ALSO BY DOROTHY ROBERTS

Killing the Black Body: Race, Reproduction, and the Meaning of Liberty

Shattered Bonds: The Color of Child Welfare

FATAL INVENTION

How Science, Politics, and Big Business Re-create Race in the Twenty-first Century

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THE NEW PRESS

NEW YORK
LONDON

Published in the United States by The New Press, New York, 2011
Distributed by Perseus Distribution

LIBRARY OF CONGRESS CATALOGING-IN-PUBLICATION DATA

Roberts, Dorothy.
Fatal invention : how science, politics, and big business re-create race in the twenty-first century / Dorothy Roberts.
p. cm.
Includes bibliographical references and index.
ISBN 978-1-59558-495-3 (hc)
1. Race—Social aspects. 2. Race—Political aspects. 3. Race—Economic aspects. 4. Physical anthropology. 5. Human population genetics. 6. Genomics. I. Title.
GN269.R64 2011
305.8—dc22

2011012830

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www.thenewpress.com

Composition by Westchester Book Composition

Printed in the United States of America

2 4 6 8 10 9 7 5 3 1

For my parents, Iris and Robert Roberts,
who taught me that there is only one human race.

2

Separating Racial Science from Racism

No sooner had the Human Genome Project determined that human beings are 99.9 percent genetically alike than many scientists shifted their focus from human genetic commonality to the 0.1 percent of human genetic difference. This difference is increasingly seen as encompassing race. On the heels of the gene map's completion in 2000, science journalist Nicholas Wade described genomic researchers' follow-up mission precisely in these racial terms. "Scientists planning the next phase of the human genome project are being forced to confront a treacherous issue: the genetic differences between human races," he wrote in a July 20, 2001, article, "For Genome Mappers, the Tricky Terrain of Race Requires Some Careful Navigating." The question was no longer whether or not racial differences exist at the molecular level, but how to go about discovering them.

The speedy resuscitation of biological concepts of race seems less surprising if we consider the intimate marriage of race and science that has lasted more than three centuries. Over this period, the function race serves as a political classification system has remained the same, but scientists have discovered new ways of identifying, justifying, and proving race as a biological category. As evidence contesting the biological basis of race emerges, scientists have reconfigured race without abandoning it. What links racial science from one generation to the next is the quest to update the theories and methods for dividing human beings into a handful of groups to provide a biological explanation for their differences—from health outcomes to intelligence to incarceration rates.

Every modern era has had a science of race. Scientists were instrumental in inventing the concept of biological races, in specifying their demarcations, and in justifying the social inequities between them. Scientists created the classification systems that placed human beings in distinct racial categories. Scientists elaborated the philosophies that explained why human races differ. Scientists made race seem like a natural condition they had discovered about human beings rather than a system of governance imposed on human beings. As Harvard science historian Evelynn Hammonds observes, "The appeal of a story that links race to medical and scientific progress is in the way in which it naturalizes the social order in a racially stratified society such as ours."[1] Science is the most effective tool for giving claims about human difference the stamp of legitimacy. And once scientists were committed to understanding human beings as divided into races, they believed that human biology could not be studied without attention to race.

It would be a mistake to think of this work as confined to "scientific racism." The term implies an exceptional use of science to support racist ideas. Calling it scientific racism identifies the problem as scientists' corrupt misuse of race rather than their support of race itself. By rejecting only specific instances of extreme scientific abuse, scientists proceed to reinforce race in novel ways that are supposedly free of past biases. When the worst abuses of racial science are revealed, the next generation of scientists disavows the "scientific racism" of its predecessors or conveniently forgets that scientists used to think that way at all. Many people, for example, point to the Nazis' eugenicist theories as the prime example of scientific racism.[2] Seeing scientific racism as restricted to extreme cases like Nazi genocide mirrors the view of racism in general as an extremist position that falls outside enlightened Western thinking. But as I have shown in the previous chapter, race and racism emerged as integral aspects of the American republic, not at all in opposition to it.

There is a similar problem with calling the racial science of prior eras pseudoscience. In hindsight, we see the flaws in bizarre means of measuring racial difference, such as craniometry, which anatomists used a century ago to determine intelligence by calculating skull volume, and brand these methods a ridiculous pretense at the scientific method. Scientists today can then claim that it was pseudoscience that fell victim to racial prejudice, not *real* science, which studies racial difference objectively. But what we call racial pseudoscience today was considered the vanguard of scientific progress at

the time it was practiced, and those who practiced it were admired by the scientific community and the public as pioneering geniuses. Could it be that our grandchildren will brand as pseudoscience today's racial classifications generated by computerized genome scans?

To understand the role science has played in perpetuating the biological meaning of race—a role that is currently intensifying—it is helpful to trace racial science from its emergence during the European Enlightenment to its practice by genomic scientists today. The belief that race is natural has always been validated by mainstream—not aberrational—scientific theories and methods, and the most advanced science of human nature has always been shaped by current political contests over racial equality. The burning scientific questions of each period have been framed and answered in terms of race not because rational scientific inquiry compelled it, but because race was *presumed* to be an essential biological category. This is not a happy-ending tale of science overcoming racism. To the contrary, this history reveals how scientists have continually rehabilitated a biological understanding of race throughout the scientific and political upheavals of the last three centuries. It also suggests that we should be just as critical of its latest incarnation in genomic science.

How Scientists Created a Racial Order

The way we think about race today is the product of historical coincidence. The concept of race as a natural category arose from the convergence of two transformations in eighteenth-century Europe that intertwined science and politics: the scientific revolution and the age of colonialism.[3] The expansion of the slave trade in the 1700s, which necessitated a racial system of governance, coincided with the shift among European intellectuals from theological to biological thinking, giving the institution of science ultimate authority over truth and knowledge. Enlightenment biologists were preoccupied with classifying all earthly creations, whether plants, insects, or animals, into a natural hierarchy. Their chief scientific method was taxonomy: observing, naming, and ordering the world by partitioning living things into biologically different types. Applying this method to human bodies, naturalists made race an object of scientific study and made European conquest and enslavement of foreign peoples seem in line with nature.[4] The

insistence on finding differences among people so they can be categorized governs the study of human biology to this day.

Race was first used as a category for scientifically classifying human beings by the French physician François Bernier, who penned a 1684 essay titled "A New Division of the Earth, According to the Different Species or Races of Men Who Inhabit It." Bernier organized human beings into five types based on their physical characteristics, grouping the people of Europe, North Africa, the Near East, and India together, but separating sub-Saharan Africans and "the blacks of the Cape of Good Hope" into two distinct species. Asians comprised the fourth large grouping. To these, Bernier added the Lapps of Norway, described as "little stunted creatures" and "wretched animals."[5]

The major groundwork for modern biological classification was laid by the writings of Carl Linnaeus, a Swedish botanist and physician born in 1707. Twelve editions of his catalogue of living things, *Systema Naturae* (published between 1735 and his death in 1778), constituted the first classification system that included human beings along with animals and plants.[6] It was in the tenth edition that Linneaus turned to the human species.

Linnaeus divided the genus *Homo* into two species, *Homo sapiens* (man) and *Homo troglodytes* (ape), and divided *Homo sapiens* into four natural varieties—*H. sapiens americanus, H. sapiens europaeus, H. sapiens asiaticus,* and *H. sapiens afer*—linked to the four known regions of the world, America, Europe, Asia, and Africa. He color-coded the subspecies red, white, yellow, and black and assigned each a set of physical, personality, cultural, and social traits. Linnaeus was influenced by the classical concept of the Great Chain of Being described by Saint Thomas Aquinas, which placed everything in the universe—from stones to angels—in a grand hierarchy established by God.

