

Reproducing Intelligence

Eugenics and Behavior Genetics Past and Present

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In the early months of 2023, a thin, white, wealthy, bespectacled Pennsylvania couple began gracing the pages of newspapers and covers of magazines across the United States. Fearing that declining birth rates around the world would lead to what they termed “civilizational collapse,” this couple—Malcolm and Simone Collins—had started the Pronatalist Foundation to encourage elite couples in wealthy countries to have more children.¹ Theirs is a high-tech pronatalism, advocating not just the use of assisted reproductive technologies but also polygenic embryo screening, a brand-new and yet unproven technique to identify the embryos in an in vitro batch with the lowest predicted risk of complex disease and the highest predicted capacity for mental health and educational success.² The term *pronatalism* refers to any effort to increase birth rates. The Collins’ pronatalism, however, is more akin to positive eugenics—efforts to increase births only among a segment of the population considered superior—and in their case to choose superior embryos as well.³

While it is technically *possible* to assess the educational aptitude of an embryo, such screening is not commercially available, and scientists have argued that using this information to select an embryo for implantation would have little effect on the resulting child’s actual educational attainment (compared to an embryo from the same biological parents selected at random).⁴ Nonetheless, a 2023 survey found that nearly 40 percent of participants would strongly consider using predicted educational attainment as a basis on which to select their own embryos if such information were available at no cost.⁵ Simone and Malcolm Collins used a DIY version of this screening for their third and fourth children.⁶

Writing about the Collinses in *Bloomberg*, Carey Goldberg says that “choosing your embryo based on its odds of earning a graduate degree is still a long way

off from eugenics.”⁷ She is wrong. Eugenics is a scientific and political program first described in 1865 by the English polymath Francis Galton. He began with a policy proposal: that a range of social problems could be solved by breeding humans like livestock, selecting for socially desirable characteristics and against socially undesirable characteristics.⁸ He then developed a scientific program that aimed to support selective breeding by demonstrating that mental and moral traits are primarily determined by biological material that is passed intact from generation to generation, what we now know as DNA.⁹ In the pursuit of such evidence, Galton and his followers developed some of the fundamental tools of inferential statistics, tests for measuring intelligence, and methods for estimating the heritability of intelligence, or the proportion of variance in intelligence attributable to genetic variation.

Galton developed the concept of eugenics in England during a time when workers demanded the right to vote and when colonial subjects challenged imperial power in various parts of the world, most notably in the 1857 uprising against the British East India Company and the 1865 Morant Bay Rebellion in Jamaica. Galton claimed that the English class structure reflected variation in the biological inheritance of intelligence—those who had inherited more intelligence had higher positions in the social hierarchy—and that Britain ruled its empire because Europeans (and especially Anglo-Saxons) on average had more hereditary intelligence than did the non-white inhabitants of other continents.¹⁰ His eugenic principles naturalized metropolitan socioeconomic inequality and imperial domination, and proposed a biological alternative to democratization and decolonization.

Although Galton’s ideas did not get much traction initially, they began to catch on around the turn of the twentieth century. By the start of World War II, eugenics movements—also described in the chapters by Mark Fedyk, Lisa Ikemoto, and Meaghan O’Keefe—existed on every inhabited continent.¹¹ In the United States, eugenicists contended that Galton had shown the folly of the democratic project, disproving the claim that “all men are created equal.”¹² Today, eugenics is often conflated with scientific racism. Scientific racists contended that members of different racially defined groups were not created equal. Eugenicists contended that even members of the same racially defined group were not created equal. Scientists established numerous eugenic organizations in the United States in the first decades of the twentieth century (many were established by the same people), conducting and promoting research on the inheritance of intelligence and other mental and moral qualities, and advocating for immigration restriction and involuntary sterilization.¹³

The word *eugenics* typically gets equated with policies regarding sterilization, immigration restriction, or genocide, but not with the scientific research that underpinned such policies. In the historical record, however, the two are impossible to separate. From Galton’s day to the present, advocates of eugenic policies

and programs have drawn on research into the measurement and inheritance of intelligence for support, and the scientists involved in that research have been among the most ardent proponents of eugenic policies and programs. They referred to their own science as eugenics and taught eugenics courses in universities.¹⁴ Scientists' advocacy for eugenic policies might be understandable if the science of intelligence and its inheritance provided clear indications that differential intelligence is the primary driver of socioeconomic and racial inequality, and that differences in intelligence are primarily driven by genetic variation, but the science has always been inconclusive at best. Scientists today (in the 2020s) are only just beginning to figure out which genes might be involved in the development of human intelligence. Whether or how variations in those genes might produce different levels of intelligence from person to person (or group to group) remains unknown.

Eugenic policies and proposals, therefore, have always been *underdetermined* by the science. As this chapter will show, empirical evidence has never clearly supported scientists' claims, either that genetic variation is an important cause of social problems or that selective breeding could solve them. Instead, scientists' support for eugenic policies tends to shape the way they interpret and communicate their findings. In other words, the science—or at least its interpretation and communication—is often *overdetermined* by support for eugenic policies. Eugenic theory is a biological instantiation of racism and classism (the idea that socioeconomic and racial inequality inhere in the bodies of poor people and people of color rather than the structures of society) that long predates research into potential genetic causes of racial or socioeconomic differentials in intelligence. Such research, therefore, is subject to the influence of racism and classism at every stage of the process, from study design to communication of results. Advocacy for breeding programs is at the extreme end of eugenic policy proposals. Eugenic science has also underpinned advocacy against the redistribution of power and resources by suggesting that the existing order of things is natural and therefore changeable only through biological intervention or totalitarianism.¹⁵ Science that claims to show a biological basis for existing racial and socioeconomic inequality therefore serves as a powerful antidemocratic force and deterrent to social change even in the absence of advocacy for selective breeding.

If selecting an embryo on the basis of its predicted educational potential doesn't *look* like eugenics to today's observers, that is because popular understandings of eugenics are overshadowed by the Holocaust. Discussions of eugenics frequently use the policies of the Third Reich as their benchmark, rather than the ideas of Francis Galton or the activities of the numerous eugenic organizations in the United States. As a result, they mistakenly reduce eugenics to genocide, race (pseudo)science, and state control over reproduction. But eugenics had a long and sordid history before and after the Holocaust, and it looked different from place to

place. In the United States, it was remarkably flexible, adapting to shifting public opinion on racism, to developments in classical and molecular genetics, to the invention of assisted reproductive technologies, and to the rise of neoliberalism.

This chapter explores the long historical roots of recent research into the genomic correlates of education—the research that makes embryo selection possible. This research applies cutting-edge molecular methods to an older field of study, behavior genetics, whose history is intimately connected to that of eugenics. By tracing the institutional and intellectual relationship between behavior genetics and eugenics across the twentieth century and into the twenty-first, this chapter demonstrates that eugenics and behavior genetics pushed one another forward. Each advanced and responded to advances in the other, and made use of advances in assisted reproductive technology, even as many behavior geneticists began to distance themselves and their field from eugenics in the 1970s. The story focuses primarily on the United States, as behavior genetics inspired and received support from a version of eugenics that emerged in the United States in the 1930s and is intimately connected to the history of American race politics and the American civil rights movement.

