**Race and Gender in Research**

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Because science is a social practice conducted by human beings who are embedded in cultures, scientific research itself is saturated with the ethical values, social norms, and political stakes of society.[[1]](#endnote-1) In this chapter, we explore two of the most studied and most damaging aspects of such societal influence on science: racial and gender biases. Science has been riddled with bias, abuse, and complicity when it comes to its mistreatment of people of color and women—not to mention poor people, disabled people, queer and trans\* people, Indigenous peoples, and other marginalized and minoritized groups—so much so that some have even questioned whether it is possible for science to abandon its historical links with hegemonic ideologies and systems of oppression.[[2]](#endnote-2) This chapter discusses two major domains of biological and medical research involving race and gender: cognitive-differences research and reproductive-health science. In each case, we explore the influence of sexist values like androcentric bias—where researchers focus on men and male bodies as the alleged “norm”—and racist values like white supremacy—where researchers privilege the cultures and attributes of white people as allegedly “superior” to those of people of color. Drawing on the insights of Black feminists, we analyze the ways in which biases involving race and gender intersect within the context of research.[[3]](#endnote-3) Our discussion aims to show how these social hierarchies can privilege and marginalize groups within the interlocking matrix of power and oppression, highlighting the complex interaction of these biases inside research communities.[[4]](#endnote-4)

 The solution to these problems of pervasive bias, we maintain, is not “value free” science, which would suffer from many of the same problems of antiracial “color-blind” ideology, such as false claims to neutrality and universality and the inability to articulate antiracist (and antisexist) practices.[[5]](#endnote-5) Instead, we suggest that while some biases can corrupt science (such as sexist and racist values), not all influences of societal values are necessarily negative: At times, influences of ethical values and social norms on research can actually improve science, particularly when a scientific community lacks the diversity to identify its own societal embeddedness and partial perspective.[[6]](#endnote-6) To better demonstrate how scientific objectivity depends on the diversity of its practitioners, we discuss the cultural and structural sources of hegemonic bias in homogeneous research communities, as well as promising developments toward equity in research practices.

**Biased Research Questions about “Cognitive Differences”**

All too often in scientific inquiry, researchers have studied human diversity in terms of *hierarchies* of difference. Under the veneer of scientific objectivity, this approach has normalized prejudices and naturalized social inequalities. For instance, over a century ago, when social scientists were engaged with studying “the Negro problem,” sociologist and philosopher W.E.B. Du Bois challenged this dominant framing for perpetuating racist stereotypes and for wrongly problematizing formerly enslaved peoples and their descendants for their own subordinate social status. Instead, Du Bois posited that “the problem of the Twentieth Century is the problem of the color-line” itself, and he sought to reorient sociology to more critically investigate how Black people had come to be conceptualized as “a problem” in the first place*.*[[7]](#endnote-7) This section explores how the framing of research questions can be biased by examining the history of alleged “cognitive differences” research.

 More specifically, the “science” of intelligence has often reified hierarchies of difference by gender, race, ability, etc. Western thinkers have long considered women a less perfect version of men for their “deficiency” in reason, morality, and self-control.[[8]](#endnote-8) In the mid-19th century, Charles Darwin used the alleged cognitive inferiority of women to explain female passivity relative to male virility: “Man is more courageous‚ pugnacious and energetic than woman‚ and has more inventive genius.”; and “Woman seems to differ from man in mental disposition‚ chiefly in her greater tenderness and less selfishness.”[[9]](#endnote-9) Darwin was not alone in considering women inherently less intelligent than men, often because of assumptions about women’s reproductive nature—despite criticisms of his androcentrism from contemporaries like Eliza Burt Gamble.[[10]](#endnote-10)

 Regarding racial differences, Darwin was a committed abolitionist of slavery, and he believed that his theory of evolution demonstrated how different human populations descended from an ancient common ancestor, against the popular idea at the time of separate divine creations resulting in different human races.[[11]](#endnote-11) Nevertheless, Darwin was often disparaging in his discussions of Black, Indigenous, and other people of color, and later evolutionary theorists like Darwin’s cousin Francis Galton (the founder of eugenics) advanced the theory that intelligence was a heritable trait, which was subject to natural selection and differed significantly between genetic races.[[12]](#endnote-12) In concert, scientists in the infamous field of craniometry used skull measurements to argue that non-Europeans were intellectually disadvantaged, despite serious methodological flaws including biased measurement and biased interpretation that were later pointed out by biologist Stephen J. Gould and corroborated by others.[[13]](#endnote-13) These craniometrists had interpreted the data to support existing unjust racial hierarchies (and human slavery) in methodologically flawed ways, despite the fact that cranial capacity is a poor measure of population-level intelligence.[[14]](#endnote-14)