At the pinnacle of beauty and intelligence Linnaeus placed *H. sapiens europaeus*: "Vigorous, muscular. Flowing blond hair. Blue eyes. Very smart, inventive. Covered by tight clothing. Ruled by law." *H. sapiens americanus,* according to Linnaeus, was "Ill-tempered, impassive. Thick straight black hair; wide nostrils; harsh face; beardless. Stubborn, contented, free. Paints himself with red lines. Ruled by custom." Linnaeus described *H. sapiens asiaticus* as "Melancholy, stern. Black hair; dark eyes. Strict, haughty, greedy. Covered by loose garments. Ruled by opinion." And at the bottom, he placed

H. sapiens afer: "Sluggish, lazy. Black kinky hair; silky skin; flat nose; thick lips; females with genital flap and elongated breasts. Crafty, slow, careless. Covered by grease. Ruled by caprice." Here lies the origin of the color scheme for mankind American children still sing about in Sunday school: red, yellow, black, and white.

Linnaeus obviously had moved beyond empirical description to opine about an ideal physical type for each group (such as the flowing blond hair of Europeans), as well as their personality traits (the stubborn and contented Native Americans, for example). In theorizing that these subspecies descended from different ancestors and developed along distinct paths, he started a new debate—did humans have one origin or many?—that would preoccupy biologists for several centuries.

French anatomist Georges Cuvier (1769–1832) applied the Linnaean method to construct "a great catalogue in which all created beings have suitable names, may be recognized by distinctive characters, and [are] arranged in divisions and sub-divisions."[7] He divided human beings into three main groups, which he labeled Caucasian, Mongolian, and Ethiopian. Cuvier's key contribution to the Linnaean classification system was the theory of "racial typology," which held that humans were divided into permanent biological kinds suited to the particular regions on Earth where they originated and differing permanently in their abilities.[8] Meanwhile, in 1795, Johann Friedrich Blumenbach, a medical professor in Germany, published the third edition of his influential *On the Natural Varieties of Mankind*, classifying human beings into five races: Caucasian, Mongolian, Ethiopian, American, and Malay. Although German philosopher Christophe Meiners had divided humans into two branches, Caucasian and Mongolian, in his 1785 work *Outline of the History of Humanity*, Blumenbach was the first to lend scientific credibility to the racial designation Caucasian, derived from the people in the Caucasus Mountain region.[9] Placing all five varieties of humankind in a single species, Blumenbach theorized that Caucasians, the designation for white peoples of Europe and contiguous regions, were the ideal from which the others "degenerated." By 1800, European naturalists had produced a scientific definition of race as a "fundamental taxonomic division of the human species," with their own kind always at the top.[10]

Eighteenth-century racial science did not fall entirely on the shoulders of biological classifiers. Philosophers were also central to the Enlightenment project of using reason to dominate nature, and they joined naturalists in

conceiving race by giving it a philosophy as well as a typological structure. In *On the Different Races of Man* (1775), the German philosopher Immanuel Kant (1724–1804) explained the reason for differences in skin color and natural disposition that distinguished the four main races, which he identified as whites, Negroes, Hindustanic, and Kalmuck, the nomadic Mongols of Central Asia.[11] Kant subscribed to monogenism, locating the origin of all humanity in a common ancestor, and defined race as "the hereditary differences of animals belonging to a single stock." "Negroes and Whites are not different species of humans (for they belong presumably to one stock)," he wrote, "but they are different *races*, for each perpetuates itself in every area, and they generate between them children that are necessarily hybrid, or blendings (mulattoes)."[12] The French philosopher Voltaire, on the other hand, believed in polygenesis, the idea that the races of mankind descended from distinct origins. "Only the blind could doubt that the Whites, the Blacks, the Albinos, the Hottentots, the Laplanders, the Chinese, the Americans, are entirely different races," he declared in a 1764 essay.[13]

The disagreement between Kant and Voltaire on the origins of races presaged a question that plagued nineteenth-century typologists. Did the differences that naturalists were cataloging constitute racial variation within the human species (monogenism) or mark completely distinct species that descended from separate creations (polygenism)? Did Africans, for instance, originate from the same ancestor as Europeans and then develop into an inferior type, or did they spring from an entirely different lineage located between human beings and the lower primates?

A major problem with the separate-origin theory was that it breached the main criterion for identifying species. In a 1753 essay on the ass, French naturalist George-Louis Leclerc, Comte de Buffon, offered an influential definition of species as "a constant succession of similar individuals that can reproduce together."[14] Scientists began to adopt "Buffon's rule" that two animals that can procreate together belong to the same species if their offspring can also procreate. Put another way, the mark of separation between one species and another is the sterility of their offspring. Following this rule, all dogs belonged to the same species even though they were grouped into different breeds. Mutts can bear puppies. But a horse and a donkey are separate species because their progeny, a mule, is sterile. Because the children of two people from different races were fertile, Buffon's rule meant that all human beings belonged to the same species. Some scientists nevertheless defended their

belief that races were separate species by predicting that the offspring of mulattoes would be born less fertile or sterile.

In the United States, two pioneering scientists were especially instrumental in promoting the view that human beings were split into separate species. Harvard professor Louis Agassiz lent intellectual firepower to the scientific theory of polygenism, while empiricist Samuel Morton developed the scientific technology to validate it. Agassiz, born in Switzerland in 1807, studied comparative anatomy under Cuvier in Paris and traveled to the United States to do research at Harvard, where he became a professor at age forty-one. A tireless lobbyist for public investment in science, Agassiz helped to found the National Academy of Sciences and was appointed a regent of the Smithsonian Institution in 1863. "No man did more to establish and enhance the prestige of American biology during the nineteenth century," wrote the renowned biologist Stephen Jay Gould, who held the Agassiz chair at Harvard.[15]

Agassiz was haunted by his encounters with blacks when he arrived in the United States. His very first experience meeting black people as servants in a Philadelphia hotel in 1846 was so unsettling that he wrote at length about it in a letter to his mother. "I can scarcely express to you the painful impression that I received, especially since the feeling that they inspired in me is contrary to all our ideas about the confraternity of the human type and the unique origin of our species," he wrote. Describing blacks as "a degraded and degenerate race," Agassiz confessed, "it is impossible for me to repress the feeling that they are not of the same blood as us."[16] Agassiz soon turned this repulsion toward blacks into a full-fledged theory that they had descended from a distinct ancestor. He argued that it was wrong to link all living things to "one common centre of origin"; rather, races were created as separate species that adapted to different zoological zones along with other animals and plants peculiar to each region.