Historians have identified the close relationship between eugenics and intelligence testing in the United States at the beginning of the twentieth century, demonstrating how eugenic principles shaped the development of intelligence testing and how the results of intelligence testing furthered eugenic projects.¹⁶ The story typically ends, however, with the institutionalization of intelligence testing during and after World War I, and the use of wartime intelligence testing results to advocate for federal restrictions on immigration and the passage of state-level eugenic sterilization laws.¹⁷

This chapter continues the story, documenting how the eugenic aims of intelligence testers in the United States gave rise to the twin and adoption studies that transformed American eugenics and formed the core of behavior genetics until after the Human Genome Project. It also demonstrates that, as scientists developed more precise ways to measure the influence of DNA on intelligence and education—first through twin and adoption studies and more recently through genome-wide association studies—genetic influences have become less determinate and more elusive. Scientists still know very little about which genes may influence intelligence or education, and nothing at all about the biochemical mechanisms through which they may do so. Nonetheless, throughout this period, behavior geneticists have presented their research to the public *as if* it indicated a decisive role for genetics, and have advocated for policies premised on that overdrawn conclusion. The determinacy (and sometimes outright determinism) of scientists' public statements about the genetic causes of social outcomes is therefore at odds with the indeterminacy revealed by their own science, and this *indeterminate genetic determinism* has advanced a range of eugenic projects, from efforts to resegregate American public education in

the 1960s to a sperm bank for Nobel Prize winners in the 1980s to polygenic embryo selection today.

INTELLIGENCE AND ITS HERITABILITY

Across the second half of the nineteenth century, Galton advocated for reproductive selection on a range of desirable characteristics. However, he often combined them into a conglomerate he termed “civic worth” and conflated with intelligence. Galton never developed an absolute metric for intelligence or civic worth; instead, he simply used socioeconomic status as a relative measure of it.¹⁸ In fact, the first intelligence test was not developed for eugenic purposes. Created in 1905 by French psychologists Alfred Binet and Theodore Simon, the Binet-Simon test was designed to identify children who had fallen behind in school, so they could be given remedial education to help them catch up.¹⁹ The test consisted of age-graded problem sets, designed so that approximately two-thirds to three-quarters of children of a particular age could solve the problems designated for that age.²⁰ Among other things, eight-year-olds were expected to be able to count down from twenty to zero, and nine-year-olds were expected to be able to name the months of the year in order.²¹ The test measured things children were expected to have learned, not their innate capacity.

The meaning of the test changed, however, when it was imported to the United States by Henry Herbert Goddard, director of research at the Vineland Training School for Feeble-Minded Girls and Boys in New Jersey. Feeble-mindedness was a central concept in American eugenics at the turn of the twentieth century. A catchall term describing those who deviated from the social norms of the day, it equated an unwillingness or inability to conform with substandard intelligence. Goddard presented the Binet-Simon test to his American colleagues as an objective tool to identify feeble-minded individuals, not so they could receive remedial education, but so they could be prevented from spreading their feeble-mindedness to future generations, either by institutionalization or by sterilization.²²

Working closely with Charles Davenport, an American eugenicist who had collaborated with Galton in England, Goddard hired female fieldworkers to collect data on patterns of feeble-mindedness in the families of Vineland children.²³ To manage these data, Davenport established the Eugenics Record Office (ERO) at Cold Spring Harbor, New York, in 1910 with a grant from the railroad heiress Mary Harriman. The ERO would eventually receive support from the Carnegie Institution for Science and the Rockefeller Foundation, two of the largest American philanthropies of the day.

By 1912 Goddard had collected enough data to publish a book titled *The Kallikak Family: A Study in the Heredity of Feeble-Mindedness*. The book told the story of Martin Kallikak, a pseudonym created from the Greek words *kallos* (beauty) and *kakos* (bad). Kallikak, Goddard claimed, was a Revolutionary War hero who

had fathered two lines of descendants: one with his Quaker wife and the other with a “feeble-minded” barmaid he had impregnated on his way home from the battlefield. According to Goddard, the descendants of Kallikak’s wife were prosperous and intelligent, while the descendants of the barmaid were nearly all “feeble-minded,” with Kallikak’s great-great-great-granddaughter ending up at Vine-land and thereby coming to Goddard’s attention.²⁴ The book became a national bestseller, popularizing eugenics for the first time in the United States.²⁵

During World War I, Goddard teamed up with the Stanford University psychologist Lewis Terman to produce an intelligence test for US army recruits, evaluating over 1.7 million men before the armistice.²⁶ In the early years of the war, Terman revised the Binet-Simon test, renaming it the Stanford-Binet. Whereas the Binet-Simon, as used by Goddard, had primarily classified individuals as either feeble-minded or normal, the Stanford-Binet drew on the concept of the intelligence quotient (IQ), introduced in 1912 by German psychologist William Stern, to produce a continuous measure of intelligence across the spectrum from low to high. Terman claimed that the test measured a person’s innate capacity and therefore reflected their genetic value, or what Galton had termed “hereditary genius.” Terman had explicitly eugenic aims for his test, predicting that it would “bring tens of thousands of these high-grade defectives under the surveillance and protection of society,” which “will ultimately result in curtailing the reproduction of feeble-mindedness and in the elimination of an enormous amount of crime, pauperism, and industrial inefficiency.”²⁷

Results of army intelligence testing during World War I appeared to demonstrate a hereditary basis for the racial and socioeconomic inequality of the day. Following a pattern that could have been predicted by Galton, African Americans earned the lowest scores, followed by immigrants, with those from southern and eastern Europe earning lower scores than those from northern and western Europe. Native-born white men had the highest scores, but theirs were directly proportional to their socioeconomic status, with higher-class men receiving higher scores and lower-class men receiving lower scores.²⁸ Overall, more than half of American recruits had a mental age of fourteen or lower. Harry Laughlin, superintendent of the ERO, used these results to lobby for immigration restriction at the federal level and for eugenic sterilization laws at the state level.²⁹ Immigration restriction intensified in the mid-1920s, and 30 states adopted sterilization laws prior to World War II.³⁰ Over 33,000 Americans were sterilized under these laws between 1907 and 1939, with more sterilized after World War II.³¹

Just as Galton’s eugenic theories had legitimated the restriction of democracy in Great Britain and the British Empire, Goddard, Terman, and other eugenic psychologists warned that most Americans did not have the innate intelligence required to participate in democratic self-government.³² Intelligence tests had classified them as mental children, in need of superintendence by their supposedly natural superiors. Critics of these antidemocratic allegations, most prominently

the journalist Walter Lippmann, countered that intelligence testing itself, not the low intelligence of the US population, posed the real threat to democracy.³³ Lippmann challenged Terman's key claims, first that a high IQ qualified one to lead society and second that IQ was inherited biologically.³⁴ Terman spent the rest of his life trying to prove the first point by following a cohort of high-IQ California children into adulthood.³⁵ These gifted girls and boys grew into amazingly accomplished women and men, though their success can't be attributed entirely to their IQ: Terman provided them with lifelong guidance, connections, and letters of recommendation.³⁶ Due to Terman's influence, a disproportionate number attended Stanford University.

