Notes

Introduction: Why Data Science Needs Feminism

1. The Hampton sit-ins were the first in the state of Virginia and contributed significantly to the dismantling of the Jim Crow era policies of segregation that were still in place at the time. See "Desegregating Hampton: Hampton University Students' Woolworth's Sit In," Humanities for All, National Humanities Alliance, accessed July 23, 2019, https://humanitiesforall.org/projects/oral-history-of-hampton-va-woolworth-s-sit-in.

2. The story about Darden that we tell here derives primarily from Shetterly's account in *Hidden Figures*. Although we have supplemented Shetterly's research with additional sources and reframed the events of Darden's life to emphasize the role that data played in her career, we remain indebted to Shetterly for calling our attention to Darden, as well as her extensive research on Darden's life. For more information on Darden, see the book *Hidden Figures: The Untold True Story of Four African-American Women who Helped Launch Our Nation Into Space* (New York: William Morrow, 2016). Darden does not appear in the film of the same name. For additional scholarship on the history of women in computing, see Jennifer Light, "When Computers Were Women," *Technology and Culture* 40, no. 3 (1999): 455–483; Nathan Ensmenger, *The Computer Boys Take Over: Computers, Programmers, and the Politics of Technical Expertise* (Cambridge, MA: MIT Press, 2010); and Mar Hicks, *Programmed Inequality: How Britain Discarded Women Technologists and Lost Its Edge in Computing* (Cambridge, MA: MIT Press, 2017).

3. *Merriam-Webster Dictionary*, "Feminist," accessed July 22, 2019. In the song "***Flawless" (2014), Beyoncé samples portions of a TED Talk by the Nigerian writer Chimamanda Ngozi Adichie, who cites the Merriam-Webster definition in her remarks. See Chimamanda Ngozi Adichie, "We Should All Be Feminists," filmed December 2012 at TEDxEuston, video, 29:28, https://www.ted.com/talks/chimamanda_ngozi_adichie_we_should_all_be_feminists.

4. Scholars have long described the evolution of feminism in terms of three waves. The first wave is said to have spanned much of the nineteenth and early twentieth centuries, culminating in the United States in 1920 with the passage of the Nineteenth Amendment, which gave women the right to vote. Women's suffrage and related legal issues were the focus of this wave. The second wave, which we reference here, is said to have encompassed the early 1960s to the

early 1980s. This wave was concerned with a wider range of legal and social issues, including the workplace conditions that Friedan describes in her book, as well as reproductive rights, domestic violence, family roles, and issues of sexuality, among others. It is said to have lost cohesion in the 1980s as a result of internal debates within the movement about sexuality and pornography, among others. Feminism's third wave is said to have begun in the 1990s and is characterized by an increased attention to the idea of intersectionality and the emphasis on both individual differences and structural power that the concept entails. Some scholars have proposed that we've entered a fourth wave of feminism, coinciding with the rise of social media in the early 2010s. With all that said, other scholars have rejected the notion of waves altogether for how it elides the longer and more sustained work of organizing and activism that took place before, during, and after these waves—especially by women of color, whose efforts did not often receive as much popular attention as those of their white counterparts. Because we endorse this critique, we attempt to de-emphasize the narrative of waves in this book, employing the terminology of waves only when it helps to establish the context of a particular example, individual, or group.

5. See bell hooks, *Feminist Theory: From Margin to Center* (New York: Routledge, [1984] 2015).

6. In *Black Feminism Reimagined: After Intersectionality* (Durham, NC: Duke University Press, 2019), Jennifer C. Nash references the work of Vivian May, who traces the intellectual origins of intersectionality to nineteenth-century scholar/activist Anna Julia Cooper; see Vivian M. May, "Intellectual Genealogies, Intersectionality, and Anna Julia Cooper," in *Feminist Solidarity at the Crossroads: Intersectional Women's Studies for Transracial Alliance*, edited by Kim Marie Vaz and Gary L. Lemons (New York: Routledge, 2012), 59–71. Brittney Cooper, in *Beyond Respectability: The Intellectual Thought of Race Women* (Urbana: University of Illinois Press, 2017), places Cooper within an intellectual milieu populated by several late nineteenth-century and early twentieth-century figures. P. Gabrielle Foreman, in *Activist Sentiments: Reading Black Women in the Nineteenth Century* (Urbana: University of Illinois Press, 2009), illuminates the intersectional thought and activism of Black women writers (and readers) in the first half of the nineteenth century. These references are not intended to be comprehensive. Rather, they are intended to give a sense of the long history behind the concept of intersectionality.

7. "The Combahee River Collective Statement," 1978, Circuitous.org, accessed April 3, 2019, http://circuitous.org/scraps/combahee.html.

8. For those who want to learn more about the values that have guided our work on this book, as well as the voices and work that we have sought to amplify, please see our values statement included as an appendix.

9. Sandra Johnson, "Interview with Gloria R. Champine," May 1, 2008, NASA Headquarters NACA Oral History Project, https://historycollection.jsc.nasa.gov/JSCHistoryPortal/history/oral _histories/NACA/champinegr.htm.

10. We'll discuss this feeling of "shock" in more detail in later chapters. Here, we will simply make note of it to emphasize how shock is such a common experience for people who occupy dominant group identities when they—and often we, your authors—find out about injustices.

"A sexist promotion structure/dataset/algorithm?!" we say incredulously. "How could that have happened?" Darden's boss, a white man, was surprised because the gender disparity was not something he expected to see, or was even looking for, since it wasn't something that he had personally experienced. Data feminism asks us to deliberately and explicitly apply an intersectional lens to our data science work—even and especially when we represent dominant group positions.

11. "More than 40 Take the Buyout, Retire," *Researcher News*, April 4, 2007, https://www.nasa .gov/centers/langley/news/researchernews/rn_07retirees.html.

12. The scholarship on this subject is vast. Key anthologies include Beverly Guy-Sheftall, *Words of Fire* (New York: New Press, 1995); and Cherríe Moraga and Gloria E. Anzaldúa, *This Bridge Called My Back: Writings by Radical Women of Color* (London: Persephone Press, 1981). For a recent anthology in this tradition, see *The Crunk Feminist Collection*, edited by Brittney C. Cooper, Susana M. Morris, and Robin M. Boylorn (New York: Feminist Press, 2017).

13. One such example is Sojourner Truth (1797–1883), who worked tirelessly over the course of the nineteenth century to advance both women's and civil rights. Truth, a Black woman who escaped slavery as a young mother in 1826, is most famous today for the speech "Ain't I a Woman?" The memorable title line has inspired generations of intersectional activist work. In truth, however, Truth did not state those words in her original speech. She said, "I am a woman's rights." It was a white abolitionist who, a decade later, rewrote Truth's speech in Southern dialect to make the meaning of her statement clearer to other white abolitionists, who would encounter Truth's lines only in print. To scholars today, the example of Sojourner Truth exemplifies both how Black women were on the forefront of intersectional feminist activism and how white women have historically sought to control that narrative, even when it misrepresents ideas and intentions. See the Sojourner Truth Project for the history and context of this example: https://www.thesojournertruthproject.com/.

14. Scholars often cite two of Crenshaw's early legal essays for the genesis of the term: "Demarginalizing the Intersection of Race and Sex: A Black Feminist Critique of Antidiscrimination Doctrine, Feminist Theory, and Antiracist Politics," *University of Chicago Legal Forum* 8 (1989): 139–167; and "Mapping the Margins: Intersectionality, Identity Politics, and Violence against Women of Color," *Stanford Law Review* 43, no. 6 (1991): 1241–1299.

15. As an accessible entry point into Crenshaw's work, see her TED Talk, "The Urgency of Intersectionality," filmed October 2016 at TEDWomen 2016, video, 18:50. For a compilation of her writings about intersectionality, including her early work referenced in note 8, see *On Intersectionality: Essential Writings* (New York: New Press, 2019). More recently, Crenshaw has been at the forefront of #SayHerName, a campaign to make the gendered dimensions of police violence visible. For more on this effort, see Kimberlé Crenshaw, Andrea J. Ritchie, Rachel Anspach, Rachel Gilmer, and Luke Harris, "Say Her Name: Resisting Police Brutality against Black Women," 2015, African American Policy Forum, Center for Intersectionality and Social Policy Studies, Columbia Law School, http://aapf.org/sayhernamereport.

16. *Positionality* is a term that describes how individuals come to knowledge-making processes from multiple positions, including race, gender, geography, class, ability, and more. Each of these

positions is shaped by culture and context, and they intersect and interact. We, the authors, have a statement about our own positionalities as an appendix in this book.

17. On the popular educational site Everyday Feminism, the comic artist Robot Hugs explains what oppression feels like at the individual level: "[It is] when prejudice and discrimination is supported and encouraged by the world around you. It is when you are harmed or not helped by government, community or society at large because of your identity." "Having Trouble Explaining Oppression? This Comic Can Do It for You," January 30, 2017, https://everydayfeminism.com/2017/01/trouble-explaining-oppression/. Ashley Crossman offers a good explainer of the sociological understanding of oppression in "What Is Social Oppression," ThoughtCo, January 28, 2019, https://www.thoughtco.com/social-oppression-3026593.