Like the European taxonomists, Agassiz professed a scientific duty to discern a natural order among the races. The fact that "there are upon earth different races of men, inhabiting different parts of its surface, which have different physical characters," Agassiz wrote, imposed on scientists "the obligation to settle the relative rank among these races, the relative value of the characters peculiar to each, in a scientific point of view." It should come as no surprise that he placed blacks at the bottom of his scientific ranking system, strenuously arguing that "human affairs with reference to the colored races" should be "guided by a full consciousness of the real difference

existing between us and them." In four ardent letters written in 1863 to Lincoln's Civil War commission, Agassiz warned that incorporating blacks as equals in the reunited nation would contaminate the white race both socially and biologically. "Social equality I deem at all time impracticable," Agassiz intoned. "It is a natural impossibility flowing from the very character of the negro race," which he described as "indolent, playful, sensuous, imitative, subservient," and incapable of living on equal footing with whites "without being an element of social disorder." Especially dramatic was his alarm at the specter of racial interbreeding: "How shall we eradicate the stigma of a lower race when its blood has once been allowed to flow freely into that of our children?"[17] Agassiz's predictions that pure blacks would not survive the northern climate and mulattoes would die off from "their sickly physique and their impaired fecundity" were disproved in time. But his construction of a scientific scaffolding for black subordination enjoyed a lasting legacy.

Taxonomies rely on collecting, measuring, and sorting specimens. Physician and anatomy professor Samuel George Morton, born in Philadelphia in 1799, used this scientific method to study racial difference and validate the separate species theory. Morton was well known as president of the Academy of Natural Sciences in Philadelphia and a founder of invertebrate paleontology, having published an acclaimed book describing the fossils collected by the Lewis and Clark expedition.[18] Morton amassed more than one thousand human skulls, sent to him from colleagues around the globe, into the largest collection in the world, known as the American Golgotha. Morton's mission was to test the hypothesis that racial rankings could be established empirically using brain size. To do this, Morton measured the cranial volume of the skulls by filling them with birdseed or lead pellets and pouring the contents into a cylinder. He then methodically calculated, recorded, and compared the skull sizes of people from different races. In his 1839 magnum opus, *Crania Americana*, Morton presented his meticulous measurements of the cranial capacity of Caucasians, Mongolians, Malays, indigenous Americans, and Negroes.

Mimicking the racial ordering of prior taxonomies, Morton concluded that, based on cranial capacity, whites had the "highest intellectual endowments"; Mongolians of Asia were "ingenious, imitative, and highly susceptible of cultivation"; American Indians "averse to cultivation, and slow in acquiring knowledge; restless, revengeful, and fond of war"; and the Ethiopians "joyous, flexible and indolent," representing "the lowest grade of humanity." Morton

also defended polygenism. He conceded that the mulatto children of black and white unions were fertile, but wrote that mulatto women had difficulty bearing children. If one of these women mated with another mulatto, he argued, her children would be even less fertile. Eventually, the progeny would die out. Like Agassiz's separate-species theory, Morton's racial methodology proved deeply flawed. But at the time of his death in 1851, the *New York Tribune* wrote that "probably no scientific man in America enjoyed a higher reputation among scholars throughout the world than Dr. Morton."[19]

The publication of Charles Darwin's *Origin of Species* in 1859 forced a sea change in thinking about how the human species developed. Darwin's earth-shaking theory proposed that all biological organisms are products of evolution, not an original and immutable hierarchy designed by a creator. As British sociologist Michael Banton puts it, "Darwin cut the ground from under the feet of the typologists by demonstrating that there were no permanent forms in nature."[20] Darwin addressed variation within the human species in a subsequent 1871 book, *The Descent of Man, and Selection in Relation to Sex*. Refuting the creationist ladder that placed Africans between Europeans and apes, Darwin argued that all humans and apes shared a common ancestor. Next, Darwin emphasized the biological unity of the human species by pointing to the high fertility of mulattoes, which contradicted the expected sterility of true species hybrids. According to Darwin, human evolution had not produced essential types, as earlier scientists thought, but was driven by individual variation of organisms within the species.

Darwin's radical view that the human species comprises varieties that are changeable and impossible to demarcate might have undermined the typological understanding of race. But the implications of Darwin's theory were too much for British and American academics to stomach. "Go back umpteen generations and would blacks and whites find a common ancestor? Itself the descendent of an ape?" English geologist Charles Lyell, a close friend and supporter of Darwin's, remarked. "The very idea would give a shock to . . . nearly all men. No university would sanction it; even teaching it would ensure the expulsion of a professor already installed."[21] Instead, most scientists adapted Darwin's theories to preexisting views of racial types.

Evolutionary reasoning proved useful to racial science in two key respects. First, Darwin's approach made theoretical sense of a race concept that positioned one group of human beings at a higher level of development than others. Darwin's claim that human beings evolved from lower animals fortified

the long-held racial hierarchy that put whites at the pinnacle of human advancement and blacks at the bottom, one step away from animals.[22] Scientific studies comparing the facial angles, limb length, and cranial structure of Negroes and whites claimed to offer physical proof of the races' evolutionary parting. Second, Darwin's view of natural selection as resulting from the struggle for existence validated a racist perspective on current political struggles. Darwin wrote at a time of tremendous racial upheaval in the United States. The nation had just survived a bloody Civil War between the slaveholding Southern states and the Union. Four million slaves were freed between 1864 and 1870.[23] Fledgling efforts by black Americans to claim the franchise they were entitled to were brutally repressed by Ku Klux Klan terror, followed by state imposition of a Jim Crow segregation regime, already in place in Northern states, that denied freed blacks the rights enjoyed by white citizens.[24] Meanwhile, the federal government continued to wage brutal conflicts with American Indian tribes aimed at taking their lands and forcibly relocating them to reservations.[25]

At the end of the nineteenth century, American anthropologists, anatomists, and statisticians eagerly embraced the Darwinian notion of survival of the fittest to explain the slaughter of American Indians and forced regression of blacks to a servant class.[26] Social Darwinists filled scientific journals with studies claiming to prove that these inherently primitive peoples were falling victim to a degenerative evolutionary process. "Will the Negro race be eliminated, and his place taken by the white man as a survival of the fittest?" became a key question for scientists to answer.[27] A popular theory held that the defective bodies and minds of "savage races" would gradually generate their own extinction.

After subjecting black people to slave labor in America for three centuries, whites now viewed their emancipation as the cause of their mental and physical deterioration. Noting that the Negro "luxuriates in the parching rays of an equatorial sun," an 1861 article in the *Medical and Surgical Reporter* concluded that it was impossible for blacks to adjust to the North American climate. Although members of a misplaced group might survive for some time, "yet physiological incompatibility will, ere a generation expires, be evident, and failure in propagation of the race will soon bring about its extinction."[28] Statistician Frederick Hoffman claimed to validate the racial extinction hypothesis with scientific data in *Race Traits and Tendencies of the American Negro*, published by the American Economic Association in 1896, compiling

extensive disease, mortality, and birth-rate statistics for white and colored populations in the United States. And with the advent of the new science of eugenics, Darwin's theory of natural selection would take racial science in a dangerous new direction.

The Progressive Science of Eugenics

At the turn of the twentieth century, American scientists embraced a theory known as eugenics, which held that intelligence and other personality traits are genetically determined and therefore inherited. This scientific theory about heredity, coupled with Progressive Era reforms, produced a campaign to remedy America's social problems by stemming biological degeneracy. The eugenicists advocated the rational control of reproduction in order to improve society's mental, moral, and physical health through selective breeding. In reality, eugenics enforced social judgments about race, class, and gender cloaked in scientific terms.