Terman encouraged his students and other young educational psychologists to develop an answer to Lippmann's second critique by demonstrating that intelligence was inherited rather than acquired. This goal would prove elusive for Terman and continues to elude researchers today. Attempts to identify a genetic basis for intelligence built upon the modern evolutionary synthesis and a related statistical concept developed by the eugenic statistician Ronald A. Fisher, whom we met in the chapter by Mark Fedyk: the analysis of variance.³⁷ Theorizing that nature and nurture act independently to produce individual outcomes (which we now know is not true—nature and nurture are inextricably intertwined), Fisher contended that it was possible to measure the amount of variance in a trait in a sample that was caused by genetic (as opposed to environmental, or nongenetic) difference, a measure that, in the 1930s, came to be known as "heritability."³⁸ Heritability quickly became an important concept in animal husbandry, as it allowed breeders to estimate the effects of selective reproduction on future generations, under controlled environments. Eugenists were interested in it for the same reason.

Animal researchers could estimate the heritability of given traits in given populations through breeding experiments, but educational psychologists could not. Instead, they adapted an analytic method developed by the animal geneticist Sewall Wright, known as path analysis. Path analysis allowed psychologists to decompose correlations between relatives in intelligence and other traits into genetic and environmental components by comparing sets of relatives with the same level of environmental similarity but different levels of genetic relatedness, such as adoptive parent-child pairs compared to biological parent-child pairs and monozygotic (identical) twin pairs compared to dizygotic (fraternal) twin pairs.³⁹ Terman edited the 1928 *Yearbook of the National Society for the Study of Education*, for which he solicited numerous path analytic studies of intelligence, hoping to establish, once and for all, that intelligence was inherited rather than acquired.⁴⁰ Yet these studies proved inconclusive. Each showed that intelligence was, in general, more tightly correlated among people who were more closely related, indicating some genetic influence. However, they did not definitively quantify the heritability of intelligence, and they indicated that nongenetic factors also play an important role in the development of intelligence. Terman nonetheless summarized these

findings as evidence that a child's environment makes little difference to their intelligence. Regardless of environment, Terman concluded, "the feeble-minded remain feeble-minded, the dull remain dull, the average remain average, and the superior remain superior."⁴¹ For Terman, these studies vindicated his assertion that intelligence tests provided an indication of innate genetic worth.

In the 1930s, however, psychologists would further challenge Terman's claim by demonstrating that IQ differences between Black and white Americans, and between US-born and non-US-born Americans, were driven largely by differences in home language and educational opportunities. In 1930 the Princeton University psychologist Carl Brigham, previously a strong proponent of northwest European superiority, admitted that his wartime findings on the genetic inferiority of southern and eastern European immigrants had been "without foundation." Further research had indicated that "comparative studies of various national and racial groups may not be made with existing tests," which penalized non-English speakers.⁴² Beyond language, IQ tests relied on knowledge of and adherence to particular social norms. Terman had standardized the Stanford-Binet test on US-born white middle-class schoolchildren and adults in California, and many questions required cultural- and class-specific knowledge.⁴³ In 1935 two books by the psychologist Otto Klineberg attacked the contention that white Americans are innately more intelligent than Black Americans. Klineberg demonstrated that African Americans living in the North had higher IQ scores on average than white Americans living in the South, and that African Americans who moved from the South to the North showed greater gains in IQ with longer residence in the North.⁴⁴

In the United States, intelligence testing and methods to estimate the heritability of intelligence were developed by adherents of eugenic ideology, who sought scientific evidence that intelligence was unequally distributed—both within and between groups defined by race and national origin—and that the distribution of intelligence was biologically determined. During the first decades of the twentieth century, when industrialization had produced immense socioeconomic inequality, intelligence testing and heritability studies generated apparent scientific evidence against social reform and in favor of selective reproduction and restrictions on democracy that facilitated selective reproduction. Although eugenics focused on biological explanations for *socioeconomic* inequality, it also undergirded a new scientific racism, one that looked to differences in average intelligence between groups as evidence of group-level superiority and inferiority.

Support for older forms of scientific racism began to wane at the end of the 1920s and the beginning of the 1930s, as scientists continually failed to find clear biological lines of demarcation between racially defined groups, and as race science became associated with the fascism emerging in Europe.⁴⁵ This turn away from scientific racism did not, however, signal the end of eugenics in the United States. In the 1930s, a new set of leaders at the American Eugenics Society (AES) rebranded eugenics. They developed a new eugenics program for the United States

that was at least nominally free of the racism that was beginning to fall out of fashion and that minimized the state control over reproduction that was becoming a hallmark of European fascism.

REBRANDING EUGENICS

The AES was a relative latecomer to the eugenics scene in the United States, having been established only in 1926 by Charles Davenport, Harry Laughlin, and other eugenicists of their generation. It underwent a leadership transition in the 1930s. Older eugenicists, for whom eugenics had been inseparable from scientific racism, and who had focused their policy agenda on sterilization and immigration restriction, stepped down. Younger eugenicists stepped up, including Terman's former student and heritability researcher Barbara Burks. The most influential of these younger eugenicists was Frederick Henry Osborn, nephew of noted paleontologist and eugenicist Henry Fairfield Osborn, who had been a longtime president of the American Museum of Natural History and a founder of the AES.⁴⁶ Osborn, Burks, and their associates recognized that a eugenics program needed popular support in order to succeed in a democracy, and that popular support depended on scientific credibility.⁴⁷ They therefore created a new American eugenics program in the 1930s, one that reflected the current state of heritability research, jettisoned overt racism, and relied on market pressures rather than state power to influence birth rates.

The mission of the AES remained, as it had always been, "selecting the better and suppressing the poorer stocks."⁴⁸ Eugenicists of the older generation had understood race and national origin as indicators of supposed genetic quality. After all, the army intelligence tests had demonstrated that African Americans had lower intelligence scores than white Americans, and that foreign-born white men had lower intelligence scores than US-born white men. The younger eugenicists, however, argued that eugenic selection should be made on the basis of *individual* attributes rather than race or national origin. The attribute that was most salient to Osborn was a person's position in the socioeconomic hierarchy. He believed heritability studies provided good evidence that differences in intelligence between members of different socioeconomic strata were, at least to some extent, genetic in origin.⁴⁹

Osborn did not, however, recommend that state or federal governments explicitly demand higher birth rates from higher-class couples or lower birth rates from lower-class couples. State control of reproduction was quickly becoming associated in the American popular imaginary with European fascism, and Osborn recognized that a successful eugenics program for the United States would need to be compatible with democracy. As noted in the chapter by Lisa Ikemoto, the Supreme Court had affirmed the constitutionality of eugenic sterilization in the 1927 opinion *Buck v. Bell*. Osborn, however, knew that the science of genetics was not yet

developed enough to support a sterilization program that went beyond “carriers of severe defect.”⁵⁰ The rest of the population would have to voluntarily have the number of children appropriate to their supposed level of genetic quality.