18. *Sexism* is discrimination based on a person's sex or gender. *Cissexism* applies to discrimination against transgender people. *Patriarchy* is a term that describes the combination of legal frameworks, social structures, and cultural values that contribute to the continued male domination of society.

19. For more on the racism encoded in demands for "proof," see chapter 2, as well as Candice Lanius, "Fact Check: Your Demand for Statistical Proof Is Racist," Cyborgology, January 12, 2015, https://thesocietypages.org/cyborgology/2015/01/12/fact-check-your-demand-for-statistical-proof-is-racist/. Maya Randolph has connected the points made by Lanius to a famous quote by Toni Morrison, from 1975: "The function of racism is distraction. It keeps you from doing your work. It keeps you explaining, over and over again, your reason for being. Somebody says you have no language so you spend twenty years proving that you do. Somebody says your head isn't shaped properly so you have scientists working on the fact that it is. Somebody says that you have no art so you dredge that up. Somebody says that you have no kingdoms, again you dredge that up. None of that is necessary. There will always be one more thing." "A Humanist View," talk delivered at Portland State University, May 30, 1975, transcribed by Keisha E. McKenzie, accessed July 23, 2019, https://www.mackenzian.com/wp-content/uploads/2014/07/Transcript_PortlandState_TMorrison.pdf. We thank Momin Malik for bringing this quotation to our attention.

20. We discuss these demographics, and the matrix of domination that they create and sustain, in detail in chapter 1.

21. Note that the latter is quite different from *data for good*. We explore these differences in depth in chapter 5.

22. The projects referenced are Terra Incognita (http://civicmediaproject.org/works/civic-media-project/terra-incognita-serendipity-and-discovery-in-the-age-of-personalization), the Border Crossed Us (http://www.kanarinka.com/project/the-border-crossed-us/), Databasic.io (https://databasic.io/en), and the Make the Breast Pump Not Suck Hackathon (https://makethebreastpumpnotsuck2018.com). To learn more about these and other projects, visit www.kanarinka.com.

23. The projects referenced are Data by Design (https://dhlab.lmc.gatech.edu/data-by-design/), Vectors of Freedom (https://dhlab.lmc.gatech.edu/tome/vectors-of-freedom/), and the Floor

Chart Project (https://dhlab.lmc.gatech.edu/category/floorchart/). To learn more about these and other projects, visit www.lklein.com or read the following publications related to the projects mentioned: Lauren F. Klein, Caroline Foster, Adam Hayward, Erica Pramer, and Shivani Negi, "The Shape of History: Reimagining Elizabeth Palmer Peabody's Feminist Visualization Work," *Feminist Media Histories* 3, no. 3 (Summer 2017): 149–153; Lauren F. Klein, Jacob Eisenstein, and Iris Sun, "Exploratory Thematic Analysis for Historical Newspaper Archives," *Digital Scholarship in the Humanities* 30, no. 1 (December 2015): 130–141; and A. Beall, C. Allen, A. Vujic, and L. Klein, "Reimagining Elizabeth Palmer Peabody's Lost 'Mural Charts,'" in *Digital Humanities 2018 Book of Abstracts* (Mexico City: Association of Digital Humanities Organizations, 2018), 607–609.

24. Mary Poovey, *A History of the Modern Fact: Problems of Knowledge in the Sciences of Wealth and Society* (Chicago: University of Chicago Press, 1998); Miriam Posner and Lauren F. Klein, "Editor's Introduction: Data as Media," *Feminist Media Histories* 3, no. 3 (Summer 2017): 1–8; and Daniel Rosenberg, "Data before the Fact," in *"Raw Data" Is an Oxymoron*, ed. Lisa Gitelman (Cambridge, MA: MIT Press, 2013), 15–40.

25. Lanius, "Fact Check"; and Theodore M. Porter, *Trust in Numbers: The Pursuit of Objectivity in Science and Public Life* (Princeton, NJ: Princeton University Press, 1996).

26. According to the press release for Apple's iPhone XR, its two-core neural engine can perform up to five trillion operations per second. Performance statistics for the IBM System/360 Model 75 were not available, so to calculate this comparison, we employed the performance statistics for the standard IBM System/360 Model 30, which could perform up to 34,500 instructions per second, with memory up to 64 KB. See "System/360 Model 30," IBM Archives, April 17, 1964, accessed April 3, 2019, https://www.ibm.com/ibm/history/exhibits/mainframe/mainframe_PP2030 .html.

27. On death tables, see Jacqueline Wernimont, *Numbered Lives: Life and Death in Quantum Media* (Cambridge, MA: MIT Press, 2018); on colonial counting, see Molly Farrell, *Counting Bodies: Population in Colonial American Writing* (Oxford: Oxford University Press, 2016); for a survey of how European nations have collected statistics on minoritized ethnicities, see Patrick Simon, "Collecting Ethnic Statistics in Europe: A Review," *Ethnic and Racial Studies* 35, no. 9 (2012): 1366–1391; and for an in-depth analysis of the politics of the US Census, see Margo J. Anderson, *The American Census: A Social History* (New Haven, CT: Yale University Press, 1988).

28. For a powerful reckoning with this history, see Jessica Marie Johnson, "Markup Bodies: Black [Life] Studies and Slavery [Death] Studies at the Digital Crossroads," *Social Text* 34, no. 4 (2018): 57–79. For a study that focuses on the legacy of eugenics, see Dean Spade and Rori Rohlfs, "Legal Equality, Gay Numbers and the (After?)Math of Eugenics," *Scholar & Feminist Online* 13, no. 2 (Spring 2016). For a transhistorical study of the surveillance of Black people, see Simone Browne, *Dark Matters: On the Surveillance of Blackness* (Durham, NC: Duke University Press, 2015).

29. This was something that community organizations (especially those led by members of targeted groups) and scholars had been saying for years. And there is a whole interdisciplinary field called surveillance studies that theorizes and studies practices of surveillance. Sociologist Simone Browne describes the field in her 2015 study, *Dark Matters*: "Since its emergence, surveillance

studies has been primarily concerned with how and why populations are tracked, profiled, policed, and governed at state borders, in cities, at airports, in public and private spaces, through biometrics, telecommunications technology, CCTV, identification documents, and more recently by way of Internet-based social network sites such as Twitter and Facebook" (13). Rita Raley and other scholars characterize contemporary digital monitoring practices as "dataveillance"; see Rita Raley, "Dataveillance and Countervailance," in *"Raw Data" Is an Oxymoron,* ed. Lisa Gitelman (Cambridge, MA: MIT Press, 2013), 121–145.

30. For example, Logipix claims to sell cameras and software that detect traffic violations, faces, and "suspicious activity"; see "Safe and Smart Cities," Logipix, accessed April 3, 2019, http://www.logipix.com/index.php/safe-and-smart-cities.

31. On segregation, see Ruha Benjamin, *Race after Technology: Abolitionist Tools for the New Jim Code* (New York: Wiley, 2019). On overpolicing, see Cathy O'Neil, *Weapons of Math Destruction* (New York: Broadway Books, 2016). On social services, see Virginia Eubanks, *Automating Inequality: How High-tech Tools Profile, Police, and Punish the Poor* (New York: St. Martin's Press, 2018). For an exploration of how civic "data dashboards" package these data up for the public, see Shannon Mattern, "Mission Control: A History of the Urban Dashboard," *Places Journal*, March 2015, https://placesjournal.org/article/mission-control-a-history-of-the-urban-dashboard/.

32. For evidence of Catherine's exceptionally interesting Maine Coon cat named n00b, see https://www.instagram.com/p/BgxGicVhhTW/.

33. Yoree Koh, "Forget Fingerprints: Car Seat IDs Driver's Rear End," *Wall Street Journal*, January 18, 2012, https://blogs.wsj.com/drivers-seat/2012/01/18/forget-fingerprints-car-seat-ids-drivers-rear-end/.

34. For more information on PredPol, see https://www.predpol.com/technology/. On the racist history of policing, see Browne, *Dark Matters*; Benjamin, *Race after Technology*; and O'Neil, *Weapons of Math Destruction*.

35. "About Us," PredPol, accessed July 23, 2019, https://www.predpol.com/about/.

36. Even after the legal strictures of slavery were lifted with the ratification of the Thirteenth Amendment, in 1865, the proliferation of so-called Black codes abounded. These were laws passed primarily in the South that restricted Black citizens' freedom of movement, access to opportunities, and protection under the law. Although they were challenged by the public and in the in courts, they were difficult to fully dismantle. Indeed, in most Southern states, they were simply replaced with regulations that used vague language to justify the same anti-Black policing and violence. Those regulations were reinforced by the introduction of Jim Crow laws in the late nineteenth and early twentieth centuries, which legalized racial segregation across the South. Scholars such as Michelle Alexander, in *The New Jim Crow: Mass Incarceration in the Age of Colorblindness* (New York: New Press, 2012), and filmmakers such as Ava DuVernay, in *The 13th* (Kandoo Films, 2016), have demonstrated incontrovertible evidence that this history is not over and persists today in mass incarceration and biased police practices.