 While much of the study of brain differences has focused on race, scientists also studied gender/sex differences and often likened the “inferiority” of women with that of people of color.[[15]](#endnote-15) There were critics of the studies claiming to show the cognitive inferiority of women, like statistician Alice Lee who compellingly demonstrated how those authors ignored the variation in cranial capacity among the anatomists who were men and how this variation overlapped with their women students. However, Lee herself maintained that people of European descent were still more evolutionarily advanced than people from Asia and Africa: after she concludes “there is no marked correlation between skull capacity and intellectual power in the case of either sex,” Lee nonetheless states that “the complexity of the convolutions of the brain, and the variety and efficiency of its commissures, rather than its actual size, are the characters we expect to differentiate race from race and sex from sex, and to have developed man’s civilisation.”[[16]](#endnote-16) This exemplifies what sociologist Patricia Hill Collins calls the matrix of domination, in which different axes of oppression interconnect, and these intersecting hierarchies of race and gender put women of color in double jeopardy.[[17]](#endnote-17) The colonial context of ongoing Western imperialism in Africa afforded European men of science (like naturalist George Cuvier) access to racialized & gendered biological materials (like brains, genitals, and bones of deceased Africans) from the bodies of trafficked women (like Sara Baartman) who had been objectified & commodified (as the “Hottentot Venus”) and displayed postmortem in colonial museums (for nearly two centuries in France, only to be repatriated to South Africa in 2002).[[18]](#endnote-18)

 While much cognitive research over the past several decades has sought to understand gender/sex differences through brain structure, studies on the corpus callosum suggest that ideas of “female-typical” and “male-typical” brains are misleading because they are based on negligible differences, which has been suggested to result from relative differences in brain volume.[[19]](#endnote-19) The key problem with such studies, as developmental biologist Anne Fausto-Sterling points out, is less about the data themselves and more about how findings of difference are interpreted to undermine equality.[[20]](#endnote-20) Accordingly, philosophers like Janet Kourany have argued that we ought to deprioritize cognitive differences research because it will confirm existing stereotypes and reinforce the unfair inequality of opportunities for women and people of color.[[21]](#endnote-21)

 To understand why this research is biased toward inequality, consider Elisabeth Lloyd’s Logic of Research Questions analysis:[[22]](#endnote-22) The primary research question of such inquiry is: “What brain structures explain the existing differences in cognitive capacities between men and women, white people and people of color, etc.”? Any responsive answers to this research question must include the following claims: “The existing differences in cognitive capacities between X and Y are explained by brain structure or functional difference Z….” A possible and responsive answer cannot begin: “There are no such cognitive differences between X and Y, which are therefore not explained by brain structure or function Z.” Instead, the question’s framing *assumes* group differences and is merely looking for answers from structures to make inferences to functional differences; therefore, this proposed research question sharply limits the possible answers of such research into the neurological or structural basis of cognitive possibilities involving human beings from different groups by gender, race, etc. Furthermore, the framing of the research question adversely affects the collection of evidence for its answer, such that the question above guides researchers to collect and label data in terms of groups that are *assumed separate from the outset*. The search for differences nearly ensures the finding of differences, whereas a more open question would not, such as “What brain structures explain the *variety* and *diversity* of cognitive capacities across the human species?” By looking for variety and diversity rather than differences, this new question is less committed to difference, less hierarchical about any found differences, and thus less biased toward reinforcing hierarchies.

