his contemporaries clearly understood what the theory of evolution meant for human beings. He recognized that all of the human races were really members of the same species, as opposed to being separate species of humans. However, it was also 1859, and

he knew that this theory would be received with shock and dismay in Victorian society. Sir Charles Lyell, a geologist and mentor to Darwin, warned him that the idea that the black and white races had common ancestry would not be tolerated, and would lead to the expulsion of any professor having the nerve to teach it.

Almost a century and a half of further research has shown that Darwin's insistence on the importance of natural selection in the origin of new species was correct. Evolutionary biologists have studied how populations acquire genetic differences, looking at it from more angles than even a yoga instructor could achieve. And they have confirmed what Darwin said: that varieties (or races) are intermediate steps to legitimate species.

Darwin was wrong, though, for thinking that the human species had a number of distinct varieties. At the time, no one had the data they would have needed to prove otherwise, nor did they see a need to go looking for it. He and other scientists made the same mistake people are still making today: They let what their eyes can see count for more than what scientific analysis can show.

The fact is that no biological races exist in modern humans. In the next few pages, I'll explain how a race is defined and why there isn't enough variation in humans for our differences to qualify as races.

What Does it Take to Be a Race?

To qualify officially as a biological race (or subspecies or variety), an animal or plant has to meet one of two requirements:

1. It can have its own distinct genetic lineage, meaning that it evolved in enough isolation that it never (or rarely) mated with individuals outside its borders, or
2. the genetic distance between one population and another has to be significantly greater than the genetic variability that exists within the populations themselves.

The first requirement is pretty straightforward, but the second takes some explaining. Think of it as a formula, and we're looking for two percentages to plug into it: one for distance and one for variability. To do that, we have to understand how geneticists measure variety, and we have to define genetic distance and genetic variability as painlessly as possible.

Variety Is the Spice of Genetics

We're all pretty familiar with DNA by now: It's the DNA molecules along our chromosomes that determine what makes us the same as other animals, what makes us different from them, and what makes us different from each other.

Along each chromosome, there are specific parts—somewhere between twenty-five thousand and forty thousand of them—that control our traits. At each of these parts there are two chemical messages that code for a trait, like brown eyes or the ability to roll your tongue. Some messages are dominant over others, so that if you get a message from Mom that says "brown" and a message from Dad that says "blue," your eyes are going to be brown. Many more messages have a mixing effect, producing physical features that fall somewhere in the middle of both parents, so that, say, your nose might be bigger than your mother's but smaller than your father's.

The range of possible combinations of these messages is pretty mind-boggling: One egg cell or one sperm cell can have 8,388,608 possible combinations of chromosomes, so for a couple producing a child, the number of potential chromosome arrangements for that child would be 8,388,608![3] This means that there is a tremendous amount of diversity that can be produced by even one pair of parents, yet on average the physical traits of the offspring still resemble a mixture of both of the parents.

No one's saying that these differences amount to races, of course, otherwise, you'd be a different race from your parents.

The large number of combinations of traits just means that, any way you look at it, human genetics is complex.

Measuring Variation: We're Not All That Different

There are ways to compare the complexity of one group of humans with another, no matter how you want to define *group*. A group could be all the people who were born and raised on Maui, or a number of people who have Down's syndrome. With all the possible variety, where do we start measuring variation?

Let's look again at those messages in our DNA. About 33 percent of the spots on the chromosomes where they live allow a lot of possibilities for a particular trait—people can have brown, blue, green, hazel, or golden eyes, for instance. In the remaining 67 percent of the spots, only one type of message is allowed, so that nearly every human being will have identical messages for a particular trait at that spot (wrong messages in these spots can result in genetic disease). So, about a third of our messages are responsible for all of the variety we see in people worldwide.

That seems like a lot, but it's not all. From studying these messages for traits, scientists now know that two individuals from anywhere in the world can potentially share 86 percent of the traits out of that 33 percent. Doing the math, that leaves only 4.62 percent of our genetic makeup responsible for all our individuality. Put another way: the traits of an Irish businessperson, an African-American lawyer, and the prime minister of India are quite likely to be 95.38 percent identical. Geography does play a part, so that if two people are from the same continent, you can reduce the variability by another 10 percent, and if they're from the same village, you can reduce it by yet another 4 percent. So, variety is measured by looking at the percentage of our DNA that makes us unique. What's genetic distance?