37. There is now a whole podcast devoted to the question of whether a particular technology should exist or not: see Catarina Fake, "Should This Exist?," accessed April 3, 2019, https://shouldthisexist.com/.

38. To learn more about Data for Black Lives, visit http://d4bl.org/.

39. See the Stop LAPD Spying Coalition report, *"To Observe and to Suspect": A Peoples Audit of the Los Angeles Police Department's Special Order 1*, Stop LAPD Spying Coalition, April 2, 2013, https://stoplapdspying.org/wp-content/uploads/2013/04/PEOPLES-AUDIT-UPDATED-APRIL-2-2013-A.pdf.

40. See Julia Angwin, Jeff Larson, Surya Mattu, and Lauren Kirchner, "Machine Bias," *ProPublica*, May 23, 2016, https://www.propublica.org/article/machine-bias-risk-assessments-in-criminal-sentencing; and Adriana Gallardo, "Lost Mothers: How We Collected Nearly 5,000 Stories of Maternal Harm," *ProPublica*, March 20, 2018, https://www.propublica.org/article/how-we-collected-nearly-5-000-stories-of-maternal-harm. We discuss risk assessment algorithms in detail in chapter 2, and maternal mortality in chapter 1.

41. See, for example, Lize Mogel, *Walking the Watershed* (2016–present), accessed July 23, 2019, http://www.publicgreen.com/projects/watershed.html; and Stephanie Dinkins, *Not the Only One* (2017), accessed July 23, 2019, https://www.stephaniedinkins.com/ntoo.html.

42. People often say that there are two broad kinds of data: quantitative data, consisting of numbers (e.g., how many siblings you have), and qualitative data, consisting of words and categories (e.g., what color is your shirt?). As we will show in chapter 4, any time there is a binary, there is usually also a hierarchy, and in this case it is that quantitative data can be incorrectly perceived as "better" than qualitative data for being more objective, true, generalizable, larger scale, and so on. Feminist researchers have consistently demonstrated the need to collect qualitative data as well, as they can often (but, of course, not always) capture more nuance and detail than numbers.

43. This phenomenon, though new to data science, is unfortunately very, very old. In their now-classic book, *Witches, Midwives, and Nurses: A History of Women Healers*, Barbara Ehrenreich and Deirdre English detail the history of obstetrics in the United States, in which evidence-driven female midwives were replaced by ridiculous-theory-having male obstetricians after the advent of formal medical schools. The same phenomenon can be found in the kitchen, with women performing most home cooking, unpaid altogether, while men attend culinary school to become celebrity chefs. See Barbara Ehrenreich and Deirdre English, *Witches, Midwives, and Nurses: A History of Women Healers* (New York: The Feminist Press, [1973] 2010).

44. See bell hooks, *Feminism Is for Everybody: Passionate Politics* (New York: Pluto Press, 2000).

1   The Power Chapter

1. Serena Williams, "Meet Alexis Olympia Ohanian Jr. You have to check out link in bio for her amazing journey. Also check out my IG stories 😍😍♡♡," September 13, 2017, https://www.instagram.com/p/BY-7H9zhQD7/.

2. See Serena Williams, Facebook, January 15, 2018, https://www.facebook.com/SerenaWilliams/videos/10156086135726834/.

3. Nina Martin and Renee Montagne, "Nothing Protects Black Women from Dying in Pregnancy and Childbirth," ProPublica, December 7, 2017, https://www.propublica.org/article/nothing-protects-black-women-from-dying-in-pregnancy-and-childbirth.

4. See New York City Department of Health and Mental Hygiene, *Severe Maternal Morbidity in New York City, 2008–2012* (New York, 2016), https://www1.nyc.gov/assets/doh/downloads/pdf/data/maternal-morbidity-report-08-12.pdf.

5. SisterSong, National Latina Institute for Reproductive Health, and Center for Reproductive Rights, *Reproductive Injustice: Racial and Gender Discrimination in U.S. Health Care* (New York: Center for Reproductive Rights, 2014), https://tbinternet.ohchr.org/Treaties/CERD/Shared%20Documents/USA/INT_CERD_NGO_USA_17560_E.pdf.

6. *USA Today*'s ongoing reporting on maternal mortality can be found at https://www.usatoday.com/series/deadlydeliveries/.

7. Robin Fields and Joe Sexton, "How Many American Women Die from Causes Related to Pregnancy or Childbirth? No One Knows," ProPublica, October 23, 2017, https://www.propublica.org/article/how-many-american-women-die-from-causes-related-to-pregnancy-or-childbirth.

8. In studies that try to infer maternal mortality through other indicators, like hospital records, what has been consistently shown is that the United States is one of the only countries in the world where maternal morbidity is increasing for all races, and increasing even more steeply for Black and brown women. For example, between 2000 and 2014, the CDC reported a 26.6 percent increase in the maternal mortality ratio in the United States. A 2018 report, *Trends and Disparities in Delivery Hospitalizations Involving Severe Maternal Morbidity, 2006–2015*, showed that life-threatening complications increased for all races and ethnicities during that time. In 2015, dying in the hospital was three times more likely for Black mothers than for white mothers. There was no change in the disparity between white mothers and Black mothers during the period that the data covered.

9. According to the 2018 Newspaper Diversity Survey led by researcher Meredith Clarke for the American Society of News Editors, ProPublica's leadership is 89 percent white, with no Black people in leadership positions, and *USA Today*'s leadership is 85 percent white. See https://www.asne.org/diversity-survey-2018.

10. As we wrote this chapter, people were tweeting #believeblackwomen (see https://twitter.com/search?q=believeblackwomen&src=typd) to grieve the death of a young Black woman named Lashonda Hazard who was pregnant and experiencing severe pain. She died at Women and Infants Hospital in Rhode Island after posting on Facebook that medical staff weren't listening to her. In response, a community organization named Sista Fire RI wrote an open letter to the hospital calling for an end to what they characterized as a pattern of racialized gender violence: "In a state that does not put Black women or women of color first, we believe and trust Black women."

See https://docs.google.com/forms/d/e/1FAIpQLSd-B1sBFiip8tB41L-q3j5vu75qwLxVA9a3h5toX-53lMEifFA/viewform, accessed May 11, 2019.

11. Lindsay Schallon, "Serena Williams on the Pressure of Motherhood: 'I'm Not Always Going to Win,'" *Glamour*, April 27, 2018, https://www.glamour.com/story/serena-williams-motherhood-activism-me-too.

12. Schallon, "Serena Williams on the Pressure of Motherhood."

13. Patricia Hill Collins, *Black Feminist Thought: Knowledge, Consciousness, and the Politics of Empowerment* (New York: Routledge, 2008), 21.

14. Even then, Native Americans of all genders were still legally excluded from voting—at least for another few years—since they had yet to be granted US citizenship. The Fourteenth Amendment explicitly excluded Native Americans from US citizenship—another instance of oppression being codified in the structural domain of the matrix of domination. In 1924, the passage of the Indian Citizenship Act granted joint US citizenship to all Native Americans, clearing the path for enfranchisement. But it would take until 1962 for the last US state (New Mexico) to change its laws so that all Native Americans could vote. Even then, obstacles abounded; the 1965 Voting Rights Act offered additional legal language to contest disenfranchisement, but that act is in the process of being dismantled by the Supreme Court (as of 2013, with *Shelby County v. Holder*), which threatens many of its protections. On the subject of voting rights in the United States, it's also worth pointing out that Puerto Rico did not have universal suffrage until 1935, and like other US territories, still does not have voting power in the US Congress or representation in the electoral college.

15. Other disenfranchisement methods devised over the years have included undue wait times for registering to vote, having to pay a tax to vote, or having to take a test about the Constitution. Well through the passage of the Voting Rights Act of 1965, Black and brown people seeking to vote faced threats of bodily harm. Note that the history of voter suppression perpetrated by white people on people of color is not over. One need only consider the 2018 gubernatorial election in Georgia, in which Brian Kemp, secretary of state and a white man, presided over his own gubernatorial race against Stacey Abrams, a Black woman. In his capacity as secretary of state, his actions included purging voter rolls and putting fifty-three thousand voter registrations on hold, 70 percent of which were for voters of color. Long lines and technical problems plagued the election day efforts, and the NAACP and ACLU sued the state of Georgia for voting irregularities. In short, voter suppression—enacted in the disciplinary domain of the matrix of domination—is alive and well. See German Lopez, "Voter Suppression Really May Have Made the Difference for Republicans in Georgia," Vox, November 7, 2018, https://www.vox.com/policy-and-politics/2018/11/7/18071438/midterm-election-results-voting-rights-georgia-florida.

16. Note that the disciplinary domain does not just have to do with government power and policy, but also with corporate, private, and institutional policies. A particular company prohibiting its workers from leaving early to vote or penalizing those who distribute information about voting on the factory floor is an example of the disciplinary domain.