The founder of eugenics, English scientist Sir Francis Galton (Darwin's half cousin), became interested in heredity after reading *The Origin of Species*.[29] Although the idea of improving the quality of humans, as well as plants and animals, through selective breeding was not new, Galton was the first to popularize an actual eugenics program. In 1883, Galton coined the word *eugenics*—from a Greek root meaning "good in birth"—to "express the science of improving stock" by giving "the more suitable races or strains of blood a better chance of prevailing speedily over the less suitable than they otherwise would have had."[30] Galton replaced the Darwinian reliance on natural selection for the inevitable extinction of inferior groups with an argument for affirmative state intervention in the evolutionary process. "What Nature does blindly, slowly, and ruthlessly, man may do providently, quickly, and kindly," he proposed.[31]

Galton's theories were grounded in a belief in the genetic distinctions among races as well as individuals. His eugenicist approach adopted the prevailing scientific model that man was divided into different races marked by distinctive physical and psychological features: "The Mongolians, Jews, Negroes, Gipsies, and American Indians severally propagate their kinds; and each kind differs in character and intellect, as well as in colour and shape, from the other four."[32] Like most scientists of the time, Galton reserved the most disparaging description for black people, emphasizing their "strong

impulsive passions, and neither patience, reticence, nor dignity,"[33] as well as their intellectual inferiority. "The number among the negroes of those whom we should call half-witted men, is very large," Galton wrote in his 1892 treatise, *Hereditary Genius*.[34]

Galton's eugenicist ideas found fertile ground in America. In the early 1900s, the descendants of northern European settlers were consolidating their hold on commercial and political power in America. They sought to maintain control over an exploited workforce of Southern black sharecroppers and urban factory workers from southern and eastern Europe. Believing that the new immigrants were reproducing faster than they were, native Anglo-Saxons became gripped by a fear of "race suicide." Now, far from believing that blacks and other inferior races were biologically destined to become extinct, whites feared their growing numbers.

Whites were also pathologically obsessed with preserving their racial purity, claiming that sexual relations with blacks would produce a degenerate mongrel race. An intense nativism led to vicious race riots across the country. These attacks, primarily of whites against blacks and natives against immigrants, often ended in dozens of deaths. Thirty-eight people were killed in a race riot in Chicago in 1919. Meanwhile, gruesome lynchings terrorized black citizens in the South.

Eugenics provided a forward-thinking scientific framework to justify whites' efforts to preserve social order in the midst of this turmoil. Concepts about race, in turn, provided a theoretical framework for eugenicist logic. European and American scientists had for over two centuries developed an understanding of races as biologically distinct groups, marked by inherited attributes of inferiority and superiority. Racial science predisposed Americans to accept the theory that social characteristics were heritable and social structure was biologically determined. Eugenicists easily latched on to race as an integral element of their ideology. Moreover, the chattel slavery and Jim Crow systems that violently enforced racial classifications paved the way for the dehumanizing programs that implemented eugenicist ideology. Forced sterilizations, eugenicists' favorite remedy for social problems, were an extension of the brutality inflicted on black Americans. Slaveholders' total dominion over the bodies of enslaved Africans—including ownership of enslaved women's wombs, which they exploited for profit—provided an early model of reproductive control.[35]

Imposing sterilization as a solution for antisocial behavior had long been

practiced in the castration of black men as punishment for rape, beginning during slavery. The territorial legislature of Kansas passed a law in 1855 making castration the penalty for any Negro or mulatto who was convicted of rape, attempted rape, or kidnapping of any white woman.[36] In 1913, the Kansas legislature authorized sterilization of state inmates. Around that time, a Texas physician, Dr. Gideon Lincecum, advocated castration as a deterrent to crime by using an anecdote about a "vicious, disobedient, drunken Negro" who was suspected of rape: "After discovering that he had impregnated an idiot white girl, three men went into the field where he worked and castrated him. Less than two years later I heard his mistress say that he had become a model servant."[37] The mutilation of lynching victims' bodies by white mobs, often involving castration of black men, served as entertainment for many residents of Southern states. This long history of sanctioned torture inflicted on black bodies prepared Americans to accept the compelled sexual surgeries performed by state officials on people deemed genetically unfit.

Eugenics was mainstream, and it was financed by the nation's wealthiest entrepreneurs, including the Carnegie, Harriman, and Kellogg dynasties. Johns Hopkins biologist Raymond Pearl observed that, by 1912, "eugenics was catching on to an extraordinary degree with radical and conservative alike."[38] The growth of eugenics as legitimate science owes much to the efforts of Harvard-trained biologist Charles Davenport. As an associate professor at the University of Chicago, he convinced the Carnegie Institute to establish a center for the experimental investigation of eugenics in Cold Spring Harbor, New York, in 1904. With the financial backing of railroad heiress Mrs. E.H. Harriman, Davenport added a Eugenics Record Office to his research station six years later. In an October 10, 1910, letter, Davenport reported to Francis Galton, "There has been started here a Record Office in Eugenics; so you see that the seed sown by you is still sprouting in distant countries."[39]

Darwinian biology and Mendelian genetics, which understood heredity as a matter of quantitative probability, had generated a concept of race as a geographical population rather than a human essence. Eighteenth-century racial typologists grouped human beings into natural kinds that could be distinguished by observing their outward traits. Scientists at the turn of the twentieth century modernized the concept of biological race by defining it as groupings of geographical populations that differed according to their likelihood of inheriting certain physical and behavioral traits. Eugenicists

used race to group European populations according to ability, intelligence, and moral character. In the early 1900s, southern and eastern Europeans were considered a racial threat by whites of Anglo Saxon origin. Dressing up racial typologies in the new scientific garb of heredity, Davenport assigned particular behavioral traits to different races of immigrants. He observed that Poles were "independent and self-reliant though clannish"; Italians were prone to commit "crimes of personal violence"; and "Hebrews" fell "intermediate between the slovenly Serbians and Greeks and the tidy Swedes, Germans, and Bohemians."[40] Davenport advocated preventing the reproduction of bad stock through a selective immigration policy, discriminating marriages, and state-compelled sterilizations.

Davenport's Cold Spring Harbor project supplied the burgeoning American eugenics movement with scientific support. It trained and dispersed over 250 field workers, published the *Eugenical News*, and disseminated bulletins and books about the reduction of hereditary degeneracy.[41] Davenport reported his early findings in his widely read book *Heredity in Relation to Eugenics* (1911). As Davenport conducted scientific research, eugenics became the vogue across the county. Ordinary Americans attended lectures, read articles in popular magazines, and participated in Better Babies contests. Those devoted to propagating eugenics joined organizations such as the American Eugenics Society, the American Genetics Association, and the Human Betterment Association. The *Reader's Guide to Periodical Literature* listed 122 articles under Eugenics between 1910 and 1915, making it one of the most referenced topics in the index.[42] At most American colleges, courses on eugenics were well attended by students eager to learn how to apply biology to human affairs.

Meanwhile, Harry Hamilton Laughlin, superintendent of the Eugenics Record Office and an active public lobbyist for the movement, turned biological theory into public policy. In 1914, he prepared a two-volume report that proposed a schedule for sterilizing 15 million people over the next two generations, as well as a model sterilization law to accomplish this plan.[43] The defective "10 percent of our population," Laughlin claimed, "are an economic and moral burden on the 90 percent and a constant source of danger to the national and racial life." It is estimated that 65,000 persons were involuntarily sterilized under eugenicist statutes passed in thirty states.[44]

Like the racial typologists of prior centuries, eugenicists developed scientific methods for testing their claims. Paralleling the development of eugenic

theory was the acceptance of intelligence as the primary indicator of human value. Eugenicists claimed that the IQ test could quantify innate intellectual ability in a single measurement, despite the objections of its creator, Alfred Binet.[45] The introduction of "mental tests" at the turn of the century to measure intelligence replaced physical measurements, such as cranial capacity, as the means of determining human inferiority and superiority. Intelligence testing was the ideal instrument for distinguishing the fitness of stocks because it provided "a seemingly objective, quantifiable measure that could be used to rank genetically transmitted ability," writes Rutgers psychology professor William H. Tucker.[46] Psychologists used the tests to demonstrate that blacks and recent immigrants from southern and eastern Europe were intellectually inferior to Americans of Anglo Saxon or Scandinavian descent.