Osborn’s proposed eugenics program therefore centered a set of social norms and financial incentives that would guide middle-class and wealthy couples to have more children and guide working-class and poor couples to have fewer. For wealthy couples, he expected tax breaks would encourage them to have more children. For middle-class couples, he recommended salaries proportional to family size and college scholarships for their children.⁵¹ Osborn attributed large families among the poor to two things: ignorance of birth control and desperate conditions that undermined the initiative to use birth control. He therefore predicted that “better housing, and the improvement of economic conditions would bring a new sense of responsibility to the majority of these parents, and the extension of birth control knowledge, with new and cheaper methods of contraception, would then tend to reduce the proportion of very large families, and bring these groups below the replacement level,” meaning fewer people in each successive generation.⁵² Osborn did not expect that ameliorating the economic conditions of the poor would have any direct effect on improving society. Since he understood poverty to result from hereditarily low intelligence, he expected that real improvement would occur only through a reduction in family size among the poor, which would gradually take their genes out of circulation. He recognized that reducing the size of poor families without direct intervention would also necessitate the cultivation of new social norms, such as “a public opinion which will not tolerate families of more than one or two children among the socially inadequate, the dependent, the marginal economic.”⁵³

Although Osborn cited heritability research as evidence that socioeconomic status was a result of hereditary intelligence, heritability studies also demonstrated a role for the environment in the development of intelligence. They therefore generated popular support for efforts to improve the home and school environments of American children. To appease this sentiment, Osborn laid an environmentalist veneer on top of his hereditarian program. He emphasized that wealthier families provided better home environments for their children, agreeing with environmentalists “that the largest possible number of children should be brought up in the homes best fitted to develop their character and their intelligence, and the smallest possible proportion brought up by parents unable or unwilling to accept responsibility for such a home.”⁵⁴ Osborn did not believe that these environments alone would increase intelligence, reduce poverty, or solve any other social problems, however. Rather, the environments proxied socioeconomic status, and therefore genetic quality, and Osborn believed that increasing the number of births to genetically superior parents and reducing the number of births to genetically inferior parents would increase intelligence in the aggregate and thereby ameliorate poverty.⁵⁵

The 1930s therefore saw the emergence of a new brand of eugenics in the United States, one that is almost unrecognizable as eugenics if we take the policies of the Nazi government as our benchmark. Indeed, the proponents of this new American eugenics explicitly aimed to distinguish their program from the race-based and state-led policies that characterized German eugenics. The new leaders of the AES stopped talking about race, paid lip service to the role of home and school environments in the development of children's intelligence, and increasingly relied on individuals making market-based choices about the composition of their families. So what makes it eugenics? To begin with, its proponents called it eugenics, and called themselves eugenicists. They were the American *Eugenics Society*. More importantly, their program closely adhered to Galton's eugenic ideas and proposals, naturalizing socioeconomic inequality by presenting it as a result of genetic variation and proposing policies that would have enhanced the life chances of the middle class and the wealthy while diminishing those of the working class and the poor.

THE RISE OF BEHAVIOR GENETICS

Osborn believed that science would eventually prove the value of his proposals. Rather than waiting for science to catch up to eugenic theory, however, he helped it along by nurturing fledgling scientific subfields that he saw as potential allies for his eugenic project and whose practitioners needed support. In the 1930s, this was demography; in the 1950s, it was medical genetics and genetic counseling; and in the 1960s, it was behavior genetics, a subfield of psychology that aims to find genetic causes for human (and animal) behaviors and social outcomes.⁵⁶ Across the second half of the twentieth century, behavior genetics would lend valuable support to Osborn's eugenics program, generating apparent evidence that intelligence has a substantial genetic component, and that even the seemingly non-genetic influences on intelligence are themselves under genetic control. Behavior genetics also intersected with the backlash against the civil rights movement, opening a space for a new kind of scientific racism based in genetics.

By the beginning of the 1960s, Osborn had grown concerned that neither demographers nor geneticists were taking seriously the effects of changing birth rates on the intelligence of the American people.⁵⁷ He organized a series of conferences in Princeton, New Jersey, between 1964 and 1969 that aimed to put demographers and geneticists into conversation with one another. Over the years, the conferences drew in more and more psychologists working on the genetics of behavior, including Jerry Hirsch, Gardner Lindzey, John Loehlin, and Irving Gottesman.⁵⁸ These psychologists were the heirs to the research program on intelligence and its heritability that had been inaugurated by Lewis Terman and Barbara Burks in the 1920s. In 1970 they created the Behavior Genetics Association (BGA), with funding from the AES.⁵⁹ The two organizations remained close, connected by interlocking directorates.

Even before the BGA officially launched, however, the new field was thrown into controversy over the relationship between genetics, intelligence, and race. The prelude to the controversy was a 1967 publication in the *Proceedings of the National Academy of Sciences* by the UC Berkeley educational psychologist Arthur Jensen. Up to that point, psychologists had used a range of methods to estimate the heritability of intelligence.⁶⁰ There was no consensus about how the heritability of intelligence should be estimated, what the heritability of intelligence was, or what the heritability of intelligence *meant* beyond its technical definition.⁶¹ Nobody could agree on what a high or low value of heritability was, or on what a high or low level of heritability indicated about the development of intelligence or its potential fixity or malleability. In the 1967 article, Jensen claimed to have answered these questions. He proposed a method that would become standard in the new field of behavior genetics for estimating the heritability of a trait in samples of monozygotic and dizygotic twins.⁶² This method still produced a range of heritability estimates for intelligence, since heritability is a property of the sample in which it is measured, not a property of the trait itself. Jensen nonetheless announced that intelligence is 80 percent heritable, meaning that 80 percent of the variance in intelligence in a population is due to genetic variation.

Since heritability can range only from 0 to 1 (100 percent), a heritability of 80 percent, or 0.8, seems quite high. It is important to remember, however, what heritability means. It is an estimate of how much of the variance in a trait in a sample is due to genetic variance in the sample. It says nothing about how susceptible the trait is to change through environmental interventions. Jensen, however, claimed otherwise. He argued that a heritability of 0.8 meant that “if everyone inherited the same genotype for intelligence . . . but all non genetic environmental variance . . . remained as is, people would differ, on the average, by 8 IQ points.” However, “if hereditary variance remained as is, but . . . *all* non genetic sources of individual differences were removed . . . , the average intellectual difference among people would be 16 IQ points.”⁶³ Jensen therefore argued that the higher the heritability of a trait, the less it could be altered through environmental manipulation.

Jensen *must* have known that this interpretation was simply untrue, as a 1958 study in rats had clearly demonstrated that genotype and environment are not independent of one another: the amount of difference genes make depends on the environment, and the amount of difference the environment makes depends on genes.⁶⁴ There is therefore no way to say how much variance there would be under a fixed environment, or how much variance there would be under a fixed genotype, without specific information about the environment or the genotype. In other words, the numbers Jensen provided for these hypothetical scenarios were pure speculation. He nonetheless announced that “these results decidedly contradict the popular notion that the environment is of predominant importance as a cause of individual differences in measured intelligence in our present society.”⁶⁵ Other scholars in the emergent field of behavior genetics would have known

that Jensen's conclusions were unwarranted. Publishing in *PNAS*, however, allowed Jensen to get away with these misleading claims. As a high-profile general science journal, its audience likely would not have known enough about the genetics of behavior to do anything other than take Jensen at his word.