17. Eleanor Barkhorn, "'Vote No on Women's Suffrage': Bizarre Reasons for Not Letting Women Vote," *Atlantic*, November 6, 2012, https://www.theatlantic.com/sexes/archive/2012/11/vote-no-on-womens-suffrage-bizarre-reasons-for-not-letting-women-vote/264639/.

18. This is a point that Collins underscores: "Oppression is not simply understood in the mind—it is felt in the body in myriad ways," she writes (*Black Feminist Thought*, 293).

19. For further explanation of why *minoritized* makes more sense to use than *minority*, see I. E. Smith, "Minority vs. Minoritized: Why the Noun Just Doesn't Cut It," *Odyssey*, September 2, 2016, https://www.theodysseyonline.com/minority-vs-minoritize; and Yasmin Gunaratnam, *Researching Race and Ethnicity: Methods, Knowledge and Power* (London: Sage, 2003).

20. This role often entails what Sara Ahmed has described as being a "feminist killjoy." As she writes in the first post on her blog, you might be a feminist killjoy if you "have ruined the atmosphere by turning up or speaking up" or "have a body that reminds people of histories they find disturbing" or "are angry because that's a sensible response to what is wrong." The feminist killjoy exposes racism and sexism, but "for those who do not have a sense of the racism or sexism you are talking about, to bring them up is to bring them into existence." In the process of exposing the problem, the feminist killjoy herself becomes a problem. She is "causing trouble" or getting in the way of the happiness of others by bringing up the issue. For example, a personal killjoy moment from the book-writing process happened when Catherine shared the topic of the book with a former professor, who responded that she should stay focused on data literacy and not become one of those "grumpy feminists" who were uncomfortable with their sexuality and sought to make problems for people. For the record, Catherine is not grumpy, feels confident in her sexuality, and is working on the killjoy skills of making more feminist problems for people. Read more about how to navigate being or becoming a feminist killjoy at feministkilljoys.com, or see Sara Ahmed, *Living a Feminist Life* (Durham, NC: Duke University Press, 2017).

21. Feminist methods involve continually asking *who questions*, as AI researcher Michael Muller has observed: By whom, for whom, who benefits, who is harmed, who speaks, who is silenced. Muller articulated what some of the *who questions* are for human-computer interaction in his essay "Feminism Asks the 'Who' Questions in HCI," *Interacting with Computers* 23, no. 5 (2011): 447–449, and in this book we articulate what some of the *who questions* are for data science.

22. "Bureau of Labor Statistics Data Viewer," US Bureau of Labor Statistics, 2019, accessed April 10, 2019, https://beta.bls.gov/dataViewer/view/timeseries/LNU02070002Q.

23. "Data Brief: Women and Girls of Color in Computing," Women of Color in Computing Collaborative, 2018, accessed April 10, 2019, https://www.wocincomputing.org/wp-content/uploads/2018/08/WOCinComputingDataBrief.pdf.

24. Sarah West Myers, Meredith Whittaker, and Kate Crawford. "Discriminating Systems: Gender, Race and Power in AI," AI Now Institute, 2019, https://ainowinstitute.org/discriminatingsystems.pdf.

25. Christianne Corbett and Catherine Hill, *Solving the Equation: The Variables for Women's Success in Engineering and Computing*, American Association of University Women (Washington, DC:

2015). For comparison, 26% women graduates today is the same percentage of women computer science graduates in 1974, and in subfields like machine learning, the proportion of women is far less. As per the points made in this chapter, even knowing the exact extent of the disparity is challenging. According to a 2014 *Mother Jones* report about diversity in Silicon Valley, tech firms convinced the US Labor Department to treat their demographics as a trade secret and didn't divulge any data until after they were sued by Mike Swift of the *San Jose Mercury News*. See Josh Harkinson, "Silicon Valley Firms Are Even Whiter and More Male Than You Thought" *Mother Jones*, May 29, 2014. There are analyses that have obtained the data in other ways. For example, a gender analysis by data scientists at LinkedIn has shown that tech teams at tech companies have far *less* gender parity than tech teams in other industries, including healthcare, education, and government. See Sohan Murthy, "Measuring Gender Diversity with Data from LinkedIn," LinkedIn (blog), June 17, 2015.

26. See Nadya A. Fouad, "Leaning in, but Getting Pushed Back (and Out)," presentation at the American Psychological Association, August 2014, https://www.apa.org/news/press/releases/2014/08/pushed-back.pdf.

27. In the case of a different resume screening tool (not the one developed by Amazon), it was found that the most predictive factors of job performance success were whether someone was named "Jared" and if they had played lacrosse. We might laugh at the absurdity of such random and specific details, but note how they tell us a lot about the group characteristics of who is getting hired: Jared is a mostly men's name, a mostly white name, and lacrosse—in spite of its Native American origins—is an expensive and predominantly elite, white sport. On biased job algorithms, see Dave Gershgorn, "Companies Are on the Hook if Their Hiring Algorithms Are Biased," *Quartz*, October 22, 2018, https://qz.com/1427621/companies-are-on-the-hook-if-their-hiring-algorithms-are-biased/; and Rachel Kraus, "Amazon's Sexist AI Has a Deeper Problem than Code," Mashable, October 10, 2018, https://mashable.com/article/amazon-sexist-recruiting-algorithm-gender-bias-ai/#VSsbMcGmvqqa. On the origins of lacrosse, see Anthony Aveni, "The Indian Origins of Lacrosse," *Colonial Williamsburg Journal* (Winter 2010).

28. Safiya Umoja Noble, *Algorithms of Oppression: How Search Engines Reinforce Racism* (New York: NYU Press, 2018), 80–81.

29. Feminist legal scholar Martha R. Mahoney summarizes the effect of this privilege hazard with respect to race: "A crucial part of the privilege of a dominant group is the ability to see itself as normal and neutral. This quality of being 'normal' makes whiteness and the racial specificity of our own lives invisible as air to white people, while it is visible or offensively obvious to people defined outside the circle of whiteness." The passage appears in "Whiteness and Women, In Practice and Theory: A Response to Catherine McKinnon," *Yale Journal of Law & Feminism* 5, no. 2 (1993): 217–251.

30. From Anita Gurumurthy's keynote address at Data Justice 2018, Cardiff University.

31. Kate Crawford, "Artificial Intelligence's White Guy Problem," *New York Times*, June 26, 2016, https://www.nytimes.com/2016/06/26/opinion/sunday/artificial-intelligences-white-guy-problem.html.

32. *Cis het* is shorthand for *cisgender heterosexual*. These are two dominant group identities: a person is cisgender when their gender identity matches the sex that they were assigned at birth, and a person is heterosexual when they are sexually attracted to people of the opposite sex.

33. Facial analysis software is used to detect faces in a larger image, such as when some digital cameras create outlines around any faces that they detect in a frame. Facial recognition is when the software both detects a face and then matches that face against a database to cross-reference the face with personal information, such as name, demographics, criminal history, and so on.

34. *Blackface* refers to the racist practice of predominantly non-Black performers painting their faces to signal their caricatured representation of Black people. The tradition has a long history, and has directly contributed to the spread of racist stereotypes about Black people. On its history, see Eric Lott, *Love and Theft: Blackface Minstrelsy and the American Working Class* (New York: Oxford University Press, 1993). On some contemporary manifestations, see Lauren Michele Jackson, "We Need to Talk about Digital Blackface in Reaction GIFs," *Teen Vogue*, August 2, 2017, https://www.teenvogue.com/story/digital-blackface-reaction-gifs.

35. See Joy Buolamwini and Timnit Gebru, "Gender Shades: Intersectional Accuracy Disparities in Commercial Gender Classification," *Proceedings of Machine Learning Research* 81 (2018): 1–15, http://proceedings.mlr.press/v81/buolamwini18a/buolamwini18a.pdf.

36. Training automated systems involves using *training data* to teach the model how to classify things. For example, in the case of Buolamwini's work, the training data would consist of images with and without faces, and the model would be trained to detect whether or not there is a face in each image and, if so, to identify the specific location of the face. Once the model is trained, it is evaluated using another dataset—called a *test dataset*—to determine whether the model works only on the training data or whether it is likely to perform well with new data. Finally, once the model has been tested, it is evaluated again with what's called a *benchmarking dataset*. Benchmarking data consists of an agreed upon standard dataset that makes possible to compare different models—so a researcher could say something like, "The facial detection model from X university performed at 90 percent accuracy, whereas the model from Y corporation performed at 87 percent accuracy."

37. For a full list of media outlets that have written about Buolamwini's work, see https://www.poetofcode.com/press.

38. In *Artificial Unintelligence* (Cambridge, MA: MIT Press, 2018), data journalist and professor Meredith Broussard outlines the concept of technochauvinism: the belief that the technological solution to a problem is the right one. She argues that artificial intelligence is often *not* the most efficient, nor most effective, nor even a remotely adequate solution to a given problem at hand.

39. In her book *White Fragility*, DiAngelo goes further, demonstrating how racial innocence can be viewed as a deliberate social strategy for maintaining power and dominance in society. In *Racial Innocence*, literary scholar Robin Bernstein explores its historical roots. See *White Fragility: Why It's So Hard for White People to Talk about Racism* (London: Penguin Books, 2019); and *Racial Innocence: Performing American Childhood from Slavery to Civil Rights* (New York: NYU Press, 2011).

