

Race and Genetics: Somber History, Troubled Present

Hussein Mohsen^{a,b,*}

^a*Computational Biology and Bioinformatics, Yale University, New Haven, CT*; ^b*History of Science and Medicine, Yale University, New Haven, CT*

Following the completion of the Human Genome Project (HGP) in 2003, advances in DNA sequencing technologies further popularized the field of genomics and brought its social ramifications to the fore. Scholars across disciplines recently voiced serious concerns about the re-emergence of genomic research that might be used to justify racism. In this piece, I trace the history of attempts to biologize the concept of race and its diffused presence in today's genomic research. I then include a brief analysis inspired by concepts from the field of Science and Technology Studies (STS) to suggest selected ways to produce better scientific knowledge. The text highlights historic landmarks of interest to science practitioners curious about the ways science of the past co-shapes science of the present. I then argue that science has never been isolated from the socio-political climate it is produced in; instead, it has been morphed by its surroundings and historically used as a potent tool to justify systemic oppression.

INTRODUCTION

In his 1508 poem, “The Dance of Seven Deadly Sins,” William Dunbar was the first to adopt the Spanish term “raza,” which refers to breeds of animals, into English. Dunbar used the modified term “race” to describe a group of people who share the same biological lineage—a group that shares a paternal ancestor in the language of the time [1]. Close to two centuries followed until scientists attempted to confer biological meaning on racial categorizations, a period that witnessed the beginnings of the transatlantic slave trade, expanded colonial conquests originating from Europe, and a series of advancements in Western science known as the scientific revolution.

This piece tells the story of the scientific craft of

the race concept that still shadows today's science. The sections below track the diffusion of the politics of each time period into scientific practice and sheds the light on the organic exchange between science and society. Eugenicians were not a group of “insular bad scientists,” mathematical equations and numbers were not neutral, and scientists still remembered with ultimate reverence produced science that biologized imagined hierarchies of human variation. The second part of the text touches on contemporary debates on the use of race in genomic research and offers suggestions toward scientific practice that critically engages with the history of science.

EARLY DEFINITIONS OF RACE IN SCIENCE (1684-1860)

*To whom all correspondence should be addressed: Hussein Mohsen, 266 Whitney Ave, Bass 426, New Haven, CT 06520; ORCID ID:0000-0002-6263-8865 Tel: 812-369-5253, E-mail: hussein.mohsen@yale.edu.

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While the first scientific system that divides human beings into races was introduced by French physician Francois Bernier in 1684, the most known system was established by Swedish naturalist Carl Linnaeus in the tenth edition of *Systema Naturae* (1758). Reflecting his belief in the Great Chain of Being, a concept that orders all forms of being in a hierarchy created by god [2], he classified *Homo sapiens* hierarchically into four groups: *europaeus*, *americanus*, *asiaticus*, and *afēr*, color-coded as white, red, yellow, and black. Linnaeus placed the group he belonged to at the top of the hierarchy. He wrote that *europaeus* had flowing blonde hair and blue eyes and were vigorous, smart, inventive, and ruled by law. Using a quite different set of descriptors, he posited that *americanus* had thick straight black hair and were stubborn and ruled by custom; *asiaticus* were melancholic, greedy, and ruled by opinion; and at the bottom of his hierarchy, *afēr* had kinky hair and were lazy, crafty, careless, and ruled by caprice. Linnaeus took the liberty to include social and personality traits alongside physical ones to further entrench racial hierarchies, and other scientists followed. For example, French naturalist Georges Cuvier, whose name is still among the 72 inscribed on the Eiffel Tower [3], divided human beings into three categories (Caucasian, Mongolian, and Ethiopian) he claimed to recognize by distinctive characters. German anatomist Johan Blumenbach in his turn suggested five categories: Caucasian, Mongolian, Ethiopian, American, and Malay [1].

The list of *varying* racial categorizations in the name of Science goes on, but four recurring themes connect them: (i) European male scientists who imposed these systems recognized difference as inferiority, (ii) they placed the group they believed to belong to on top based on subjective value judgements [4], (iii) conflated personality and social traits with physical ones, and (iv) assumed that demarcation is possible to categorize human variation. The driving rationale behind these categorizations was about to take a new shape while maintaining the same ill-defined categories.

EUGENICS: TENUOUS THEORIES, MAINSTREAM SCIENCE

Before the “eugenic turn,” Charles Darwin’s works reshaped debates on evolution. In two of his main works, *Origin of Species* (1859) and *The Descent of Man, and Selection in Relation to Sex* (1871), Darwin rocked the boat by an evolutionary theory that contradicts with the fixity of god-made hierarchies of being. While he asserted that all humans share the same origin—against the multi-origin theory of polygenism—Darwin talked about gradations between the “highest men of high races and lowest savages.” Mixed with the politics of the time, his ideas on natural selection were interpreted to place the

white races at the front of the evolutionary trail; assumed white superiority wore the cloak of “the survival of the fittest [5].”