Getting within Shouting Distance

Genetic distance is a statistic calculated by examining different groups of people. It is a measurement of how frequently the genetic messages for traits occur in populations. People who share larger proportions of the same messages across their genome are genetically close, and people who do not share the same messages are genetically more distant. For instance, let's examine the message that causes sickle cell anemia, a disease that people think of as associated with race. This message occurs in large numbers in people who live in tropical areas because, it turns out, if you have one sickle cell message and one normal message, you have a better chance of surviving malaria, a typical disease of the tropics. So, the sickle cell anemia message is in high frequencies in populations in western Africa, the Middle East, the Persian Gulf, the Mediterranean, and India. In the case of this message, someone from Ghana is genetically closer to someone from Syria than to someone from Kenya, because Kenyans (who live at high altitudes where there isn't much malaria) don't have a high frequency of sickle cell messages. This clearly shows that sickle cell anemia cannot be associated with any particular race.

This points to an important fact: Geographical distance does not necessarily equal genetic distance. In fact, assuming that two people are genetically different because they look like they came from different parts of the world can be really dangerous for their health. Why? Because things like people's blood type or their ability to accept transplanted organs are dictated by how genetically close they are, not necessarily by where their ancestors came from geographically.

Because people equate race with external physical characteristics, they assume more often than not that a person is more likely to find an organ donor among the members of their own supposed racial group. This misconception in biomedical research or clinical practice that insists on sticking to these false racial categories causes many errors and lost lives.

Location, Location, Location?

If geographic distance doesn't necessarily equal genetic distance, does that make geographic distance irrelevant? No. There is still a strong correlation between geographic distance and genetic distance. After all, it's geographic isolation that is the biggest factor in the development of new traits. It's just a mistake to assume that one type of distance equals the other.

So, whether we're looking at geographically close or distant populations of humans, the question that really matters is still this: If all the genetic information from two populations that we think of as races is examined, how similar are they? And are their differences big enough to qualify them as separate races?

Size Matters: The Standard for Measuring Genetic Variation

To figure this out, we would have to look at a lot more than a couple of indicators like a sickle cell message or blood types. We'd have to evaluate the genetic information from enough people across a big enough number of separated populations for the statistics to be meaningful. Fortunately for you and me, it's been done for us already.

This analysis has used a number of approaches, examining the big three sources: protein variation, nuclear DNA, and mitochondrial DNA. All of these techniques agree that anatomically modern humans are a young species—too young to have developed any significant genetic distances between populations before mass mobility on a global scale started blurring what few differences there were. The result is that there is no unambiguous way to describe biological races within our species.

It's not for lack of a standard: Biologists have studied genetic variation in a wide variety of organisms other than humans for over fifty years, and have described many geographical races or

subspecies. The races we have identified outside of humans usually show about 20 percent total genetic distance between their populations, as is the case in, say, the various species of fruit flies.

We do not see anywhere near that much genetic variation in modern humans. The genetic distances in humans are statistically about ten times lower (2 percent) than the 20 percent average in other organisms, even when comparing the most geographically separated populations within modern humans. There is greater genetic variability found within one tribe of western African chimpanzees than exists in the entire human species! In fact, there has never been any degree of natural selection in modern humans equivalent even to the levels used to create the differences in the breeds of domestic pigeons or dogs. In order to support the existence of biological races in modern humans, you would have to use a very different sort of reasoning than has been applied to all other species of animals—and that would be bad science.

One Requirement Bites the Dust

Okay, now we have the first number to plug into our formula for race: Genetic distance between populations of humans is about 2 percent. We still need the other number, for genetic variation within those populations.

The same types of studies that showed us that human genetic distances average only 2 percent have also shown that there is about 8.6 times more genetic variation within the classically defined racial groups than between them. Why? Because there is about 8.6 times more genetic variation between any given individual on the planet and another individual than there is between the populations they belong to. In other words, the variability that makes one African-American person different from another is greater than the variability between African Americans and Swedes or Tibetans or Amazonian tribes.

Remember we said that modern humans share 86 percent of

their genetic variations, so that less than 5 percent of our genome is responsible for our individuality. Now, it's time to look back at the formula for genetic distance versus genetic variability. For any group of humans to be a race, their genetic distance from another group, around 2 percent, would have to be greater than their unique genetic variability, around 5 percent. Two is not bigger than five.

It's a fact that if you add the 10 percent that accounts for shared variations between populations on the same continent, plus the 4 percent shared by local populations, you end up with about 1 percent genetic variability. Since this is lower than the 2 percent statistic for genetic distance, this would technically meet our definition of a race. There are a couple of problems with that conclusion. For one, we would be accepting percentages of variability in humans that are far below the percentages that are applied to all other organisms on the planet as evidence of race. For another, treating populations with 1 percent variability as distinct races would result in identifying over a 1,000 races of humans. Following the argument to its logical conclusion, since families are even more genetically similar than geographic neighbors, we could say that every individual family is a race, or every cultural group that tries to keep itself separate (such as the Amish) is a race. In other words, the distinction becomes meaningless.