 In contrast to Kourany’s suggestion to deprioritize the search for cognitive differences, others like neuroscientist Deboleena Roy have a somewhat different perspective: Roy maintains that scientists should remain open to finding cognitive differences and not assume that moral equality entails physiological sameness.[[23]](#endnote-23) Rather than replicating the old, hackneyed hierarchies of difference, Roy contends neuroscientists ought to study diversity in a more positive light, seeking more nuanced and dynamic concepts of difference, such as through developmental systems theory and neuroplasticity and without determinist and essentialist ideas about gender/sex and race.[[24]](#endnote-24) Whatever solution one accepts for these design problems in studying cognitive differences, one thing is clear: neuroscientists must remain critical and vigilant to identify the influence of values on their research questions and to avoid problematic framings and limiting assumptions.[[25]](#endnote-25)

**Biased Selection & Mistreatment of Subjects in Reproductive Research**

Another major domain of pervasive abuse, bias, and injustice in research is reproductive health and medicine. When the famed tennis star Serena Williams nearly died after her first pregnancy in 2018, it was not just an isolated affair but part of the maternal mortality crisis in the US: Black women face two to three times the risk of dying from pregnancy; furthermore, Black, Indigenous, Latina, and Asian/Pacific Islander women are all more likely than white women to become seriously ill during pregnancy.[[26]](#endnote-26) Not only has the medical establishment long ignored the needs of Black and Indigenous women of color, but doctors and hospitals have actively sought to reduce the number of children born to these groups, as well as to poor women and disabled people, as attested to by the legacies of forced sterilization of the allegedly “unfit” throughout the 20th century.[[27]](#endnote-27) This sections turns to biomedical research to discuss the larger context of abuse of research subjects from marginalized groups and the implications for scientific knowledge specifically in the domain of reproductive research. Here, injustice has arisen from both the exclusion of marginalized groups from research as well as unfair forms of inclusion; therefore, any attempts to diversity the subjects of biomedical research and make recruitment more inclusive will need to be grounded in equity.

 Reproduction has long been a major axis for social hierarchies, at least in the West, where the sexual division of labor under patriarchy continues to devalue domestic labor and marginalize women.[[28]](#endnote-28) Patriarchy in the United States and Europe is rooted in the institution of the nuclear family, so gender-based oppression is not necessarily universal across cultures; nevertheless, Western imperialism imposed its hierarchies of gender throughout Africa, Asia, and the Americas.[[29]](#endnote-29) As stated above, modern biology and anatomy have been androcentrically biased based on false beliefs that women are biologically inferior to men, resulting in systematic ignorance about women and female bodies.[[30]](#endnote-30) In contrast, *reproductive* medicine has focused almost exclusively on cisgender women and female reproductive systems until recently.[[31]](#endnote-31) Gynecology (“the science of women”) was initially shaped by the Victorian idea that women’s nature was essentially reproductive.[[32]](#endnote-32) While gynecology has since flourished, the attempt to create a parallel field of andrology (“the science of men”) languished, reinforcing the dissociation of men with reproduction.[[33]](#endnote-33)

 Particularly in the US context, many gynecological advancements were made brutally through the suffering of enslaved people. Dr. Marion Sims, the so-called “father of American gynecology,” developed the first surgery for vaginal fistula (an abnormal opening between the bladder and vagina) on enslaved Black women. This plantation doctor intended the surgery to benefit white women, but they were less than willing subjects, as recounted by historian Harriet Washington: “Slaves did not have to be recruited, persuaded, and cajoled to endure pain and indignity; they could not refuse.”[[34]](#endnote-34) Furthermore, Sims did not believe Black people felt pain in the same way as white people, so he refused to provide anesthesia to his research subjects—despite the standards of the time and the obvious displays of suffering from Betsy, Anarcha, Lucy, and the other unnamed enslaved women. Today, the statues of Sims as the “Father of Modern Gynecology” continue to attract protest from racial justice activists who call for removal of these monuments or for the addition of more historical context to memorialize the non-consensual nature of the experiments and to acknowledge the contributions of the Mothers of Modern Gynecology.[[35]](#endnote-35)

 The root problem with such biased selection and blatant mistreatment of human subjects is not merely that researchers held these false beliefs about racial and gender hierarchies; it is that these researchers are enabled and empowered by unfair social structures like the legal institution of slavery and subsequent Jim Crow segregation. Beginning in the 1930s, the US Public Health Service (PHS) supported a variety of research programs on sexually transmitted diseases, in large part because of increased syphilis among soldiers. One well known result is the notorious “Study of Untreated Syphilis in the Male Negro” in Tuskegee, Alabama, conducted between 1932-1972 to understand the progression of syphilis in the late stages if left untreated, as well as possible racial differences.[[36]](#endnote-36) The latter goal was based on the false stereotype that Black men were “sexual deviants,” and researchers recruited poor Black sharecroppers, misleadingly told them their diagnostic spinal taps were “special treatment,” and failed to provide them penicillin even after it became the standard of treatment in the 1940s and ‘50s.