Eugenic science went hand in hand with Jim Crow laws, official disenfranchisement of blacks, and the entrenchment of formal racial segregation—all Progressive reforms intended to strengthen the social order.[47] On a single day in March 1924, the Virginia legislature passed two laws that jointly promoted the state's eugenicist and racist agendas. The first, "An Act to provide for the sexual sterilization of inmates of state institutions in certain cases," authorized the forced sterilization of people confined to government asylums because they were deemed to be "feebleminded." The second half of Virginia's eugenicist scheme was the Racial Integrity Act, which banned interracial marriage. Both focused on controlling reproduction as a means of maintaining the racial order, and both acts would eventually end up in the U.S. Supreme Court.

Six months after the passage of the sterilization statute, the Virginia Colony for Epileptics and Feebleminded approved the sterilization of a seventeen-year-old girl named Carrie Buck. Buck, the daughter of an allegedly feebleminded woman, was committed to the colony by her foster parents when she became pregnant as a result of rape by their nephew.[48] Her court-appointed guardian, in cooperation with the colony's superintendent, appealed the order as a test case challenging the new law. The case made its way to the U.S. Supreme Court. Noting that her sexual depravity was "a typical picture of the low-grade moron," Harry Laughlin testified in a deposition that Buck belonged to the "shiftless, ignorant, and worthless class of anti-social whites of the South." The colony also submitted testimony that her daughter, Vivian, was mentally below average. In its 1927 decision *Buck*

v. Bell, the Supreme Court upheld the statute.[49] Rejecting arguments that the Virginia sterilization law violated Buck's equal protection and due process rights, Justice Oliver Wendell Holmes explained the state's interest in preemptively sterilizing people with hereditary defects: "It is better for all the world if, instead of waiting to execute degenerate offspring for crime, or let them starve for their imbecility, society can prevent those who are manifestly unfit from continuing their kind." Holmes, himself an ardent eugenicist, gave eugenic theory the imprimatur of constitutional law in his infamous declaration, "Three generations of imbeciles are enough." He imposed his social judgment condemning Carrie Buck for being poor and pregnant in a disguise of scientific authority.

The Racial Integrity Act required the racial classification of every person at birth and made marriage between whites and anyone with a trace of Negro ancestry a crime. It expressed eugenicists' worry that sexual intermingling between blacks and whites would deteriorate the white race. Over half the papers presented at the Second International Congress of Eugenics in 1921 concerned the biological and social harms caused by marriages between people from different racial groups. Walter Ashby Plecker, the Virginia registrar of vital statistics, was charged with maintaining racial integrity by zealously enforcing the antimiscegenation law. In a letter to Laughlin dated June 18, 1931, Plecker expressed his fears about the genetic contamination caused by intermarriage: "I would feel somewhat easier about the matter if I thought that these near-whites would not produce children with negroid characteristics. I have never felt justified in believing that in some instances the children of mulattoes are really white under Mendel's Law."[50] Plecker selectively rejected scientific tenets that conflicted with his beliefs about racial difference. In 1967, the Virginia statute—a lingering artifact of eugenics—would be struck down by the landmark Supreme Court decision *Loving v. Virginia*.

Laughlin's 1922 survey, *Analysis of America's Melting Pot*, studied the ethnic background of the institutionalized population in order to demonstrate that recent immigrants made up a disproportionate share of the nation's socially degenerate members. Laughlin's conclusion that "the recent immigrants (largely from southern and eastern Europe), as a whole, present a higher percentage of inborn socially inadequate qualities than do the older stocks," helped persuade Congress to pass a 1924 law severely restricting immigration.[51] The Johnson-Reed Act, which set numeric quotas for immigration from nations worldwide, not only introduced the concept of the illegal alien,

who was denied any legal rights in the United States, but also defined this disqualification in racial terms.[52]

A year after Laughlin's survey was issued, a new edition of the popular book *The Passing of the Great Race*, by New York eugenicist Madison Grant, appeared. Grant, resident anthropologist of the American Museum of Natural History, similarly warned that the Nordic stock in America was threatened by racial intermixture with blacks and inferior immigrant groups, which inevitably produced children of the "lower" type. Portraying inferior stocks as public enemies, he described racial intermarriage as a "social and racial crime of the first magnitude."[53] *The Passing of the Great Race* was a bestseller, with four editions and numerous reprints published between 1916 and 1923. The *Saturday Evening Post* praised its reflection of "recent advances in the study of hereditary and other life sciences" and recommended it as a book that "every American should read."[54] Legislators quoted passages from the book during congressional debates on immigration restrictions, and President Theodore Roosevelt commended it as "the work of an American scholar and gentleman," stating that "all Americans should be immensely grateful to [Grant] for writing it."[55] Grant was regarded as an important scientist, while his detractors were labeled "Bolsheviks and Jews" who were biased against scholarly investigation of racial difference.

Grant intended readers to learn the central political lesson of eugenic science: that egalitarian social programs are incapable of improving society. As Ellsworth Huntington concluded in his commentary in the *Yale Review*, Grant demonstrated a "lesson of biology . . . that America is seriously endangering her future by making fetishes of equality, democracy, and universal education."[56] Eugenicists' motto was "Nature knows no equality."[57] These scientists argued that inequality is natural: the unequal conditions in which people live are dictated by nature and trying to change them is folly. So, too, 1950s segregationists described integration as a political ideology that disrupted the natural separation of races and threatened white citizens' freedoms. "Integration represents darkness, regimentation, totalitarianism, communism and destruction," declared Robert "Tut" Patterson, founder of the Citizens Council Association, an organization of white businessmen dedicated to preserving white supremacy.[58] Nobel Prize–winning scientist James Watson expressed this sentiment when he told a London newspaper in 2007 that he was "inherently gloomy about the prospect of Africa" because "all our social policies

are based on the fact that their intelligence is the same as ours—whereas all the testing says not really."[59]

Watson's remarks were considerably less socially acceptable in 2007 than they would have been in 1925. Shortly after his comments were made public, Watson was asked to resign his position as chancellor of Cold Spring Harbor Laboratory—the same laboratory that had once housed the Eugenics Record Office. By the 1940s, eugenics had been discredited both as bad science and as an excuse for racial hatred. American eugenicists who had initially supported the German sterilization law were shamed by its connection to the Nazi Holocaust.[60] After World War II, a central project of racial scientists became to explain why their investigations of intrinsic racial difference had nothing to do with racism.

The End of Racial Science?