Six years after Darwin’s first seminal book, his cousin Francis Galton suggested that human “bodies, minds and capabilities of development” are derived from their biological forefathers. Gradually laying the pieces of the eugenic puzzle, Galton also suggested that races “propagate their types” and differ in character, intellect, color, and shape. In the words of historian and ethicist Michael Yudell, Galton “expressed his views about race through science [...] and his social prejudices became scientific ones [6].” In 1869, Galton measured the “worth of races” and established a racial hierarchy based on intelligence using the law of deviation from average. In 1883, he introduced eugenics as the science to improve human stock and suggested how selective breeding could be used to give “more suitable races [...] a better chance of prevailing.” Ideas by him and his fellow eugenicists—many of whom were at the heart of the scientific establishment of the time—started to gain momentum during the late 1860s.

The eugenics movement found fertile soil during times when debates on race occupied a central position in English politics [6]; in the United States, this aspect was not quite different. In *The Condemnation of Blackness*, professor of History, Race, and Public Policy at Harvard University Khalil Gibran Muhammad describes this time period which followed the end of the Civil War (1865) as one with “[...] instabilities within scientific and popular discourses on the nature and meaning of blackness [7].” In 1904, Charles Davenport, Harvard-trained biologist and professor at the University of Chicago, convinced the Carnegie Institute to fund the establishment of Cold Spring Harbor Laboratory (CSHL) for the study of evolution [6]. Six years later, the Eugenics Record Office was established at CSHL and eugenics rapidly started to become part of the mainstream with proponents including scholars and entrepreneurs across the political spectrum [1].

A key element of eugenic thought pertains to its versatility when it comes to the meanings underlying the race concept. Mainstream US American eugenicists explicitly expressed their prejudices towards black Americans, but their target populations varied depending on the socio-political debates of the time. Before the 1924 passage of the Johnson-Reed Act which imposed wide restrictions on immigration to the United States, for example, key eugenicists turned their attacks against southern and eastern European immigrants in attempt to preserve the purity of an imagined “American Race”—a race of white people from northern and western Europe [6].

While eugenics is often linked exclusively to its extreme theories that helped enact Nazi policies of “ra-

cial hygiene” and mass extermination, it is essential to highlight that eugenic circles included different streams of ideas. This very heterogeneity of thought created factions within the movement and contributed to its decline. In 1927, for instance, prominent statistician and geneticist at Johns Hopkins University Raymond Pearl, then eugenicist himself, attacked scientists who filled the field of genetics with “emotional appeals to class and race prejudices [6].” Notable works by antiracist and anti-eugenicist scholars like W. E. B. Du Bois and Franz Boas further exposed the prejudices that plagued the science under the guise of numbers.

During the 1930s, more scientists joined the side of Du Bois and Boas furthering the decay of eugenics. In 1939, the Eugenics Record Office at CSHL closed its doors, and horrendous crimes by the Third Reich in Nazi Germany targeting Jews, Roma and Sinti, Slavs, individuals with disability, and homosexuals among other groups [8] co-rendered eugenics unacceptable in scientific circles [6]. The 1940s witnessed an end to explicit eugenic practice in US American mainstream science, but embedded legacies of the movement persisted. Confusion, the element that historically coupled the association of biology and race, continued, and albeit being deeply flawed at the scientific level, the concept of race remained a topic biologists grappled with.

PERSISTENCE OF RACIAL CATEGORIES IN GENOMIC RESEARCH: WHAT’S NEXT?

Following the eugenic episode that heavily drew genetics and heritability with a quantitative brush, a long series of discoveries—of the DNA double helix structure, restriction enzymes, and Sanger sequencing among numerous others—created a toolbox that allowed scientists to sequence the first (near-)complete human genome [9]. The Human Genome Project (1990-2003) was a milestone and historic opportunity to initiate an end to the race and genetics debate. During the announcement of the working draft of the human genome in June 2000, both Francis Collins (then-head of the US National Human Genome Research Institute) and Craig Venter (head of Celera Genomics) declared in clear terms the lack of scientific or genetic basis of race [1]. Similar commentaries by other scientists followed shortly after, but racial categorizations persisted in genomics. Rapid advancements in DNA sequencing further popularized the field, and legacies that long permeated science led to racialized designs underlying numerous studies.