40. Danielle Brown, "Google Diversity Annual Report 2018," Google, 2018, accessed April 10, 2019, https://static.googleusercontent.com/media/diversity.google/en//static/pdf/Google_Diversity _annual_report_2018.pdf; and Catherine D'Ignazio, "How Might Ethical Data Principles Borrow from Social Work?," Medium, September 2, 2018, https://medium.com/@kanarinka/how-might -ethical-data-principles-borrow-from-social-work-3162f08f0353.

41. The paper about DiF states, "For face recognition to perform as desired—to be both accurate and fair—training data must provide sufficient balance and coverage." See Michele Merler, Nalini Ratha, Rogerio Feris, and John R. Smith, "Diversity in Faces," IBM Research, 2019, https://arxiv .org/abs/1901.10436.

42. Amy Hawkins, "Beijing's Big Brother Tech Needs African Faces," *Foreign Policy*, July 24, 2018, https://foreignpolicy.com/2018/07/24/beijings-big-brother-tech-needs-african-faces/.

43. Hawkins, "Beijing's Big Brother Tech."

44. See Os Keyes, Nikki Stevens, and Jacqueline Wernimont, "The Government Is Using the Most Vulnerable People to Test Facial Recognition Software," *Slate*, March 17, 2019, https://slate.com/ technology/2019/03/facial-recognition-nist-verification-testing-data-sets-children-immigrants -consent.html.

45. @ShovelRemi, "I hope facial recognition software has a problem identifying my face too. That'd come in handy when the police come rolling around with their facial recognition truck at peaceful demonstrations of dissent, cataloging all dissenter for 'safety and security,'" Twitter, February 12, 2018, 7:58 p.m., https://twitter.com/ShovelRemi/status/963215680559489024.

46. "Research shows facial analysis technology is susceptible to bias and even if accurate can be used in ways that breach civil liberties. Without bans on harmful use cases, regulation, and public oversight, this technology can be readily weaponized, employed in secret government surveillance, and abused in law enforcement," Buolamwini warns. In early 2019, the AJL collaborated with the Center on Technology & Privacy at Georgetown Law to launch the Safe Face Pledge, a set of four ethical commitments that businesses and governments make when using facial analysis technology. Many AI companies and prominent researchers have signed the Safe Face Pledge at the time of this writing. Notably, Amazon, which sells its Rekognition technology to police departments around the country, has not signed and has actively attacked Buolamwini's research. In response, top AI researchers have come to her defense and have called on Amazon to stop selling Rekognition to police departments. See Matt O'Brien, "Face Recognition Researcher Fights Amazon over Biased AI," Associated Press, April 3, 2019, https://apnews.com/24fd8e9bc6bf485c8a ff1e46ebde9ec1. For other references, see Joy Buolamwini, "AI Ain't I a Woman?," YouTube video, 3:32, June 2018, https://www.youtube.com/watch?v=QxuyfWoVV98; Joy Buolamwini, "How I'm Fighting Bias in Algorithms," filmed November 2016 in Boston, TED video, 8:34, https:// www.ted.com/talks/joy_buolamwini_how_i_m_fighting_bias_in_algorithms?language=en; Federal Trade Commission, "Hearings on Competition and Consumer Protection in the 21st Century," event agenda, November 13–14, 2018, https://www.ftc.gov/news-events/press-releases/2018/10/ ftc-announces-agenda-seventh-session-its-hearings-competition; and Soledad O'Brien and Joy

Buolamwini, "Artificial Intelligence Is Biased: She's Working to Fix It," *Matter of Fact*, September 8, 2018, https://matteroffact.tv/artificial-intelligence-is-biased-shes-working-to-fix-it/.

47. Arrianna Planey, "Devalued Lives, & Premature Death: Intervening at the Axes of Social 'Difference,'" *Arrianna Planey's Blog*, March 29, 2019, https://arriannaplaney.wordpress.com/2019/03/29/intervening-at-the-axes-of-social-difference-devalued-lives-premature-death/.

48. Mimi Onuoha, "On Missing Data Sets," GitHub, January 25, 2018, https://github.com/MimiOnuoha/missing-datasets.

49. Mayra Buvinic, Rebecca Furst-Nichols and Gayatri Koolwal, *Mapping Gender Data Gaps* (New York: Data2X, 2014), https://data2x.org/wp-content/uploads/2019/05/Data2X_Mapping GenderDataGaps_FullReport.pdf; and Caroline Criado Perez, *Invisible Women: Exposing Data Bias in a World Designed for Men* (New York: Random House, 2019).

50. See Adriana Gallardo, "How We Collected Nearly 5,000 Stories of Maternal Harm," ProPublica, March 20, 2018, https://www.propublica.org/article/how-we-collected-nearly-5-000-stories-of-maternal-harm.

51. See https://www.boston.gov/neighborhood/roxbury.

52. Penn Loh, Jodi Sugerman-Brozan, Standrick Wiggins, David Noiles, and Cecelia Archibald, "From Asthma to AirBeat: Community-Driven Monitoring of Fine Particles and Black Carbon in Roxbury, Massachusetts," *Environmental Health Perspectives* 110 (April 2002): 297–301.

53. On counter-data, see Morgan Currie, Britt S. Paris, Irene Pasquetto, and Jennifer Pierre, "The Conundrum of Police Officer-Involved Homicides: Counter-Data in Los Angeles County," *Big Data & Society* 3, no. 2 (2016): 1–14. On data activism, see Stefania Milan and Lonneke Van Der Velden, "The Alternative Epistemologies of Data Activism," *Digital Culture & Society* 2, no. 2 (2016): 57–74. On statactivism, see the introduction to the special issue of *Partecipazione e conflitto. The Open Journal of Sociopolitical Studies* on the topic, edited by Isabelle Bruno, Emmanuel Didier, and Tommaso Vitale: "Statactivism: Forms of Action between Disclosure and Affirmation," *Partecipazione e conflitto: The Open Journal of Sociopolitical Studies* 7, no. 2 (2014): 198–220. There is a large body of literature on citizen science; a good starting point is Sara Ann Wylie, Kirk Jalbert, Shannon Dosemagen, and Matt Ratto, "Institutions for Civic Technoscience: How Critical Making Is Transforming Environmental Research," *Information Society* 30, no. 2 (2014): 116–126.

54. See Ida B. Wells, "A Red Record: Tabulated Statistics and Alleged Causes of Lynchings in the United States, 1892-1893-1894: Respectfully Submitted to the Nineteenth Century Civilization in 'the Land of the Free and the Home of the Brave,'" New York Public Library Digital Collections, accessed July 24, 2019, http://digitalcollections.nypl.org/items/510d47df-8dbd-a3d9-e040-e00a18064a99.

55. See the About and Data Institute pages of the Ida B. Wells Society website. Since 2016, the Ida B. Wells Society has partnered with ProPublica to offer a two-week data science institute for both journalism students and working reporters. See http://idabwellssociety.org/data-institute/, accessed August 8, 2019.

56. *Femicide* is a term first used publicly by feminist writer and activist Diana Russell in 1976 while testifying before the first International Tribunal on Crimes Against Women. Her goal was to situate the murders of women in a context of unequal gender relations. In this context, men use violence to systematically dominate and exert power over women. And the research bears this out. While male victims of homicide are more likely to have been killed by strangers, a 2009 report published by the World Health Organization and partners notes a "universal finding in all regions" that women are far more likely to have been murdered by someone they know. Femicide includes a range of gender-related crimes, including intimate and interpersonal violence, political violence, gang activity, and female infanticide. Such deaths are often depicted as isolated incidents and treated as such by authorities, but those who study femicides characterize them as a pattern of underrecognized and underaddressed systemic violence. See World Health Organization, *Strengthening Understanding of Femicide: Using Research to Galvanize Action and Accountability* (Washington, DC: Program for Appropriate Technology in Health [PATH], InterCambios, Medical Research Council of South Africa [MRC], and World Health Organization [WHO], 2009), 110.

57. See Maria Salguero's map at https://feminicidiosmx.crowdmap.com/ and https://www .google.com/maps/d/u/0/viewer?mid=174IjBzP-fl_6wpRHg5pkGSj2egE&ll=23.942983359872816 %2C-101.9008685&z=5.

58. Indeed, Marisela Escobedo Ortiz, the mother of one such victim, was herself shot at point-blank range and killed while demonstrating in front of the Governor's Palace in Chihuahua in 2010.

59. The toll now stands at more than 1,500. Three hundred women were killed in Juárez in 2011 alone, and only a tiny fraction of those cases have been investigated. The problem extends beyond Ciudad Juárez and the state of Chihuahua to other states, including Chiapas and Veracruz.

60. *Strengthening Understanding of Femicide* states that "instances of missing, incorrect, or incomplete data mean that femicide is significantly underreported in every region." See World Health Organization, *Strengthening Understanding of Femicide*, 4.