The Carnegie Institute rescinded its support for eugenic studies at Cold Spring Harbor in 1939, and Harry Laughlin resigned as secretary of the Eugenics Record Office in 1941, marking the end of eugenics as an official social program in most of the United States. Beyond U.S. eugenics, the horrific outcome of Nazi racial science also generated a powerful challenge to the belief in the biological basis of race. Renowned scholars such as Columbia anthropologist Franz Boas and his prestigious cast of students, including Margaret Mead, Otto Klineberg, Ruth Benedict, Ashley Montagu, and Melville Herskovits, had demonstrated scientific errors in eugenicists' theories about inherited traits. Raised in a German Jewish home, Boas began teaching at Columbia University in 1896. Within three decades, he and his students had established anthropology as a respected discipline focused on studying culture instead of race.

On July 18, 1950, the *New York Times* ran a front-page story, "No Scientific Basis for Race Bias Found by World Panel of Experts."[61] That day, the United Nations Educational, Scientific, and Cultural Organization (UNESCO) issued a landmark "Statement on Race," drafted by an international committee of experts, declaring that race "is not so much a biological phenomenon as a social myth." The committee emphasized that human populations share most of their traits, meaning that "the likenesses among men are far greater than their differences." Rejecting the Nazi idea that some races are superior to

others, the UNESCO statement concluded that biological science demonstrated "the unity of mankind."

The UNESCO committee included scholars from multiple disciplines who were well known for their classic books contesting traditional views on race: Columbia University anthropologist Ashley Montagu, author of *Man's Most Dangerous Myth: The Fallacy of Race*; black sociologist E. Franklin Frazier, author of *Black Bourgeoisie* and *The Negro in the United States*; English humanist Aldous Huxley, author of *Brave New World*; Swedish economist Gunnar Myrdal, author of *An American Dilemma: The Negro Problem and Modern Democracy*; and geneticists Theodosius Dobzhansky and Leslie Dunn, whose 1946 book *Heredity, Race and Society* exposed the genetic fallacies underlying racial classifications.[62] In the 1930s, Dobzhansky and Dunn had joined five other Columbia professors to found the University Federation of Democracy and Intellectual Freedom, dedicated to ridding science of Nazi ideas about race.

The first UNESCO statement was met with a firestorm of criticism from physical anthropologists and geneticists who accused the drafters of allowing their political agenda to distort their scientific claims about race.[63] The following year, a modified UNESCO committee—this time staffed entirely by physical anthropologists and geneticists—issued a revised "Statement on the Nature of Race and Race Differences." Although the second committee unanimously rejected "the racialist position regarding purity of the races and the hierarchy of inferior and superior races to which this leads," it also made clear that scientists could continue to study innate differences between races without being racists. While the original committee insisted that there were no racial differences in mental traits, the 1951 statement conceded that "it is possible, though not proved, that some types of innate capacity for intellectual and emotional response are commoner in one human group than another." In addition, the 1951 statement repudiated the link the first committee made between biological theories of race and social inequality: "We wish to emphasize that equality of opportunity and equality in law in no way depend, as ethical principles, upon the assertion that human beings are in fact equal in endowment." This distinction enables scientists to research inherent racial inequalities while avowing allegiance to the legal and moral principles of human equality. Both UNESCO statements disclaimed the practice of ranking races. But neither document abandoned the concept of biological race altogether. Instead, both statements took issue with race as

an *ideological* doctrine of inferiority that was responsible for deadly social conflicts. They distinguished the Nazis' ideological use of race for repressive purposes from the scientific use of race for legitimate research.[64]

At the same time UNESCO issued its statements on race, the NAACP was waging a legal campaign to overturn segregationist state policies. The federal government, now engaged in international competition with the Soviet Union over the spread of communism, felt pressure to reduce blatant racial discrimination in order to gain allegiance from developing nations breaking free from colonial rulers.[65] In the 1954 landmark case *Brown v. Board of Education*, a unanimous U.S. Supreme Court held that public school segregation violated the Constitution because "separate educational facilities are inherently unequal." In rejecting the long-held separate-but-equal doctrine, the Court relied heavily on empirical data collected by the NAACP's expert, Kenneth Clark, showing that segregation caused psychological harm to black children. Clark's heartbreaking experiments that showed black children a white doll and a black doll and asked them, "Which is the nice doll?" no doubt ranks with Newton's apple as one of the best-known scientific studies.

Clark's use of science in the service of racial equality and the gains in black freedom of the 1960s were met by a political backlash that claimed scientific legitimacy. Carleton Putnam, longtime chairman of the board of Delta Airlines, published *Race and Reason: A Yankee View* in 1961, opposing the *Brown* decision on both anthropological and ideological grounds, with a fair share of hysteria about the debilitating effects on white civilization of mixing with inferior Negro genes. Endorsed by a lead review in the Books for Lawyers section of the American Bar Association Journal, *Race and Reason* kept open the debate about the scientific basis for integration accepted by the Supreme Court.[66] The following year, *The Origin of Races*, by Carleton Coon, a University of Pennsylvania professor and the president of the American Association of Physical Anthropologists, claimed once more to provide definitive proof that human races had separate origins. Coon identified five major races in hominid fossils and, based on cranial capacity, theorized that each had evolved toward modern *Homo sapiens* separately and at different rates—Caucasoids (Europeans) and Mongoloids (Asians) advanced the fastest, while Congoids (Africans), Capoids (the Bushmen of South Africa), and Australoids (Australian aborigines and nearby island populations) fell behind. "The length of time a subspecies has been in the sapiens state," Coon

postulated, determined "the levels of civilization attained by some of its populations."[67] (With today's more advanced knowledge of human ancestry, this theory would position Africans as the superior subspecies.)

Coon fought an academic battle opposing the revolution in anthropology instigated by the likes of Boas and Montagu. His theory on the origin of races was circulated widely by the media and provided fodder for Putnam and other segregationists. Nonetheless, when the physical anthropologists called a special meeting at their convention in 1961 to censure Putnam's book, Coon resigned his post as president.

Later, Berkeley psychologist Arthur Jensen, Harvard psychologist Richard Herrnstein, and Nobel laureate William Shockley, a Stanford physicist, argued that since genes determined intelligence and intelligence determined social achievement, racial inequality resulted from blacks' cognitive inferiority. The combination of black people's lower IQ scores and higher birth rates, they warned, rendered public programs not only futile for improving blacks' socioeconomic status but a threat to the nation's welfare. "Is there a danger that current welfare policies, unaided by eugenical foresight, could lead to the genetic enslavement of a substantial segment of our total population?" Jensen asked in his 1969 *Harvard Educational Review* article, "How Much Can We Boost IQ and Scholastic Achievement?" Twenty-five years later, Herrnstein and Charles Murray of the American Enterprise Institute rehashed the claim that social disparities stem from the higher fertility rates of genetically less intelligent groups in their controversial bestseller *The Bell Curve*.