Jensen's claims about the biological fixity of intelligence served a larger political purpose that became clear in 1969, when the controversy began in earnest. In an article published in the *Harvard Educational Review* (another nonspecialist journal), Jensen presented the high heritability of intelligence as evidence that programs like Head Start would never close the IQ gap between Black and white students in the United States because the gap was rooted in genetic difference.⁶⁶ Jensen called for the resegregation of American education, and for a eugenics program that would reduce the childbearing of all individuals with low IQs, which would have disproportionately targeted African Americans, given racial bias in IQ testing.

The Nobel Prize-winning physicist William Shockley had been using his scientific celebrity status to advance similar claims for a few years by that point, and Jensen's article seemed to add the scientific authority that Shockley lacked because he didn't have a background in genetics.⁶⁷ The two men had met during Jensen's sabbatical at the Center for Advanced Study in the Behavioral Sciences at Stanford University in 1966–67, and both received support from the openly racist Pioneer Fund, whose explicit goal was to reinstate educational segregation in the United States after the Supreme Court's 1954 decision in *Brown v. Board of Education*.⁶⁸

Geneticists in the 1960s knew that Jensen's and Shockley's claims for a genetic basis to average IQ differences between Black and white Americans had no foundation in heritability studies or any other scientific evidence.⁶⁹ Heritability estimates refer only to the proportion of variance *within* a sample that is due to genetic variation; they can say nothing about the cause of differences *between* samples. As the population geneticist Richard Lewontin explained, "the fundamental error of Jensen's argument is to confuse heritability of a character within a population with heritability of the difference between two populations." This was a problem because, according to Lewontin, "between two populations, the concept of heritability of their difference is meaningless."⁷⁰ At the end of the 1960s, the heritability of intelligence had been estimated only in white Americans and Europeans. Such estimates provided no evidence regarding the source of average IQ differences between Black and white Americans or any relative genetic superiority or inferiority for either group vis-à-vis the other. Indeed, there was—and still is—no scientific method to assess the role of genetics in producing group-level differences in IQ or any other trait. Given the structural racism that has always plagued the United States, it is just as plausible that African Americans have the superior genetics, but that these are overwhelmed by an environment of severe oppression.⁷¹

In support of his racist claims, Jensen merely pointed to his 0.8 heritability estimate, arguing that it showed environment to play little role at all in the

development of intelligence; he claimed that average differences between racially defined groups therefore *must* have at least some genetic component. Lewontin pointed out in numerous scientific and public forums that Jensen was simply wrong: even if the heritability of intelligence among white Americans was 1, or 100 percent (essentially meaning that the environment made no contribution to differences in intelligence between white Americans), this would still say nothing about the causes of average differences in intelligence between Black and white Americans.⁷²

Other scientists argued that Jensen had overestimated the heritability of intelligence. This overestimate had occurred in three ways. First, the data Jensen had drawn from studies of identical twins reared apart were simply bogus. In some studies, the data appear to have been fabricated.⁷³ In all of the others, the phrase “reared apart” was interpreted so loosely as to be nearly meaningless.⁷⁴ Second, the method of estimating heritability by comparing samples of monozygotic twins to samples of dizygotic twins, which Jensen had presented as a new gold standard, was known at the time to overestimate heritability, both because monozygotic twins tend to grow up in more similar environments than dizygotic twins, and because monozygotic twins share *all* of their DNA—including interaction effects between genes (epistasis)—so they are actually more than twice as similar genetically as fraternal twins. For these reasons, the animal geneticist Douglas Falconer had explained in 1960 that a comparison between monozygotic and dizygotic twins can produce only an “upper limit” to estimates of heritability⁷⁵—that is, an overestimate.

The third way in which Jensen overestimated heritability was that his method attributed to genetics “any variance attributable to the interaction of genotype and environment,”⁷⁶ including genes that had no direct bearing on intelligence but that shaped a person’s social world in ways that might influence their intelligence. Education scholar Christopher “Sandy” Jencks explained what this meant in colloquial terms in 1972:

If, for example, a nation refuses to send children with red hair to school, the genes that cause red hair can be said to lower reading scores. This does not tell us that children with red hair cannot learn to read. Attributing redheads’ illiteracy to their genes would probably strike most readers as absurd under these circumstances. Yet that is precisely what traditional methods of estimating heritability do. If an individual’s genotype affects his environment, for whatever rational or irrational reason, and if this in turn affects his cognitive development, conventional methods of estimating heritability automatically attribute the entire effect to genes and none to environment.⁷⁷

While Jensen and other behavior geneticists were (and still are) happy to include this type of “genetic cause” in their heritability estimates (because it makes intelligence seem more “genetic”), it does not represent what most people think of when they imagine potential genetic effects on intelligence or education.⁷⁸ Behavior

genetics thus engages in a type of reasoning that is directly opposed to feminist theory, critical race theory, and disability studies, each of which separates social and somatic causes of inequality. Each of these liberatory approaches attributes inequality to discrimination, not to the bodies of the people being discriminated against. Behavior genetics does the opposite, presenting the effects of discrimination as originating in an individual's DNA. While feminist, antiracist, and disability scholars work toward dismantling discrimination by denaturalizing inequality, behavior genetics promotes discrimination by naturalizing inequality.

Many nonscientists reacted with outrage to Jensen's racism. Protesters disrupted his lectures and threatened physical harm. The tires on his car were slashed, and police had to open his mail. Jensen received bomb threats at his office, and his family had to seek protection.⁷⁹ This response allowed Jensen to portray himself as a victim, even as he advocated genocide against African Americans according to the UN definition of the term, which includes restricting births among a racially or ethnically defined group.⁸⁰ The public focus on Jensen's racism centered race differences in IQ in the popular debate, leaving unquestioned whether IQ had any practical significance. Galton and Terman had proposed that intelligence directly determined a person's socioeconomic status and value to society, but sociologists in the 1960s had found that *educational attainment* was the key to socioeconomic success in the United States, and that intelligence was not the sole determinant of educational attainment; a child's parents' socioeconomic status mattered at least as much.⁸¹

Jensen's supporters compared him and other behavior geneticists advancing racist claims to Galileo, a truth teller being persecuted by irrational zealots. The BGA, and the field of behavior genetics in general, rallied around him. As behavior geneticists defended Jensen, they became hyperfocused on estimating the heritability of mental traits and behaviors using methods similar to the one Jensen had described in 1967.⁸² These studies suggested that *all* traits and behaviors are heritable, though heritability estimates varied wildly between samples for the same trait.⁸³ They also appeared to show that social institutions—such as families, schools, and religion—played only a trivial role in individual outcomes.⁸⁴ Echoing Frederick Osborn, behavior geneticists claimed that a child's home environment was genetically determined, influenced by the genes of both parents and children. Even the amount of television a child watched, it seemed, was heritable.⁸⁵ In the epistemological space of behavior genetics, heritability created a kind of hall of mirrors from which there was no escape. Genes seemingly accounted for *all* social outcomes, though the methods that appeared to demonstrate this supposed fact provided no information about how any actual genetic variants might influence any of them.