The historic opportunity to end a historically loaded debate on race and genetics became one through which attempts to—implicitly or explicitly—re-enforce unscientific categories using science. In 2016, prominent scholars from the humanities and natural sciences issued

a call in *Science* to take race out of genetic research [10], but the debate was about to spike again. On March 23, 2018, Harvard geneticist David Reich published an opinion piece in the *New York Times* titled “How Genetic is Changing our Understanding of ‘Race’.” Reich strongly rejected earlier statements on race and ancestry made by Nobel laureate James Watson and former *Times* science writer Nicholas Wade and expressed “deep sympathy for the concern that genetic discoveries could be misused to justify racism.” Yet, he then claimed that as a geneticist he knows that “it is no longer possible to ignore average genetic differences among ‘races’,” providing examples that conflated ancestry with race, relied on the quantitative reductionism of averages, and failed to address the everyday ramifications of pathologizing socially constructed (racial or ancestral) categories to which millions of human beings belong or were historically forced to. To the last point, for example, historian Rana E. Hogarth provides in *Medicalizing Blackness* extensive examples to demonstrate the oppressive potency of associating blackness with disease during the 1780-1840 period. Hogarth writes, “[...] pathologizing blackness also served the purpose of expanding existing social divisions. The pathological and even normative traits that physicians attributed to black bodies became tools of oppression and power [...]” Only one week after Reich’s piece, 67 scholars across disciplines published a critical open letter in response. Titled “How Not To Talk About Race and Genetics,” signatories eloquently laid their arguments to explain the complexity of the race concept and stark limitations of quantitative genetics to grasp its fluid histories [11].

But Reich’s examples represent only a tiny fraction of a stream of genomic research. Despite a recent progressive shift towards ancestral categories, racial categories still appear regularly in genomic literature under different names that do sometimes conflate with ancestry (e.g. “Caucasian [12],” “black [13],” “African American [14],” “white [15],” etc.). Study designs pre-classify collected data based on categories of or related to race and dig downhill in attempt to find genetic differences associated with measured outcomes. In a stark yet far from lone example, a 2019 study in *Translational Psychiatry* attempted to find “genome-wide significant” signals associated with “suicide attempt severity” in Yale-Penn sample cohorts of European Americans and African Americans [16].

There are reasons the lens many geneticists default to frames human variation through scientifically tenuous racial categories. There are reasons many think of “Africa” and “Asia,” massive geographies with incredible richness and diversity on every front, as homogeneous entities that fit into narrow categories. There are reasons many think of an imagined monochromatic dark skin when they think

of the peoples of the African continent and overlook a wide spectrum of skin color that's been studied recently by a group of scientists [17]. The presence of the race concept in genomics research is far from "objective" as was its introduction to science.

A radical shift in deep-rooted scientific practices requires serious efforts that transcends brief, often ineffective statements issued by scientists after—inadvertently at best, carelessly at worst—wide-opening doors for the misuse of science [18,19]. Diversifying scientific circles to include all demographics with respect to race (in its social meanings), gender, socio-economic status, disability, and sexual orientation is crucial *at all levels of decision making* and scientific practice to allow for a fair distribution of power and agency. While some progress has been made, diversity programs within institutions need to go beyond tokenism and over-representing historically underrepresented groups on marketing brochures rather than inside labs and leading boards.

The emergence of racial hierarchies that placed the white race on top during times of colonization and slavery is not a coincidence. Similar perspectives allow us to recognize how science, historically dominated by male practitioners, have constantly propagated misogynistic ideas. Hence, no demographic can single-handedly draw an accurate picture of scientific knowledge. Coupled with serious power shifts that transcend slogans, comprehensive diversity and inclusion will produce better science and bring myriad *situated knowledges* to the table [20].

Equally important, wide-open and equal-agency collaborations between scholars across disciplines must be central throughout the scientific process. Researchers from the (i) natural and physical sciences and (ii) the humanities and social sciences must share decision making on issues related to scientific study design, hypothesis generation, and science communication. Perspectives of Race scholars who spent long years to grasp the complexity of the race concept, for example, must be instrumental in shaping science that pertains to studying the effect of racial disparities on human biology—rather than an imagined “underlying genetic basis of race [10].” Such transitions in knowledge making, again, require shifts in power dynamics that often go upheld in public but hurdled in practice.

CONCLUSION

Ever since its importation into science during the seventeenth century, the concept of race has stood on unreliable grounds. Ever-changing historic transformations morphed the definitions of the concept, but its use persisted with a legacy that still shadows genomic research. The story of race and biology is emblematic to the social constructivist approach to scientific knowledge

production. Scientists throughout time have not lived or practiced in political vacuums; rather, politics of their times have shaped and gotten shaped by their science. Pervasive assumptions about the neutrality of scientific results fall short to explain the story of race, and this essay sheds light on this story knit by connected threads of history—in the past, present, and future.

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