Despite some scientists' use of genetic science to promote segregationist ideals, the horrors of Nazi science, the civil rights movement, and the emerging science of population genetics all raised hopes for a scientific consensus rejecting the typological meaning of race. In 1964, *The Concept of Race*, edited by Ashley Montagu, gave a platform for ten of the nation's preeminent biologists and anthropologists to propose replacing scientifically useless racial taxonomies with a more accurate account of human variation. One of the contributions, "On the Nonexistence of Human Races," by University of Michigan anthropologist Frank B. Livingstone, optimistically predicted:

> Just as Galileo's measurements and experiments paved the way for Newton's laws of motion, which totally replaced the Aristotelian laws of motion concerned as they were with describing the nature of bodies and their "essences," our newer genetic knowledge and the measurement of gene frequencies will replace the studies on the nature or essence of race and the mathematical theory of population genetics will replace the Linnaean system of nomenclature.[68]

Although Livingstone adhered to the nonexistence of human races, many biologists and anthropologists were interested in using population genetics to study race, not invalidate it. These scientists "merely believed that race needed to be reformed and refined in the wake of abuses by the eugenicists, white supremacists, and Nazis," observes sociologist Jenny Reardon.[69] By demonstrating the utility of population analysis to understanding how races were formed, leading evolutionary biologists convinced their peers to accept population genetics as the discipline's cutting-edge method. At a 1950 gathering of 129 scientists in Cold Spring Harbor, Joseph Birdsell, a physical anthropologist at UCLA, argued that "problems of human evolution and racial differentiation are essentially population problems. And their solutions will be advanced by borrowing techniques of analysis from the vigorous field of population genetics."[70] A growing view within biology, anthropology, and genetics was that the old racial categories derived from externally visible traits could be upgraded with scientific research on genetic differences that lay beneath the skin.

For many scientists, then, the emerging civil rights ethos did not make racial science untenable. Rather, it made it imperative for scientists to detach their study of biological race from societal racism. It was not the blatantly racist theorizing of Carleton Coon and his ilk that left its mark on today's racial science. Scientists who openly spew racial defamation risk being swiftly ushered out of the limelight, like James Watson. The imaginary wall more liberal-minded scientists erected, separating racial science from racial politics, became critical to the scientific validation of race in a post–civil rights culture that espouses racial equality.

Nevertheless, it is important to note that eugenics never really went away. While mainstream geneticists increasingly condemned what they referred to as "eugenics' excesses," North Carolina's eugenic sterilization program actually *expanded* after World War II and continued until 1974.[71] An investigation by the *Winston-Salem Journal* in the 1990s uncovered records documenting decisions by the Eugenics Board of North Carolina, a panel of five bureaucrats who enforced the state's 1929 eugenics law (revised in 1933) authorizing compulsory sterilization for epilepsy, disability, and feeblemindedness. The

program gained momentum when the North Carolina Human Betterment League, formed in 1947 by hosiery magnate James G. Hanes and others in Winston-Salem's elite, joined with Dr. Clarence Gamble, Bostonian heir to the Proctor & Gamble fortune, and local members of the medical community to launch a massive publicity campaign promoting sterilization to improve the state's mental fitness.

Scientists at Wake Forest University School of Medicine also played a key role. Dr. C. Nash Herndon, chair of the department of medical genetics at the university's medical school, helped to promote the state's involuntary sterilization program by serving as president of the Human Betterment League and issuing academic reports advocating eugenics. He also conducted his own eugenic studies with funding from Wickliffe Draper, a wealthy segregationist. Draper was so committed to the merger of Jim Crow and eugenics that he traveled to Germany in 1935 to attend a Nazi eugenics conference. After supporting Herndon's research with two grants in the 1950s, Draper donated $100,000 to the school, solicited by the medical school dean, on the condition that the school promised not to advocate interracial marriage and consider teaching students about therapeutic sterilization. Other faculty members performed involuntary sterilizations on patients at state hospitals, with and without authorization from the Eugenics Board.[72]

In all, the program counted close to eight thousand victims. During the eugenics era, a majority of those sterilized were white. But in the program's final decade, the target shifted to poor black women. Social workers supervising welfare caseloads were empowered to petition the Eugenics Board for orders sterilizing their clients. The board approved 95 percent of the petitions it received, acting largely out of social prejudice against the women it ordered to be sterilized. In 1965, a social worker told Nial Cox, a pregnant teenager living at home, that her family would lose government aid unless she was sterilized. A doctor performed the surgery because she was black, on welfare, and had had a baby out of wedlock. The program ordered sterilizations of two thousand children, including a ten-year-old boy who was castrated.

Governor Mike Easley and Dr. William Applegate, dean of Wake Forest's medical school, apologized after the *Journal*'s revelations in 2003. But eugenicist philosophy continues to make its way into state and federal reproductive, welfare, and immigration policies.[73] Republican congressman Mark

Kirk of Illinois (elected in 2010 to fill the Senate seat vacated by Barack Obama) stated on the House floor during deliberations over a 2007 foreign family-planning provision that slowing the rate of growth of Mexico's population would "reduce the long-term illegal immigration pressure on America's borders."[74] Like eugenicists of old, Kirk argued for fixing a social problem by reducing the fertility rates of people believed to embody it. In reality, birth rates in Mexico have dropped over the last twenty-five years to 2.5 children per couple, very close to the 2.1 birth rate in the United States. But what really matters was the lawmaker's message: America can solve its immigration crisis by decreasing births of undocumented immigrants.

The Final Chapter?

The Human Genome Project was supposed to finally put an end to the biological definition of race. The idea of creating a map locating all the genes in the human body began circulating as early as 1985. By October 1990, the Human Genome Project was official. The National Institutes of Health (NIH) and the Department of Energy authorized $3 billion to be spent over fifteen years on an international venture involving Great Britain, France, Japan, China, and Germany to sequence the entire human genome. The U.S. government's research was headed by a fitting national figure—the ubiquitous James Watson, the geneticist who won a Nobel Prize for discovering DNA's double helix structure, who was then serving as director of the National Human Genome Research Institute. When Watson abruptly resigned his post in 1993, Francis Collins, an accomplished physician and molecular geneticist, accepted President Bill Clinton's invitation to assume leadership of the research institute and the genome project. The genome initiative became a race to the finish in 1998 when Craig Venter, who had defected from a government post to become chief scientist at the private firm Celera Genomics, threw down the gauntlet by promising to complete the genome map and release it to the public in three years.

To understand what it means to map the entire human genome, it is helpful to start with the biological unit being mapped: our genes. Genes are conceived as segments of a six-foot-long molecule called deoxyribonucleic acid, or DNA, that encodes instructions for making proteins. Each nucleus of the trillions of cells in the human body contains two copies of twenty-three

DNA strands, one from each parent, composing forty-six chromosomes. Although each cell has a complete set of DNA, only the portions that are important to the cell's particular function are activated.

How does one gene differ from another? DNA is composed of four kinds of units called nucleotides—adenine, cystosine, guanine, and thymine (A,C,G, and T)—that are strung together like beads on a necklace in different combinations. The sequence of these nucleotides functions like a code using four different letters that are arranged in an infinite variety of spellings. The cell uses part of the DNA code to help determine what sequence of amino acids to build into a protein and another part to help determine when and where to turn on or off a protein. Each person's genome—the complete set of DNA—is distinguished from someone else's by the precise chemical composition of the DNA making up their genes. The Human Genome Project identified the 20,000 to 25,000 genes in human DNA, sequenced the 3 billion base pairs that make up human DNA, and stored all this genetic information in databases.

On June 26, 2000, President Bill Clinton, flanked by Francis Collins and Craig Venter, marched into the East Room of the White House to unveil a working draft of the genomic survey. "Without a doubt, this is the most important, most wondrous map ever produced by humankind," Clinton proclaimed. The genome project was cheered as the Holy Grail that would disclose all the secrets of human life. It was supposed to reveal what it means to be human. Perhaps the most pressing question to be answered was, Is race real? During the 1990s, debates on race had once again permeated scientific circles. Every major scientific journal featured research studies, special issues, editorials, and commentaries on the scientific validity of race. What would mapping every human gene tell us about the biological basis for racial categories? Would scientists discover that race is written in our DNA?