Behavior geneticists reiterated Jensen's misleading statements about the meaning of heritability estimates and defended his "intellectual freedom" to make scientifically unwarranted claims about the relationship between race and intelligence.⁸⁶

To these white and mostly male scientists, protecting Jensen's freedom to speculate idly about the innate inferiority of an oppressed segment of society was more important than protecting his targets from the consequences of such speculation. An attempt by the wider genetics community—the Genetics Society of America (GSA)—to make a clear statement to the American public that “there is no convincing evidence of genetic difference in intelligence between races” failed because several GSA members insisted that it would be equally true to say that “there is no convincing evidence that there are *not* genetic differences in intelligence between races.”⁸⁷ Ultimately, the GSA took a nonposition on the issue, stating that “in our view, there is no convincing evidence as to whether there is or is not an appreciable genetic difference in intelligence between races.”⁸⁸

As behavior geneticists doubled down on their support for Jensen, the gulf between behavior genetics and other social sciences widened.⁸⁹ Researchers outside of behavior genetics put little stock in heritability studies, so behavior geneticists developed their own publishing ecosystem to bring their work into print. They published in eugenics journals, many of which were in the process of taking the word *eugenics* out of their titles (such as *Annals of Eugenics*, which became *Annals of Human Genetics* in 1954; *Eugenics Quarterly*, which became *Social Biology* in 1968 and is now *Biodemography and Social Biology*; and *Eugenics Review*, which became *Biosocial Science* in 1969). They also published in new journals specific to behavior genetics (such as *Behavior Genetics*, *Twin Research*, *Intelligence*, and *Personality and Individual Differences*). There was even a set of journals (such as *Mankind Quarterly*; *Journal of Social, Political, and Economic Studies*; and *Population and Environment*) for research that was too racist to appear in the other journals.⁹⁰

Those who did this racist research received generous support from the Pioneer Fund. When Richard Herrnstein and Charles Murray published *The Bell Curve* in 1994, they disproportionately cited scholars who had received support from the Pioneer Fund and whose work was published in *Mankind Quarterly*. Herrnstein and Murray's argument differed little from the one advanced by Jensen and Shockley in the 1960s. Publishing 25 years later, however, they could make the disingenuous and obviously untrue claim that the civil rights movement had equalized opportunities between Black and white Americans, so any remaining disparities in IQ or socioeconomic status “must” be genetic in origin.⁹¹ In response to widespread criticism of the book, 52 behavior geneticists, many of them Pioneer Fund grantees, published an open letter in the *Wall Street Journal* in Herrnstein and Murray's defense. Titled “Mainstream Science on Intelligence,” the letter portrayed the book as having been based in solid scientific research.⁹² The claims it made were considered “mainstream” only among behavior geneticists, but the letter's publication in the *Wall Street Journal* elevated those claims to the status of established fact among the American public. Similar ideas were also aired in other popular press outlets, such as *Science News*, which in 2022 apologized for its earlier support for eugenics and scientific racism.⁹³

Around the same time, behavior genetics authorized a bizarre eugenic venture. In 1980 the Repository for Germinal Choice opened just outside San Diego. One of the country's first sperm banks, it offered the gametes of Nobel Prize-winning (male) scientists to high-IQ women, who could presumably use them to have smarter children than they would be able to conceive with their male partners.⁹⁴ Few Nobel Prize winners ever donated their sperm—William Shockley was the only one who publicly admitted to having done so—and the repository eventually cast a wider net, trawling the halls of university math and science departments and targeting self-made businessmen.⁹⁵ Though it went out of business just before the turn of the millennium, the repository created a new consumer-focused model of sperm donation that has only gained in popularity since then, as described in the introduction to this volume and the chapter by Lisa Ikemoto.

The repository's legitimacy depended on the indeterminate genetic determinism that formed the heart of both Osborn's eugenics program and the field of behavior genetics. Men who donated sperm to the repository did not undergo any kind of genetic testing. Since behavior genetics had demonstrated the heritability of intelligence, the Nobel Prize itself served as a genetic marker. As sperm banking grew in popularity, choosing a donor at least partly on the basis of his test scores or educational attainment became the norm, demonstrating general public acceptance of eugenic principles grounded in the indeterminate determinism of behavior genetics.⁹⁶

During the last few decades of the twentieth century, the meaning of eugenics shifted yet again. Jensen, Shockley, and the Pioneer Fund used the word *eugenics* to describe their explicitly racist breeding proposals. A new organization, the American Eugenics Party, sprang up in the mid-1960s, vocally equating eugenics with racism.⁹⁷ It seemed that Osborn and the AES had lost the 30-year battle to divorce eugenics from racism in the popular imaginary. In 1972 the organization changed its name to the Society for the Study of Social Biology.⁹⁸ Its program remained the same, but its leaders, now primarily drawn from the new field of behavior genetics, wanted to distance the organization from the word *eugenics*, which was no longer separable from racism. Ironically, the behavior geneticists associated with the erstwhile AES were among the less racist members of their field.

As the leaders of the organization embraced the new name, they also projected it backward in time, reinterpreting the previous 30 years of the organization's history. In this revisionist version, eugenics had never changed; the organization had simply stopped doing eugenics around the time of World War II. The 1990s saw an outpouring of histories of eugenics, covering most parts of the world. The majority of this scholarship ended before 1945, producing the popular impression that eugenics had ended then as well.⁹⁹ Osborn's eugenics was no longer eugenics; it was now simply behavior genetics, medical genetics, genetic counseling, and fertility medicine. This rewriting allowed behavior geneticists to disavow and forget the eugenic origins of their field, even as some continued to hail Francis Galton

as its founder.¹⁰⁰ It also reduced eugenics to racism, genocide, and state control over reproduction, making it impossible to recognize or critique such eugenic initiatives as the Repository for Germinal Choice and the polygenic screening of embryos for educational potential because they aren't explicitly racist and they operate on the private market rather than through the state.

GOING MOLECULAR

By the turn of the twenty-first century, behavior genetics had demonstrated that all human outcomes are heritable but had produced no information about which genes might contribute to which outcomes or how they might do so. Some behavior geneticists continued to point to heritability estimates as evidence that average IQ differences between racially defined groups were genetic in origin, while others maintained that heritability demonstrated no such thing. The field had exhausted the limits of the twin method popularized by Jensen in 1967. The indeterminate determinism of behavior genetics underpinned sweeping claims: that the existing social order was rooted in genetic difference and therefore natural, just, and immutable; that most findings in sociology and economics were wrong because they didn't take genetics into account; and that racial inequality was a product of genetic difference rather than discrimination. At the beginning of the twenty-first century, behavior genetics went molecular.¹⁰¹

After the completion of the Human Genome Project, it began to seem possible that behavior geneticists might finally overcome their field's indeterminacy by locating the actual genes that contribute to intelligence and socioeconomic status. Other social scientists also became interested in genetics at this point. Sociologists and epidemiologists were excited to identify the genes that predispose people to complex diseases in order to better tease out the social causes.¹⁰² Some sociologists were also curious about the genetics of behavior.¹⁰³ In the quantitative social sciences, outcomes are always underdetermined, meaning that, no matter how many variables a model includes, it will never be able to account for all or even most of the variance in the outcome. Sociologists suspected that genes might explain why people in the same social circumstances often respond in different ways.¹⁰⁴

Behavior geneticists and their new partners initially looked for correlations between specific traits and genes with known biochemical effects. Within a decade, however, it became clear that this candidate-gene approach wasn't working. Researchers attained few positive results, and even fewer of these replicated. The most well-known is probably the so-called "warrior gene," a variant of the MAOA gene that was found to predispose men to aggressive behavior. When this result failed replication, behavior geneticists hypothesized that perhaps it caused aggression only in people who had been abused as children.¹⁰⁵ Further research, however, showed that children who were abused were more likely to

grow into aggressive adults regardless of which variant of MAOA they possess.¹⁰⁶ Nonetheless, Genex Diagnostics still sells an over-the-counter test for the “warrior gene.”