 During the same time, US imperialism in Central American enabled an ease of access for researchers to exploit vulnerable, marginalized institutionalized populations outside their own borders. A less well known PHS-supported trial was conducted in Guatemala during the late 1940s by the Venereal Disease Research Laboratory and the Pan-American Health Organization. Unlike the concurrent trials in Alabama, researchers in Guatemala were actually testing whether penicillin worked as both a treatment and a prophylaxis for diseases like syphilis; to do so, they intentionally infected over 2000 participants, including Guatemalan sex workers, soldiers, incarcerated people, people in mental asylums, and children. Researchers at US PHS chose Guatemala because sex work was legal there, even in prisons. Similar to the trials in Alabama, the white American researchers justified their choice of subjects based on false racist assumptions that “syphilis is more frequent in Latins than in Indians and that, when manifested in an Indian, it appears in mild form,” referring derogatorily to the Indigenous descendants of Mayans.[[37]](#endnote-37)

 These examples of biased selection of subjects illustrate broader patterns of neglect and abuse of people of color, women, and other marginalized groups, what Washington fittingly calls “Medical Apartheid.”[[38]](#endnote-38) Media coverage was first to disclose the abuses in PHS trials in Tuskegee and elsewhere in the early 1970s, resulting in the current federal guidelines for research ethics codified in the Belmont Report, such as the right to informed consent and fair selection of subjects.[[39]](#endnote-39) These protections for human subjects were bolstered by the legacy of dangerous prescription drugs in the early 1960s, after which the US Food and Drug Administration (FDA) began to exclude “women of childbearing potential” from early clinical trials.[[40]](#endnote-40) Such rules were rooted in gendered concerns about women’s reproductive systems “to avoid any and all risks to a potential fetus,” and they resulted unintentionally in the underrepresentation of women in drug trials and other medical research in the 1980s.[[41]](#endnote-41) Consider the infamous Multiple Risk Factor Intervention Trial (“Mr. Fit”) on coronary heart disease, involving 12,866 men and 0 women.[[42]](#endnote-42) In another example, AIDS activists famously and publicly protested the FDA and National Institutes of Health (NIH) for the underrepresentation of women and people of color in the trails of AIDS treatments.[[43]](#endnote-43) Researchers later found that many of the results about male anatomy do not apply to female anatomy; furthermore, the women’s health movement criticized this androcentrism, not simply as “politicized science” but rather as dependent on questionable background assumptions that undermined both scientific accuracy and gender equality.[[44]](#endnote-44)

 While earlier cases like the PHS trials in Tuskegee & Guatemala illustrate the oppressive potential of difference-based reasoning when based on hierarchies, these newer cases demonstrated the pitfalls of hasty generalizations from limited samples and the need for more inclusive and diverse samples.[[45]](#endnote-45) Based on advocacy for the women’s health movement and AIDS activists, the FDA removed its exclusions for “women of childbearing potential” in 1993 and began encouraging pharmaceutical companies to have inclusive samples and to conduct subpopulation analyses to find differences.[[46]](#endnote-46) This was followed by the NIH Revitalization Act of 1993, which requires federal grant recipients to recruit samples representative of the US population, unless justified otherwise, and to conduct analyses of difference by sex/gender and race/ethnicity.[[47]](#endnote-47)

 Based on principles of diversity and inclusion, as well as protections for research subjects, we hope that medical research will be more accountable to marginalized communities involved in research. Yet, without a commitment of the medical community to equity and a disavowal of double standards by race and gender, researchers are likely to continue reinforcing unfair social hierarchies.[[48]](#endnote-48) These historical cases exemplify how unfair selection of subjects can embody practices of exclusion or inclusion and subsequent mistreatment. Thus, researchers must exercise deliberation and reflection as well as openness to external criticism, in order to reduce the harms done to human subjects and transform science from a culture of complicity, to one of accountability and justice.