61. After three years of investigating, the commission, chaired by politician Marcela Lagarde, found that femicide was indeed occurring and that the Mexican government was systematically failing to protect women and girls from being killed. Lagarde suggested that femicide be considered, "a crime of the state which tolerates the murders of women and neither vigorously investigates the crimes nor holds the killers accountable." See World Health Organization, *Strengthening Understanding of Femicide*, 11.

62. See Maria Rodriguez-Dominguez, "Femicide and Victim Blaming in Mexico, Council on Hemispheric Affairs, October 2, 2017, http://www.coha.org/wp-content/uploads/2017/10/ Maria-Rodriguez-Femicidio-Mexico-.pdf.

63. Mara Miranda (@MaraMiranda25), "#SiMeMatan es porque me gustaba salir de noche y tomar mucha cerveza ... ," Twitter, May 5, 2017, 11:17 a.m., https://twitter.com/MaraMiranda25/ status/860559096285720581. For an in-depth study of the hashtag and its use in social and political organizing, see Elizabeth Losh, *Hashtag* (New York: Bloomsbury, 2019).

64. Missing data is not a new problem; the fields of critical cartography and critical GIS have long considered the phenomenon of missing data. Contemporary examples of missing data and counterdata collection include "The Missing and Murdered Indigenous Women Database," created by doctoral student Annita Lucchesi, which tracks Indigenous women who are killed or disappear under suspicious circumstances in the United States and Canada (https://www.sovereign-bodies.org/mmiw-database). Jonathan Gray, Danny Lämmerhirt, and Liliana Bounegru also wrote a report which includes case studies of citizen involvement in collecting data on drones, police killings, water supplies, and pollution. See "Changing What Counts: How Can Citizen-Generated and Civil Society Data Be Used as an Advocacy Tool to Change Official Data Collection?," 2016, https://dx.doi.org/10.2139/ssrn.2742871. Environmental health and justice is an area in which communities are out front collecting data when agencies refuse or neglect to do so. The MappingBack Network (http://mappingback.org/home_en/aboutus/) provides mapping capacity and support to Indigenous communities fighting extractive industries, and Sara Wylie, cofounder of Public Lab, works with communities impacted by fracking to measure hydrogen sulfide using low-cost DIY sensors. See Sara Wylie, Elisabeth Wilder, Lourdes Vera, Deborah Thomas, and Megan McLaughlin, "Materializing Exposure: Developing an Indexical Method to Visualize Health Hazards Related to Fossil Fuel Extraction," *Engaging Science, Technology, and Society* 3 (2017): 426–463. Indigenous cartographers Margaret Wickens Pearce and Renee Pualani Louis describe cartographic techniques for recuperating Indigenous perspectives and epistemologies (often absent or misrepresented) into GIS maps. See Margaret Pearce and Renee Louis, "Mapping Indigenous Depth of Place," *American Indian Culture and Research Journal* 32, no. 3 (2008): 107–126. All that said, participatory data collection efforts have their own silences, as Heather Ford and Judy Wajcman show in their study of the "missing women" of Wikipedia: "'Anyone Can Edit,' Not Everyone Does: Wikipedia's Infrastructure and the Gender Gap," *Social Studies of Science* 47, no. 4 (2017): 511–527.

65. Jonathan Stray, *The Curious Journalist's Guide to Data* (New York: Columbia Journalism School, 2016).

66. Virginia Eubanks, *Automating Inequality: How High-Tech Tools Profile, Police, and Punish the Poor* (New York: St. Martin's Press, 2018).

67. "The data are not neutral" is a recurring theme of data feminism. This doesn't mean that data are never useful, just that they are never neutral representations of some sort of essential truth. Examining and understanding the asymmetries of power in the data collection environment (that lead to inequities in the dataset itself) is one of the key responsibilities of the feminist data scientist.

68. Charles Duhigg, "How Companies Learn Your Secrets," *New York Times*, February 19, 2012.

69. Duhigg, "How Companies Learn Your Secrets."

70. The Target "pregnancy prediction score" was more detection than actual prediction because by the time the products were purchased, the customer was likely already pregnant.

71. "Clicking Clean," Greenpeace, May 2015, accessed April 10, 2019, http://www.greenpeace.org/usa/global-warming/click-clean/#top.

72. Joshua S. Hill, "Facebook Los Lunas Data Center Boosted by 100 Megawatts of Solar," Clean-Technica, October 23, 2018, https://cleantechnica.com/2018/10/23/facebook-los-lunas-data -center-boosted-by-100-megawatts-of-solar/.

73. Marie C. Baca, "It's Official: Facebook Breaks Ground in New Mexico Next Month," *Albuquer-que Journal*, September 15, 2016, https://www.abqjournal.com/844876/facebook-picks-los-lunas -for-its-data-center.html.

74. On the percentage, see "Women in U.S. Congress 2018," Rutgers Eagleton Institute of Poli-tics, December 13, 2018, https://cawp.rutgers.edu/women-us-congress-2018. On the wealth, see David Hawkings, "Wealth of Congress: Richer than Ever, but Mostly at the Very Top," Roll Call, February 27, 2018, https://www.rollcall.com/news/hawkings/congress-richer-ever-mostly-top.

75. A good visual exploration of the whiteness and the maleness of power across domains can be seen in a photographic data visualization: Haeyoun Park, Josh Keller, and Josh Williams, "The Faces of American Power, Nearly as White as the Oscar Nominees," *New York Times*, February 26, 2016, https://www.nytimes.com/interactive/2016/02/26/us/race-of-american-power.html.

76. See "The World's Most Valuable Resource Is No Longer Oil, but Data," *Economist*, May 6, 2017. For a list of these CEOs, see Michael Haupt, "'Data Is the New Oil'—A Ludicrous Proposi-tion," Medium, May 2, 2016. If you want to hear many people in a row say the phrase, check out the supercut by Neil Perry, "MyDataMyDollars_2018," YouTube, January 28, 2019, https://youtu .be/kKwr1Tp0TBA?t=587.

77. For example, once advertising giants like Facebook and Google have your gender, they can turn around and use it against you. In 2018, Facebook was accused of gender discrimination because it permitted employers to show job ads only to men. Part of this hinges on corporations' reluctance to take responsibility for any of the content that passes through their platforms: Is Facebook discriminating against women? Or merely letting its customers use Facebook data to discriminate? The news article about the suit says that "Facebook said that it was still review-ing the ads but that it generally did not take down job ads that exclude a gender." See Noam Scheiber, "Facebook Accused of Allowing Bias Against Women in Job Ads," *New York Times*, September 18, 2018, https://www.nytimes.com/2018/09/18/business/economy/facebook-job-ads .html. In another example, computer scientists scraped YouTube videos by transgender users and used their images (without consent) to try to train an algorithm to recognize transgender faces. People found their images included in scientific research papers about the technology when they had never granted permission. Because of cissexism, this kind of unethical practice poses severe risk of harm to transgender users in the form of discrimination and violence. See James Vin-cent, "Transgender YouTubers Had Their Videos Grabbed to Train Facial Recognition Software," *Verge*, August 22, 2017, https://www.theverge.com/2017/8/22/16180080/transgender-youtubers-ai -facial-recognition-dataset. For an example from the government sector with even more severe ethical implications, see Keyes, Stevens, and Wernimont, "The Government Is Using the Most Vulnerable People."

78. In their widely cited paper "Critical Questions for Big Data," danah boyd and Kate Crawford outlined the challenges of unequal access to big data, noting that the current configuration (in

which corporations own and control massive stores of data about people) creates an imbalance of power in which there are "Big Data rich" and "Big Data poor." Boyd and Crawford, "Critical Questions for Big Data: Provocations for a Cultural, Technological, and Scholarly Phenomenon," *Information, Communication & Society* 15, no. 5 (2012): 662–679. Media scholar Seeta Peña Gangadharan has detailed how contemporary data profiling disproportionately impacts the poor, communities of color, migrants, and Indigenous groups. See Seeta Gangadharan, "Digital Inclusion and Data Profiling," *First Monday* 17, no. 5 (April 13, 2012). Social scientist Zeynep Tufecki warns that corporations have emerged as "power brokers" with outsized potential to influence politics and publics precisely because of their exclusive data ownership. See Zeynep Tufekci, "Engineering the Public: Big Data, Surveillance and Computational Politics," *First Monday*, 19, no. 7 (July 2, 2014). And in advancing the idea of *Black data* to refer to the intersection of informatics and Black queer life, Shaka McGlotten states, "How can citizens challenge state and corporate power when those powers demand we accede to total surveillance, while also criminalizing dissent?" See Shaka McGlotten, "Black Data," in *No Tea, No Shade: New Writings in Black Queer Studies* (Durham, NC: Duke University Press, 2016), 262–286.