In 2012 a group of genetically oriented social scientists announced that “most reported genetic associations with general intelligence are probably false positives.”¹⁰⁷ This finding didn’t shake behavior geneticists’ faith that intelligence was driven largely by DNA, but it did encourage them to adopt a new paradigm. In keeping with the modern evolutionary synthesis, behavior geneticists had long worked on the assumption that intelligence and socioeconomic status were polygenic—that is, influenced by multiple genes. This assumption didn’t change, but after the failure of candidate-gene studies, behavior geneticists decided that, instead of looking for a small number of genes with large effects, they should look for a large number of genes with tiny effects.¹⁰⁸ They termed this idea the “fourth law of behavior genetics.”¹⁰⁹

Following the lead of medical and psychiatric genetics, behavior geneticists and their new collaborators in economics and sociology turned to genome-wide association studies. Known familiarly as GWAS, these hypothesis-free studies simultaneously but independently test millions of loci (single-nucleotide polymorphisms, or SNPs) across the genome for correlations with the outcome in question. Since they seek minuscule effects, they require enormous samples. The Social Science Genetic Association Consortium (SSGAC) was born in 2012 from the need for these huge samples. As a consortium, it can meta-analyze cohorts across a variety of studies to get the statistical power necessary to identify tiny genetic effects. But it was difficult to do a GWAS on intelligence, as most genetic studies hadn’t tested participants’ IQ, and those that had done so had used a variety of different metrics. Nearly all of the available data sources, however, had collected information about participants’ educational attainment, which became the SSGAC’s primary outcome of interest. Over the past 10 years, the vast majority of research in molecular behavior genetics has focused on educational attainment.

The SSGAC published its first GWAS of educational attainment in 2013.¹¹⁰ Although the study would prove highly consequential, its findings were not particularly impressive. It identified three SNPs with statistically significant correlations to educational attainment, each of which was associated with about a month of additional schooling. When summed into a polygenic score—which molecular behavior geneticists describe as an index of a person’s genomic propensity for a particular outcome (in this case, educational attainment)—DNA appeared to account for only about 2 percent of the variance in educational attainment, leaving 98 percent unexplained by genetics. Because the study used cutting-edge molecular methods, and because it was published in *Science*, arguably the highest-profile outlet for scientific research, it generated a new respectability for behavior genetics, even though the findings were meager and even though the idea that educational attainment has a genetic basis sounds preposterous to most people.

The popular press reported on the study with an appropriate level of skepticism. *Futurity* stated that “genes have small effect on length of education.”¹¹¹ The *Chronicle of Higher Education* announced that “there is no gene for finishing college.”¹¹² Even the *Wall Street Journal* cautioned readers that there probably isn’t a “gene for” height or intelligence.¹¹³ Those closer to the study, however, read its results differently. The SSGAC’s leadership believed that a GWAS run on a larger sample could produce a polygenic score that accounted for *more* than 2 percent of the variance in educational attainment. They were right. The SSGAC published two more studies of educational attainment, in 2016 and 2018, the latter using a discovery sample of 1.1 million people and generating a polygenic score that accounted for approximately 12 percent of the variance in educational attainment.¹¹⁴ Behavior geneticists and their new colleagues responded to the 2016 and 2018 studies with breathless enthusiasm, publishing books for popular audiences that touted GWAS and the polygenic scores they generated as a validation of the genetic determinism represented in twin and adoption studies.¹¹⁵ A fourth GWAS came out in 2022.¹¹⁶ With a sample size of 3.3 million, it managed to raise the proportion of variance accounted for up to 16 percent, as shown in figure 5.1. At the same time, however, the study showed that the majority of this effect was predictive but not causal. At most, it appears that only about 5 percent of the variance in educational attainment can be attributed to the *causal* effects of DNA.¹¹⁷ This is a far cry from the 40 percent heritability estimated for educational attainment from twin studies.¹¹⁸ Rather than suggesting that twin studies may have overestimated heritability, however, behavior geneticists argued that they simply needed different methods to find the genes responsible for the “missing heritability.”¹¹⁹

In addition to being small, molecular research shows that the effects of DNA are largely drowned out by those of childhood socioeconomic status. In a study of older white Americans, individuals with the *highest* polygenic scores for educational attainment but whose fathers were in the bottom quartile of the income distribution were less likely to have graduated from high school and college than were individuals with the *lowest* polygenic scores but whose fathers were in the top quartile of the income distribution.¹²⁰ Similarly, white kids with low polygenic scores for educational attainment are more likely to complete advanced math classes in high school if they attend wealthy schools than if they attend poor ones.¹²¹

A serious problem with molecular behavior genetics is that it includes only white people.¹²² This is true of most GWAS, as discussed in the chapter by Tina Rulli, not just GWAS for social or behavioral outcomes. These studies typically use supposedly “ancestrally homogenous” samples to avoid spurious associations, and they typically define “genetic ancestry” in continental terms.¹²³ This practice conflates genetic difference (which varies continuously across space) with US race categories (which identify people categorically according to the migration history of their ancestors), furthering the popular but incorrect belief that race categories represent genetic difference. It also produces faulty results. Researchers have

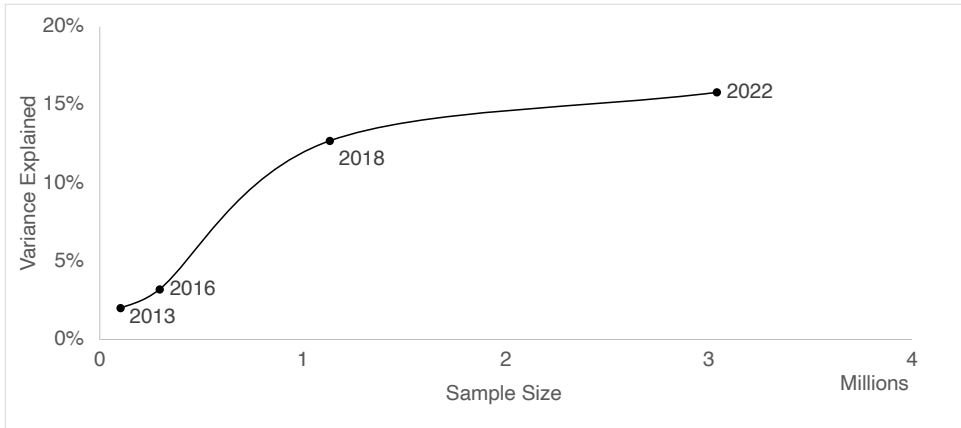


FIGURE 5.1. Genome-wide association studies (GWAS) of educational attainment. The x axis shows the size of the discovery sample; the y axis shows the proportion of variance accounted for by the resulting polygenic score. As the size of discovery samples increased, so, too, did the variance accounted for by the resulting polygenic scores, but further increases in the size of the discovery sample will likely have diminishing returns. Image created by the author.