**Cultural & Structural Sources of Bias in Research**

We have discussed how the framing of research questions (such as “cognitive differences”) and the selection of research subjects (without diversity and inclusion) can be biased and perpetuate inequality. But what is the *source* of such biases? This is an open question with shifting answers, particularly in the face of societal change and pressure to advance more equity and justice. Change in authority, power, leadership, and representation at higher ranks both academically and professionally has been remarkably slow over those decades, and this has had impacts on their treatment of marginalized and minoritized groups. Due to social and cultural obstacles to management and leadership roles, women and people of color are significantly underrepresented in STEM disciplines. For instance, only 30% of the world’s researchers are women, and a mere 11% of US practicing engineers are women.[[49]](#endnote-49) Black and Hispanic/Latinx women are 15% of the US population but only 4% of workers in science and engineering occupations.[[50]](#endnote-50) While Black men are 13% of the US population, they compromise only 3% of practicing physicians and 7% of medical students (and the latter figure is decreasing).[[51]](#endnote-51) The overrepresentation of white people and cisgender men in STEM is an ethical problem in itself, as it sustains unequal opportunities and unmerited privileges. Furthermore, this hegemony harms the epistemic quality and objectivity of science because homogenous communities of scientists often share the same problematic background assumptions, which can undermine the quality of evidence for a given theory, hypothesis, or practice, and such homogenous groups are unaware of their own biases, and thus unable to correct for them.[[52]](#endnote-52)

 The presence of deeply inbuilt, institutionalized bias reveals the core of this situation, concentrating power and authority in the hands of a few privileged white men. Or, put another way, biases against the visibility and recognition of female, gender-diverse, racially diverse promise and accomplishment are built into our educational, governmental, legal, and social institutions so deeply that it is foundational and thus hard to eject—despite the manifold scientific achievements of women and people of color, as well as the successes of historically Black colleges and women’s colleges.[[53]](#endnote-53) This invisibility of competence and erasure of merit are the results of a variety of biased methods of evaluation and thus promotion, including androcentric, Eurocentric, and anti-Black ways of doing research which intersect with overlapping biases of class, ability, sexual orientation, etc., thereby compounding the distortions of research practices and knowledge.[[54]](#endnote-54)

 Recent research in social sciences has highlighted some of *how* such biases work in practice. Take laboratory sciences, which are relatively flush with younger women interested in pursuing the science, but they thin out at the upper ranks. Is it because women and people of color are just not *good* in advanced biology, genetics, biochemistry, or chemistry? On the contrary, there is substantial evidence of subtle and pervasive evaluation bias among science faculty (including men and women) in their judgment of student applications for laboratory positions, based on a 2012 study utilizing feedback on the same CV with a randomly assigned masculine or feminine name.[[55]](#endnote-55) Professors examined the qualifications of the students and decided whether to recommend hiring them, what salary to give them, whether to mentor them, and how much to do so. The very striking results found that both men and women scientists hired more men, gave them higher salaries, and offered more mentoring to them, even though the applications were identical *except for the gendering of the name*. Their justification? Applicants with feminine names were perceived as less “competent” by all professors (men and women), even though the applications were otherwise identical. We are reminded of Supreme Court Justice Ruth Bader Ginsburg insightful and fitting proposal: “I ask no favor for my sex; all I ask of our brethren is that they take their feet off our necks.”[[56]](#endnote-56)

 We also see societal assumptions at work in the case of the abysmally slow gains in diversifying senior faculty, in STEM fields as well as Philosophy. What causes that? Is it a lack of interest? The answer seems to be most often given or implied that they don’t have the talent, capability, and “brilliance” to be top researchers. One philosopher conceived of an excellent experiment to investigate the causes and corollaries of this perceived gap between genders and between races in the profession: Sarah Jane Leslie and her collaborators documented the deficit in the perceived “raw intellectual talent” or “brilliance” of women and people of color—traits that are widely believed to be necessary for professional success in many STEM disciplines, especially math, physics, engineering, and computer science.[[57]](#endnote-57) Leslie and her colleagues discovered pervasive cultural associations linking men and white people but not women and Black people with what they term “field-specific ability beliefs”, which can account for demographic gaps by race and gender not only in STEM fields, but also in the social sciences and humanities, in which white men are overrepresented.