That's really the point. The majority of genetic variation in humans occurs between individuals, without regard to membership in socially constructed race. And none of the unique variations we see approach the minimum levels used to identify races in other species.

Homage to Alex Haley: Our Common Roots

Our formula didn't work, so we know that populations of humans just don't meet the required distance-to-variability ratio for being separate races. Identifying a race by physical characteristics such as skin color or eye shape is as invalid as saying that all

people who are tall or who have straight hair or who are pigeon-toed constitute separate races. Let's look now at the other requirement for race identification, genetic lineage.

There is no evidence that any group of humans now in existence—geographically or in socially defined races—has an evolutionary or genetic line of descent that is distinct from other groups.

Every person is descended from two parents, four grandparents, and eight great grandparents. With each generation back into our ancestry, the number of lineal ancestors doubles (if all the ancestors are unrelated). If we go back twenty-four generations into our past, about fifteen hundred years ago, we each would have had 33,554,432 ancestors! At that time, the world population was around 206,000,000 people. That means that if we all really had separate, unrelated ancestors, every single one of us would be descended from about 16 percent of the world's population in the year 502 A.D. Obviously the math doesn't work, which strongly suggests that not all of our ancestors came from independent families and that many individuals must have contributed to many family lineages.

In a place like the United States, where the population has been intermarrying for a long time, and has been engaged in interracial sex and conception outside of marriage, it is fairly easy to show that the socially described races do not exist as separate lines of genetic descent. Still, we can and should ask if there ever was a time when the world's populations were truly independent.

In this sense, an independent lineage would be a population that was isolated from mixing genetically with other humans—one that never mated and bred outside its own group. In the animal kingdom, kangaroos are an example of this: The geographic isolation of Australia and its surrounding islands was so complete that this particular species of marsupial developed there and nowhere else. Since we know that race is an intermediate step toward becoming a species, what we're looking for genetically is

the human equivalent of a marsupial on its way to becoming a kangaroo.

The Gene Trail: Better than Breadcrumbs?

Humans have been moving around for centuries, so finding evidence of lineage isn't as easy as, say, going to an isolated location like the Seychelles and testing the population there. Geneticists have worked out various ways to test for the existence of separate lineages in other species, so it's worth looking at those for a minute to see if they work on humans.

One way is to calculate the amount of population subdivision that exists in a particular species. A species that has unique lineages within it is going to be subdivided, and you can find subdivisions by finding uneven distributions of genetic information among groups in that species.

Appendix 1 shows what weak subdivision might look like using pie diagrams. In a species that is weakly subdivided we would expect that all local populations show gene frequency percentages closer to the grand average of all the populations. The percentages of the two different genes in this example are shown by different shades. The circle in the center shows the average of all the local populations, and you can see that each isn't very different in shading from the grand average. Appendix 2 shows what strong subdivision would look like. Here, the gene frequencies of the local populations have very different shading percentages from the grand average of the total population. The subdivision statistic can take on values from 0.00 (no subdivision) to 1.00 (completely subdivided) or we could consider this in percentage terms 0 percent to 100 percent. A species with low subdivision does not have races, whereas a species with high subdivision can be said to have races.

It should be no surprise that global samples of modern humans show very little population subdivision compared to other mammals

(0 percent–16 percent), lower than for Kenyan impala and wildebeest, or the American bighorn sheep, and much lower than highly subdivided predatory animals like the North American gray wolf (70 percent–85 percent). Recently, some scientists have raised criticisms concerning the validity of this statistic for examining population subdivision. They point out the calculation of this statistic is dependent on the range of allele frequencies found in populations and particular assumptions made about the nature of the population's history and of the genes being studied. The originator of this method, American geneticist Sewall Wright, assumed that the genes in question had unique origins in the populations studied and that the populations were independent of each other. For this reason, Wright felt that an arbitrary value of about 0.250, or about 25 percent, might be an indication of moderate subdivision and a threshold for identifying genetic races. However, we know that most human genes did not arise independently nor do our populations show independence from each other. The best models of human evolution show that all non-sub-Saharan Africans are derived from sub-Saharan Africans. Thus, their genes did not all arise independently and the population's histories are not independent from sub-Saharan Africans. This problem can be fixed by nesting the non-Africans within the Africans during the calculation, and when this is done for some sample genetic systems the value increases slightly, but still not enough to approach Wright's arbitrary threshold. So, even with this added sophistication, the study of subdivisions produces no evidence for genetic lineages. Some scientists claim to have found such evidence another way, however, so we'll look at that next.

Your Genetic Family Tree

In the same way that people trace their genealogies to see if a line goes back to someone famous, scientists trace molecular information to find the ancestry of genetic groups to see if

they're related. These genetic family trees of human populations have been examined for evidence of unique genetic lineages.