found that the racial exclusivity of medical GWAS threatens to exacerbate health disparities,¹²⁴ and the same would undoubtedly be true if the GWAS for educational attainment were used for educational or policy purposes. Molecular behavior geneticists have largely brushed this problem aside, claiming that GWAS will become more representative any day now.¹²⁵ While it is true that initiatives like the Human Pangenome Reference and the National Institutes of Health's "All of Us" project are increasing the diversity of genome databases, much work still needs to be done to overcome the technical challenges to performing GWAS on genetically diverse samples. Until then, research in molecular behavior genetics will be limited primarily to white people, and research has demonstrated that polygenic scores are more predictive for some white people than for others.¹²⁶

Molecular behavior geneticists and their colleagues are well aware of these limitations and have published at length about them in venues frequented by specialists. But they present a very different image in venues intended for popular audiences. To be sure, most molecular behavior geneticists do not write for popular audiences. Those who do, however, routinely oversell the role of genetics in producing social outcomes and exaggerate how much we know about the role genetics plays in producing social outcomes. In public-facing publications, scientists misrepresent the findings of behavior genetics research—including their own research—to claim that genomic variation makes a decisive contribution to differences in intelligence, educational attainment, and socioeconomic status.¹²⁷ At times, popular descriptions of polygenic scores for educational attainment

and other socioeconomic outcomes equate them with “genes for” the outcomes they predict, and at other times as measures of the outcomes themselves.¹²⁸ Their authors describe polygenic scores as valuable tools for social scientific research, personalized educational interventions, and public policy.

Molecular behavior geneticists who write for popular audiences represent a tiny fraction of their field but serve as ambassadors to the general public, not just in the United States but also worldwide. As such, they foster the widespread acceptance of deterministic ideas about the effects of DNA on behavior, even when they themselves disclaim genetic determinism.¹²⁹ Many present themselves as political progressives. Nonetheless, their research has been used for a range of reactionary, eugenic, and racist purposes. The behavior geneticist Robert Plomin has argued that the polygenic score for educational attainment should be used to allocate educational opportunities and occupational placements, describing it as a test of intelligence and aptitude that people can neither cheat on nor study for.¹³⁰ In 2015 the sociologist Dalton Conley—a coauthor of the 2013 GWAS of educational attainment—published a popular online article describing how the polygenic score for educational attainment could be used for embryo selection.¹³¹ Although his vision was decidedly dystopian, it represented polygenic embryo selection as *effective* and may therefore have inspired readers like Simone and Malcolm Collins.

Polygenic scores are more determinate than the heritability estimates produced by twin and adoption studies in the sense that they provide individual predictions of the outcomes for which they are constructed, though the SSGAC has warned against using polygenic scores for educational attainment in this way. Polygenic scores are, however, still indeterminate in the sense that they provide no information about which variants *contribute* to the outcome in question (as opposed to simply predicting it) or how they do so. Variants contributing to educational attainment *might* make people more intelligent, but they might just make them taller or more attractive, such that other people respond to them in ways that encourage them to go farther in school. Overall, however, they simply contribute to the indeterminate genetic determinism of modern eugenics, producing more concrete evidence that genes matter in some way without producing any information about how.

Molecular methods, therefore, have considerably boosted the authority of behavior genetics without advancing scientific knowledge about how DNA might contribute to either intelligence or education. Scientists now have a sense of which genomic variants correlate with educational attainment in white people with supposedly European genetic ancestry, but they have also recognized that correlation is not the same as causation, and they are still no closer to identifying biochemical mechanisms that might link DNA to education or any social outcome. Nonetheless, behavior geneticists have widely publicized GWAS and the polygenic scores they produce as validation of the eugenic idea that intelligence and socioeconomic status have a genetic basis. Such hype inspired a New Jersey start-up, Genomic Prediction,

to make it possible for IVF patients to screen embryos for “intellectual disability,” the company’s disingenuous gloss for low predicted educational attainment, though this service was quietly discontinued at the end of 2020 due to bad press.

CONCLUSION: EUGENICS TODAY

When prospective parents like Simone and Malcolm Collins select embryos on the basis of their predicted educational attainment, they may not be aware that they are participating in eugenics. They are certainly not engaging in genocide, and the government is not selecting their embryos for them. The racism of the endeavor is hidden from view—companies that sell polygenic embryo screening do not advertise the fact that the science behind their product was carried out on white people and that polygenic scores are far more predictive for white people than for people of color.¹³² Such parents are also likely unaware that the science behind the polygenic score for educational attainment is indeterminate at best. Since 2016 behavior geneticists have presented GWAS and polygenic scores to the public as if they demonstrated a decisive role for genetics in educational attainment, playing down the fact that polygenic scores explain very little of the variance in educational attainment and the fact that any biochemical mechanisms that *might* connect DNA to educational attainment remain completely unknown. Since behavior geneticists have obscured their field’s long roots in eugenics, today’s prospective parents are likely unaware that the GWAS for educational attainment is simply the most technologically advanced approach in a eugenic research project that originated with Galton’s desire to breed humans like livestock. This research agenda has produced no information about which genes might contribute to the development of human intelligence or how they might do so, but has produced widespread acceptance of the idea that intelligence is largely under genetic control, that white people have more of the “genes for” intelligence than people of color, that the existing socioeconomic hierarchy is natural, and that social interventions can do little to change it.¹³³

The real problem with eugenics is not that the Collinses and their followers will actually be able to breed smarter children. As noted above, scientists have found that embryos selected on the basis of their polygenic score for educational attainment would be unlikely to attain much more education than a randomly selected embryo from the same biological parents.¹³⁴ Rather, it is that attributing socioeconomic inequality to genetic diversity is simply the wrong diagnosis, one that ignores a century of scientific, historical, and genetic research. As such, it can only point to ineffective or at best inefficient solutions that are more likely to perpetuate inequality than to overcome it. Eugenics doesn’t “work” by breeding better people; it works by convincing us that socioeconomic and racial inequalities are underpinned by biological variation, and that some people are therefore more deserving—of education, wealth, power, rights, and even life—than others.

It works by absolving governments, social institutions, and individuals from the responsibility of improving the world we all share.

The most chilling consequence of the SSGAC's research agenda probably could have been foreseen in advance. Just as Arthur Jensen, William Shockley, Richard Herrnstein, and Charles Murray called on heritability studies to advance the racist claims that African Americans have a lower genetic endowment of intelligence than white Americans, today's race scientists have pointed to the results of educational GWAS to make the same racist claims.¹³⁵ Although GWAS of educational attainment have been done only on white people, and although molecular behavior geneticists have warned against drawing any kind of racial comparisons on their basis, white nationalists have pointed to their results to make unsubstantiated assertions that African Americans have fewer of the intelligence- and education-producing variants than white Americans.¹³⁶ The results have been nothing short of devastating. In 2022 a white supremacist cited the SSGAC's third GWAS of educational attainment in a racist diatribe he posted shortly before perpetrating a mass shooting at a grocery store in an African American neighborhood in Buffalo, New York.¹³⁷ While the SSGAC is certainly not responsible for this heinous act of violence, it underscores how easy it is to unwittingly promote racism, inequality, and even genocide when we do not understand the history of eugenics and thereby fail to recognize the eugenic projects in which we may be participating.

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