 The basic idea is that practitioners of different disciplines vary in the extent to which they believe that their discipline requires some innate, inborn, fixed talents or gifts. Those coming from disciplines that emphasize *raw aptitude* or *brilliance* may doubt that women and people of color possess this sort of aptitude for success in their field, and therefore may show biases against them. Leslie and colleagues surveyed academics from 30 disciplines across multiple institutions concerning such *field specific ability beliefs* and compared these reasons against competing hypotheses for the lack of women and people of color in the relevant fields, such as the requirements for long hours, very high aptitudes, or the extent to which a field requires either systematizing or empathizing—all of which involve gendered and racialized assumptions.[[58]](#endnote-58) Leslie et al. found that field specific ability beliefs were able to predict the representation of women and African Americans specifically across all 30 fields of academia that they tested. For instance, as they had predicted, the more a field valued giftedness or brilliance, the fewer the women Ph.D.’s. (Philosophy is located at the most extreme end of belief in the requirement of brilliance for success in the field!) Leslie et al. found similar correlations between field-specific ability beliefs and the percentage of Ph.D.’s who were African American. Moreover, “the extent to which practitioners of a discipline believe that success depends on sheer brilliance is a strong predictor of women’s and African American’s representation in that discipline.”

 But *how* does such bias work? Could it be a natural result that certain groups are less gifted at abstract work like math, physics, computer science, and philosophy? No. Available evidence goes strongly *against* the claim that women or people of color actually have less innate intellectual talent of the type that’s required for STEM.[[59]](#endnote-59) This is not to say that marginalized and minoritized groups haven’t suffered from stereotypes and educational neglect to reduce their numbers, beginning early in their math & science classes.[[60]](#endnote-60) Field-specific ability beliefs lower diverse representation in part by making the atmosphere in these fields less welcoming and more hostile, such as creating a professional climate of normalized sexual harassment and discrimination against women.[[61]](#endnote-61) Because it is desirable for disciplines and fields to be more inclusive—both for social justice and for scientific success and objectivity—Leslie and her colleagues recommend highlighting the role of sustained effort for achieving top-level success in areas like physics, math, tech, and philosophy. Leslie emphasizes that we should praise our students for their effort and merit, *not* promoting ideas of inherent brilliance, saying, for example, “you worked so hard on this paper, and did a terrific job: you should be really proud of your *achievement*”, not “you have a *real* *talent*”. The big take home here is to think of the problems and solutions to biased research in cultural and structural terms: in order to challenge the unmerited power and privilege of white men in STEM and the systemic biases entrenched in scientific knowledge and practice, we need to promote diversity, inclusion, and equity in the *workplace* of research as well as the *content* of research.

**Conclusions**

Biases are sometimes transparent for all to see. Consider the title of the 2020 documentary, *Picture a Scientist*. What image comes to mind? For most audiences, the image of a white man, perhaps with facial hair and spectacles, leaps to mind. (The “Ivory Tower” takes on several figurative meanings of exclusion.) This film investigates such assumptions and the damage they do, exploring in depth some cases of sexual harassment that demonstrate how women students must often run a whole additional gauntlet than their peers who are men, usually without protection, recourse, or accountability for discrimination. Building on a report from the National Academies of Sciences, the film explains that explicit sexual advances are only the “tip of the iceberg” of sexual harassment, and that suffering verbal abuse, bullying, exclusion, sabotage, and more all fall under the surface of the deeper iceberg.[[62]](#endnote-62) In fact, this iceberg of sexual harassment and discrimination is one of the chief reasons that women of all backgrounds drop out of M.S. and Ph.D. programs more than men, thus narrowing the pool of women to advance to professorships, with particularly detrimental effects for women of color in the double bind of racism and sexism.[[63]](#endnote-63) These are just some of the many forms of gatekeeping explored in the film, which is highly recommended for its coverage of cultural barriers for women and people of color trying to break into the bastion of science and other scholarly research utterly ruled and controlled by white men at the top.

 We draw hope and inspiration from the countless researchers who are trying to change exclusionary institutional structures and cultural attitudes about who a scientist is and challenging the culture of science to be more inclusive. Given that science is a social process, we must make the culture of research more equitable to make the research itself less biased and more fair for all people.

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