That all three of the chief figures at the White House ceremony pronounced on the issue of race shows the intensity of the angst surrounding these questions. Their conclusion was unanimous: the Human Genome Project revealed that the human species cannot be divided into biological races. President Clinton famously announced, "I believe one of the great truths to emerge from this triumphant expedition inside the human genome is that in genetic terms, all human beings, regardless of race, are more than 99.9 percent the same."[75] Collins ended his remarks by saying, "I'm happy that today the only race that we are talking about is the human race." Venter reported

that Celera Genomics had sequenced the genomes of three women and two men who identified as Hispanic, Asian, Caucasian, and African American and found that "there's no way to tell one ethnicity from another." He bluntly declared, "Race has no genetic or scientific basis." The Human Genome Project confirmed what many leading biologists and anthropologists had concluded several decades earlier: race is a social and not a biological category. The project validated a shared humanity that many people had long known without the need for genetic evidence.

Clinton's announcement that human beings, regardless of race, are 99.9 percent genetically identical suggests an obvious question. Can't the 0.1 percent of genetic makeup that people do not share encompass important racial differences? "After all, dogs and wolves are nearly identical at the genetic level, but the difference between a dog and a wolf is huge," a man pointed out at a conference I attended not long afterward.

This 99.9 percent sound bite, commonly deployed to debunk the biological meaning of race, is not enough to prove that race is not biological. Human beings share a majority of their estimated 22,000 genes with other mammals. As fellow primates, chimpanzees are extremely close to humans: we share 98.7 percent of our genes. Humans are also 90 percent genetically the same as mice. So bearing genetic similarity does not mean there are no important differences. With more than 3 billion nucleotide pairs in the human genome, even a 0.1 percent difference can be consequential. Still, as species go, *Homo sapiens* stand out as remarkably homogeneous. There is less genetic variation in the entire human race than in a typical wild population of chimpanzees. This means that what matters to understanding human genetic variation is not only the amount of genetic difference but what the differences are and how they are expressed and distributed.

While it is true that the 0.1 percent of human genetic difference is meaningful, it does not mean that human genetic difference is organized by race. The genetic variation found in the human species is not grouped in discrete, genetically distinct units scientists can identify as races. To the contrary, human genetic diversity occurs in a continuum that cannot be partitioned by clear boundaries and that crosses what are commonly considered racial lines. Consider how, in the United States, people with any amount of African ancestry are grouped together in one race. Yet the greatest amount of genetic diversity in the world exists in sub-Saharan Africa. *Homo sapiens* originated in Africa and remained there for almost 200,000 years before

spreading relatively recently throughout the rest of the globe, about 70,000 or 80,000 years ago. African populations vary the most because most of human genetic diversity evolved in Africa, and groups living there had more time to accumulate genetic differences. The people who migrated from Africa and dispersed throughout the globe carried in their genomes only a portion of variants found in the ancestral inhabitants. "From a genetic perspective," writes anthropologist Deborah Bolnick, "non-Africans are essentially a subset of Africans."[76]

In fact, the entire range of human variation for some genetic traits can be found on the African continent.[77] A person from the Congo, a person from South Africa, and a person from Ethiopia are more genetically different from each other than from a person from France.[78] This seems astonishing because we are so used to focusing on a tiny set of physical features, especially skin color, to assign people to racial categories. It turns out that the genes contributing to these phenotypic differences represent a minute and relatively insignificant fraction of our genotypes and do not reflect the total picture of genetic variation among groups.[79] What's more, these phenotypic differences do not even fall neatly into the categories known as races. Rather, the physical features are "discordant" among groups—they are assorted randomly and do not come assembled in racial packages. "Sub-Saharan Africa is home to both the tallest (Maasai) and the shortest (pygmies) people, and dark skin is found in all equatorial populations, not just in the 'Black race' as defined in the United States," writes Richard S. Cooper, a physician epidemiologist at Loyola University.[80] And most genetic variation is found *within* any human population.[81]

How can it be that there is more genetic difference among people within each race than between races? Imagine a white congregation worshipping one Sunday morning at a Lutheran church while a black congregation worships at a Baptist church across town. Our racial habits might lead us at first to view everyone within each church as alike and the two congregations as very different. But think more carefully: each and every person at the Lutheran service is unique and genetically different from every other congregant, especially if they come from different families. Any two unrelated people in the pews have millions of genetic differences, contributing to (though not determining) their looks, personalities, and health.[82] The same is true for every single person at the Baptist church. And those millions of genetic differences that set each parishioner apart as a unique human being, whether

black or white, are greater than the differences that separate the black and white congregations. The more significant differences between the two churches—in overall health and wealth, in the neighborhood where each is located, in the songs sung during service—stem from social, not biological, causes.

By the late 1990s, many American biologists, led by Harvard evolutionary geneticist Richard Lewontin, agreed that "no justification can be offered" for continuing the biological concept of race.[83] The American Anthropological Association endorsed this view in a 1997 statement: "genetic data also show that, no matter how racial groups are defined, two people from the same racial group are about as different from each other as two people from any two different racial groups."[84] But this pronouncement came under attack when new genomic technologies permitted analysis of gene clustering on a global scale. In 2003, British statistician and evolutionary biologist A.W.F. Edwards faulted Lewontin for basing his conclusions on simple comparisons of individual genes rather than a more complex structure of correlated gene frequencies. While Lewontin compared a relatively small number of specific points on the DNA molecule, or loci, in different populations, Edwards recommended looking at small frequency differences across many loci to detect population structure. Lewontin, Edwards charged, had mounted "an unjustified assault on human classification, which he deplored for social reasons."[85]

Edwards was proposing that geneticists should examine the question of human genetic difference at the level of gene clusters instead of in terms of individual genes. But Edwards did not refute Lewontin's main claim: that there is more genetic variation within populations than between them, especially when it comes to races. Lewontin did not ignore biology to support his social ideology; he was not making an ideological claim. To the contrary, he argued that there is no biological support for the ideological project of racial classification.

Another reason why human genetic difference defies racial classification is that there are no genetic boundary lines that mark off a handful of large, discrete groups. The genetic differences that exist among populations are characterized by gradual changes across geographic regions, not sharp, categorical distinctions.[86] Groups of people across the globe have varying frequencies of polymorphic genes, which are genes with any of several differing nucleotide sequences. Molecular biologists can use the frequency of alternate alleles, or versions of genes, to trace the geographic ancestry of

populations. But they can't draw a line where one set of gene frequencies stops and another begins. Furthermore, these differences are a matter of frequencies of certain gene mutations, not the absence or presence of genotypes.[87] There is no such thing as a set of genes that belongs exclusively to one group and not another. The *clinal*, or gradually changing, nature of geographical genetic difference is complicated further by the migration and mixing that human groups have engaged in since prehistoric times. Race collapses infinite diversity into a few discrete categories that in reality cannot be demarcated genetically.

Did the portrait of genetic unity and diversity unveiled by the Human Genome Project finally put an end to the biological concept of race once and for all? Would genomic science usher in an understanding of human variation devoid of antiquated racial classifications? The story I tell next reveals just the opposite: scientists are using advanced genomic theories and technologies to create a new racial science that claims to divide the human species into natural groups without the taint of racism.

PART II

The New Racial Science