79. Indeed, four prominent Black maternal health scholars and leaders wrote an essay titled "An Inconvenient Truth: You Have No Answer That Black Women Don't Already Possess." They assert that we should use this moment of increased attention to uplift the work that Black women are already doing, including the "support of Black women in paid, leadership and research roles." Karen A. Scott, Stephanie R. M. Bray, Ifeyinwa Asiodu, and Monica R. McLemore, "An Inconvenient Truth: You Have No Answer That Black Women Don't Already Possess," Black Women Birthing Justice, October 31, 2018, https://www.blackwomenbirthingjustice.org/single-post/2018/10/31/An-inconvenient-truth-You-have-no-answer-that-Black-women-don't-already-possess.

80. See Jochen Profit, Jeffrey B. Gould, Mihoko Bennett, Benjamin A. Goldstein, David Draper, Ciaran S. Phibbs, and Henry C. Lee, "Racial/Ethnic Disparity in NICU Quality of Care Delivery," *Pediatrics* 140, no. 3 (2017) : e20170918; as well as Kelly M. Hoffman, Sophie Trawalter, Jordan R. Axt, and M. Norman Oliver, "Racial Bias in Pain Assessment and Treatment Recommendations, and False Beliefs about Biological Differences between Blacks and Whites," *Proceedings of the National Academy of Sciences* 113, no. 16 (April 4, 2016): 4296–4301, https://doi.org/10.1073/pnas.1516047113.

81. Kimberly Seals Allers, interview by Catherine D'Ignazio, February 26, 2019.

2 Collect, Analyze, Imagine, Teach

1. Gwendolyn Warren, "About the Work in Detroit," in *Field Notes No. 3: The Geography of Children, Part II* (East Lansing, MI: Detroit Geographical Expedition and Institute, 1971), 12. The report also included data that Warren and her team collected—and quantified—on factors as specific as amount of broken glass found on playgrounds in white versus Black neighborhoods, as well as essays from other members of the DGEI.

2. Paul Szewczyk, a historian of Detroit, has created a map that overlays demographic information on top of the redlining map to show how all of Detroit's majority Black neighborhoods were colored red. See the blog post authored by Alex B. Hill, "Detroit Redlining Map 1939," *Detroitography*, December 10, 2014, https://detroitography.com/2014/12/10/detroit-redlining-map-1939/.

3. And that's not the end of the cycle: those who could not buy in those neighborhoods but still wanted to own their homes were required to look elsewhere, depriving those neighborhoods of higher-income individuals, as well as those committed to the neighborhood's long-term growth. Fewer higher-income individuals and prospects for long-term growth made those neighborhoods less desirable as locations for business or other developments, and so the cycle continued on, as it does into the present. For a summary of these and other pernicious effects, including their impact into the present on homeownership rates, home values, and credit scores, see Daniel Aaronson, Daniel Hartley, and Bhash Mazumder, "The Effects of the 1930s HOLC 'Redlining' Maps," Working Paper No. 2017-12 (2017), Federal Reserve Bank of Chicago; and Emily Badger, "How Redlining's Racist Effects Lasted for Decades," *New York Times*, August 24, 2017.

4. We use the term *whiteness* here and throughout the book to refer to the social category of whiteness and to distinguish it from any biological or otherwise essentialist conception of race. The concept of whiteness has a long history, just as the concept of Blackness does. Indeed, many have argued that the two are co-constructed. In the early twentieth century, James Weldon Johnson, James Baldwin, and W. E. B. Du Bois devoted significant attention to the relationship between Blackness and whiteness, emphasizing how Black people needed to understand whiteness for their very survival. In more recent years, scholars from across the humanities have taken up this category, offering additional historical context and theoretical importance. See, for example, David Roediger, *The Wages of Whiteness: Race and the Making of the American Working Class* (New York: Verso, 1991) and Toni Morrison, *Playing in the Dark: Whiteness and the Literary Imagination* (New York: Vintage, 1993) for two early works in this tradition; or, more recently, Nell Irvin Painter, *The History of White People* (New York: Norton, 2010).

5. *Buchanan v. Warley*, a 1917 legal case heard before the US Supreme Court, declared that a race-based zoning ordinance in Kentucky was unconstitutional. But many states and cities, as well as private communities, continued to implement other laws and covenants that would effectively exclude certain inhabitants on the basis of race. See Christopher Silver, "The Racial Origins of Zoning in American Cities," in *Urban Planning and the African American Community: In the Shadows*, ed. June Manning Thomas and Marsha Ritzdorf (Thousand Oaks, CA: Sage, 1993), 23–42.

6. On racial capitalism, see Cedric Robinson, *Black Marxism: The Making of the Black Radical Tradition* (1983; Chapel Hill: University of North Carolina Press, 2000); and Jodi Melamed, "Racial Capitalism," *Critical Ethnic Studies* 1, no. 1 (2015): 76–85. On credit scores, see Mikella Hurley and Julius Adebayo, "Credit Scoring in the Era of Big Data," *Yale Journal of Law and Technology* 18, no. 1 (2017), 148-216. On the tax code, see Michael Leachman, Michael Mitchell, Nicholas Johnson, and Erica Williams, "Advancing Racial Equity with State Tax Policy," Center on Budget and Policy Priorities, November 15, 2018.

7. Cheryl I. Harris, "Whiteness as Property," *Harvard Law Review* 106, no. 8 (1993): 1758. Along similar lines, transgender activist and writer Dean Spade and computational biologist Rori Rohlfs, following Michel Foucault, theorize these effects in terms of "life chances." Sorting techniques like redlining distribute life changes differently for different populations, they explain. This "distribution of life chances" is key. Under the matrix of domination, life chances for majoritized bodies are enhanced, multiplied, and secured by new technologies, whereas life chances for minoritized bodies are diminished, divided, and imperiled by new technologies. Spade and Rohlfs, "Legal Equality, Gay Numbers and the (After?)Math of Eugenics."

8. Redlining is still present with us in numerous ways. In late 2018, the US Department of Housing and Urban Development charged Facebook with discrimination for, among other things, enabling housing advertisers to draw a red line around geographic areas where they did not want their housing ads to appear. See Russell Brandom, "Facebook Has Been Charged with Housing Discrimination by the US Government," *Verge*, March 28, 2019, https://www.theverge.com/2019/3/28/18285178/facebook-hud-lawsuit-fair-housing-discrimination. Scholars have also proposed the concepts of *technological redlining*, to describe the ways that technology reinforces oppression and engages in racial profiling (see Safiya Umoja Noble in *Algorithms of Oppression: How Search Engines Reinforce Racism* [New York: New York University Press, 2018]); *digital redlining*, to refer to the unequal distribution of digital services across different geographies, such as the lack of *Pokémon Go* stops in neighborhoods of color (see Allana Akhtar, "Is Pokémon Go Racist? How the App May Be Redlining Communities of Color," *USA Today*, August 9, 2016); and *discursive redlining*, in which online characterizations of physical places, such as Yelp reviews, directly contribute to gentrification processes (see S. Zukin, S. Lindeman, and L. Hurson, "The Omnivore's Neighborhood? Online Restaurant Reviews, Race, and Gentrification," *Journal of Consumer Culture* 17, no. 3 [2017]: 459–479).

9. Warren, "About the Work in Detroit," 12.

10. Warren, "About the Work in Detroit," 10.

11. In fact, Warren had previously led numerous community actions, including school walkouts and protests, before beginning her collaboration with the DGEI.

12. The work of the Detroit Geographic Expedition and Institute inspired a generation of critical cartographers—geographers who would go on to interrogate the role of power in maps and the potential of counterdata and countermapping to challenge that power. But progressive, "critical" people have their own sexism and racism to negotiate. In academic geography, the DGEI's work is almost exclusively portrayed as the work of the progressive academics who worked on the project. Gwendolyn Warren is rarely credited with leading the work; or, if credited, she is used as an example of how the elite academics were successfully able to collaborate with and transfer knowledge to "the disadvantaged Blacks," to quote geographer Ronald Horvath's account of DGEI ("The 'Detroit Geographic Expedition and Institute' Experience," *Antipode* 3, no. 1 [November 1971]: 74). Warren herself challenged this misattribution of the project and mischaracterization of the community in *Field Notes No. 3*. But the white male savior narrative persists to this day: the DGEI map included in this chapter was referred to as "Bill Bunge's map" (which it definitively is

not!) as recently as 2018 in a scholarly paper. Feminist geographers like Cindi Katz have worked to restore credit to Gwendolyn Warren. See, for example, Gwendolyn Warren, Cindi Katz, and Nik Heynen, "Myths, Cults, Memories, and Revisions in Radical Geographic History: Revisiting the Detroit Geographic Expedition and Institute," in *Spatial Histories of Radical Geography: North America and Beyond*, ed. Trevor Barnes and Eric Sheppard (New York: Wiley, 2019), 59–85. In addition, a video of Katz and Warren in conversation at the City University of New York is available here: https://vimeo.com/111159306.

13. Julia Angwin, Jeff Larson, Surya Mattu, and Lauren Kirchner, "Machine Bias," ProPublica, May 23, 2016, https://www.propublica.org/article/machine-bias-risk-assessments-in-criminal-sentencing.

14. Angwin et al., "Machine Bias."

15. "Children in Single-Parent Families by Race in the United States," Annie E. Casey Kids Count Data Center, accessed July 29, 2019, https://datacenter.kidscount.org/data/tables/107 -children-in-single-parent-families-by#detailed/1/any/false/867,133,38,35,18/10,9,12,1,185,13/4 32,431.