This is how we found out that humans and chimpanzees have a more recent common ancestor than either have with gorillas. In a genetic tree diagram, humans and chimpanzees are on one branch, and gorillas on another. The lengths of the branches are used to show how long it's been since the species separated. This procedure works well for tracing evolutionary histories between species, because the genes in one species don't recombine with the genes from the other species, since separate species can't mate.

It's another thing altogether to create a reliable genetic tree within one species, especially humans. During recombination, the father's and mother's DNA can exchange segments of genes with each other. If this occurs, the gene in question has two different evolutionary histories. And this is just in one individual: When that individual mates with another in their own species whose DNA has also recombined, it's much harder to trace a definitive evolutionary history. Multiply that by billions of individuals, and you can see the problem.

So, while a genetic tree can be useful for more general things like showing when different migratory groups of humans started developing geographically adapted traits, it can't reliably be more specific than that, and certainly can't show independent genetic lineages.[4]

All Roads Lead To . . .

More reliable methods of studying human populations can be used, such as *neighbor joining* techniques, which allow relative genetic distances between groups to be shown. The data from these studies show that humans vary in small increments from group to group, rather than differing drastically depending on where they originated.

Humans have been on the move since we first left sub-Saharan Africa 80,000 years ago, combining our DNA at the same time as we were adapting genetically to our local conditions. Distinct genetic lineages cannot be traced within or between human populations because we've been mixing with each other since we first evolved. We're the only species of the *Homo* genus to have survived into modernity—an analogy would be if the only members of *Canis* to survive were domestic dogs (no more coyotes, jackals, or wolves). Genetically, we're not even separate breeds: We're all mutts.

Aren't Physical Differences Proof that Races Exist?

We kind of look like separate breeds, though. Observable physical features are what people point to first to justify their belief in different races. After everything you've read so far, you know that's a dead horse but, just to make the point, let's beat it a little longer.

What determines physical traits in populations? Genes do this in combination with environmental factors. So, if genetic variation can't be divvied up evenly into races, neither can physical traits. Skin color, hair type, body stature, blood groups, or tendencies to get certain diseases do not alone or in combination define the racial groups that have been socially constructed in North America.

It's absolutely true that these physical traits vary among geographical populations. What most people don't realize is the way that they vary. For example, Sri Lankans of the Indian subcontinent, Nigerians, and aboriginal Australians share a dark skin tone, but differ in hair type, facial features, and genetic predisposition for disease. If you try to use characteristics such as height, body proportions, skull measurements, hair type, and skin color to create a tree showing how human populations are related, you get a tree that doesn't match the measured genetic relatedness and known evolutionary history of our species.

A tree like that would say, "all short, extremely dark-skinned

people with thick curly hair are the same race," and would link Papuans from New Guinea and aboriginal Australians most closely to sub-Saharan Africans. We know, however, from genetic analyses, that Papuans and aboriginal Australians are the group most genetically distant from sub-Saharan Africans. And that makes total sense, because sub-Saharan Africans and aboriginal Australians are two of the most geographically separated human groups, so intermarriage has been minimal. Australia, after all, was cut off from human migration for most of its history.

We also know that within sub-Saharan African populations, everything from skin color to skull types to total genetic diversity is more variable than in any other of the world's populations.[4] In other words, a person from the Congo and a person from Mali are more likely to be different genetically from each other than either is from a person from Belgium. Yet, if everyone from this region got up and moved to the United States, we'd call them all African Americans and see them as members of the same race.

Physical traits fail to define races because local populations produce traits that adapt to climate and other environmental factors wherever those factors occur. This means that, however genetically or geographically distant they are, tropical populations will have physical traits that match tropical conditions, like the sickle cell message. Kenyans and Peruvians will have greater lung capacities and red blood cell counts from living at high altitudes. These features are completely independent of the other genetic aspects of their physical makeup, and cannot be used to determine membership in a socially defined race.

Taking It Back Home

America has perfected the concept of socially defined races. On first inspection, it might have seemed that these races had biological legitimacy. The English colonists, the native peoples they called *Indians,* and the West Africans they brought as slaves all

came from different places along the range of genetic diversity. It is entirely possible that the social construction of race in America would have proceeded differently if the full spectrum of the world's populations had immigrated to America along with western Europeans and Africans. Certainly, things would have been different if the prior history of the world had allowed these groups to come together under conditions fostering social equality.

But, as we know, cultural rather than biological traits were used to define our races. The rules of cultural evolution differ from those of biological evolution, but sadly scientists, doctors, philosophers, and law makers have for the most part, not yet acknowledged the difference. We must stop masking the real social issues with racist ideologies in order to build a truly just society.