16. Walter S. Gilliam, "Implicit Bias in Preschool: A Research Study Brief," Edward Zigler Center in Child Development & Social Policy, September 28, 2016, https://medicine.yale.edu/ childstudy/zigler/publications/briefs.aspx.

17. Ruha Benjamin, *Race after Technology: Abolitionist Tools for the New Jim Code* (Medford, MA: Polity, 2019).

18. Surya Mattu offered this quotation in a comment posted on the first draft of this manuscript, viewable at https://bookbook.pubpub.org/pub/7ruegkt6.

19. Ben Green, *The Smart Enough City: Putting Technology in Its Place to Reclaim Our Urban Future* (Cambridge, MA: MIT Press, 2019).

20. Julia Angwin, interview by Catherine D'Ignazio, March 1, 2018.

21. Kristy Holtfreter and Rhonda Cupp, "Gender and Risk Assessment: The Empirical Status of the LSI-R for Women," *Journal of Contemporary Criminal Justice* 23, no. 4 (November 1, 2007): 363–382, https://doi.org/10.1177/1043986207309436.

22. See, for example, Frank Pasquale, *The Black Box Society* (Cambridge, MA: Harvard University Press, 2015).

23. ProPublica was able to obtain risk scores, criminal records, and incarceration history because of Florida's strong open records laws. A complete accounting of ProPublica's methods can be found here: Jeff Larson, Julia Angwin, Lauren Kirchner, and Surya Mattu, "How We Analyzed the COMPAS Recidivism Algorithm," ProPublica, May 23, 2016, https://www.propublica.org/article/ how-we-analyzed-the-compas-recidivism-algorithm.

24. Nicholas Diakopoulos, *Algorithmic Accountability Reporting: On the Investigation of Black Boxes* (New York: Tow Center for Digital Journalism, 2013).

25. Nicholas Diakopoulos and Sorelle Friedler, "How to Hold Algorithms Accountable," *MIT Technology Review*, November 17, 2016, https://www.technologyreview.com/s/602933/how-to-hold-algorithms-accountable/.

26. See https://legistar.council.nyc.gov/LegislationDetail.aspx?ID=3137815&GUID=437A6A6D-62E1-47E2-9C42-461253F9C6D0; see also https://www1.nyc.gov/office-of-the-mayor/news/251-18/mayor-de-blasio-first-in-nation-task-force-examine-automated-decision-systems-used-by.

27. Another powerful outcome of the ProPublica story is that more than one hundred civil rights groups came together to write a statement against the use of pretrial risk assessment algorithms and released a signed statement: https://civilrights.org/edfund/pretrial-risk-assessments/. Other good work in the vein of algorithm accountability is emerging in activist and scholarly as well as journalistic spaces. For instance, the lack of data on women impacted by police violence in the United States led Kimberlé Crenshaw and the African American Policy Forum to develop the Black Women Police Violence database (http://www.aapf.org/sayhernamewebinar/), designed to challenge the narrative that police violence only affects males of color. The Fairness, Accountability, and Transparency in Machine Learning (FAT/ML) organization and conference examines fairness, accountability, and transparency for machine-learning systems. This growing community of technical researchers looks at how to measure bias in datasets, how make visible the workings of machine-learning algorithms, and how to align system recommendations with equity and policy goals, among other things.

28. We'll discuss issues of "bigness" in more detail in chapter 6.

29. Candice Lanius, "Fact Check: Your Demand for Statistical Proof is Racist," *Society Pages*, January 12, 2015, https://thesocietypages.org/cyborgology/2015/01/12/fact-check-your-demand-for-statistical-proof-is-racist/.

30. Maggie Walter and Chris Andersen, *Indigenous Statistics: A Quantitative Research Methodology* (London: Routledge/Taylor & Francis Group, 2016).

31. Nina Rabinovitch Blecker, interview by Catherine D'Ignazio, November 29, 2018.

32. Data2X, "Invisible No More? A Methodology and Policy Review of How Time Use Surveys Measure Unpaid Work," March 2018, https://data2x.org/wp-content/uploads/2019/05/Data2X-Invisible-No-More-Volume-1.pdf. For more on invisible labor, see chapter 7.

33. Maggie Walter, "Indigenous Statistics: Doing Numbers Our Way," keynote presentation at the American Indigenous Research Association 2016 Meeting, https://www.americanIndigenousresearchassociation.org/wp-content/uploads/2016/11/Walters-AIRA-2016.pdf.

34. Ruha Benjamin, Twitter post, March 19, 2018, https://twitter.com/ruha9/status/975722518773403648.

35. There is a well-documented phenomenon called *automation bias* that is described by many researchers, including M. L. Cummings, director of Duke's Humans and Autonomy Laboratory, in which humans are prone to trusting automated systems more than they should. M. L.

Cummings, "Automation Bias in Intelligent Time Critical Decision Support Systems," AAIA First Intelligent Systems Technical Conference, September 2004.

36. See, for instance, the organization (and related conference) for Fairness, Accountability, and Transparency in Machine Learning: http://www.fatml.org/.

37. Funders have been getting behind ethics in data and artificial intelligence in a big way. The Stanford Institute for Human-Centered Artificial Intelligence aims to raise $1 billion for its university-based research center. Reid Hoffman, Pierre Omidyar, and the Knight Foundation created the $27 million Ethics and Governance in AI Fund. The Rockefeller Foundation and the Mastercard Impact Fund recently gifted nonprofit DataKind $20 million to catalyze a "data for social good" ecosystem. But is "ethics" the right framing for this work?

38. Julia Powles, "The Seductive Diversion of 'Solving' Bias in Artificial Intelligence," Medium, December 7, 2018, https://medium.com/s/story/the-seductive-diversion-of-solving-bias-in-artificial-intelligence-890df5e5ef53.

39. We are not suggesting that ethics have no place in data science. There are very valuable contributions to this discussion that come from the emerging field of data ethics—for instance, those of media studies scholar Aristea Fotopoulou, who is working to theorize a feminist data ethics of care, or of information studies scholar Anna Lauren Hoffman, who explores both the uses and limits of data ethics in her research. We should also make clear that there have been many valuable correctives to traditional ethical frameworks that seek to challenge and redefine the notion of ethics through a feminist lens. For example, the idea of an ethics of care that arose from theorizing work in the home emphasizes shared responsibilities rather than individual obligations, the importance of relationships among individuals and groups, the fundamental role of invisible labor, and the importance of placing issues in context. Virginia Held, in *The Ethics of Care: Personal, Political, and Global* (New York: Oxford University Press, 2006), offers one of the most comprehensive accounts of this feminist framework. More recently, Maria Puig de la Bellacasa, in *Matters of Care: Speculative Ethics in Nonhuman Worlds* (Minneapolis: University of Minnesota Press, 2017), extends this ethical conversation to issues of technology and other nonhuman actors. Aristea Fotopoulou extends this framework to data in particular. See "Understanding Citizen Data Practices from a Feminist Perspective: Embodiment and the Ethics of Care" in *Citizen Media and Practice*, ed. H. Stephansen and E. Trere (Oxford: Taylor & Francis/Routledge, forthcoming); and *Feminist Data Studies: Big Data, Critique and Social Justice* (Thousand Oaks, CA: SAGE Publications, forthcoming). For more of Hoffman's work, see D. Greene, A. L. Hoffmann, and L. Stark, "Better, Nicer, Clearer, Fairer: A Critical Assessment of the Movement for Ethical Artificial Intelligence and Machine Learning," presented at the Hawaii International Conference on System Sciences (HICSS), Maui, Hawaii, 2019; and A. L. Hoffmann, "Beyond Distributions and Primary Goods: Assessing Applications of Rawls in Information Science and Technology Literature since 1990," *Journal of the Association for Information Science and Technology* 68, no. 7 (2017): 1601–1618.

40. Sasha Costanza-Chock, "In Defense of Data Discrimination," keynote at Data Justice 2018, Cardiff University, May 2018. A video of the talk can be found here: https://cardiff.cloud

.panopto.eu/Panopto/Pages/Viewer.aspx?id=d132281d-8bbc-4980-8013-a8e8007c788d. For more perspectives on data justice, see special issue, *Information, Communication & Society* 22, no. 7 (2019), ed. Lina Dencik, Arne Hinta, Joanna Redden, and Emiliano Treré.

41. See, for example, the *New York Times*'s extensive coverage of the 2019 college admissions cheating scandal, at https://www.nytimes.com/news-event/college-admissions-scandal.

42. From Sasha Costanza-Chock's keynote at the Data Justice 2018 conference at Cardiff University. We do not delve into restorative justice in depth in this chapter, but interested readers may wish to consult Margaret Urban Walker, "Restorative Justice and Reparations," *Journal of Social Philosophy* 37, no. 3 (Fall 2006): 377–395.

43. For example, the Computer People for Peace (CPP), a late 1960s activist group, strongly criticized the Association for Computing Machinery (ACM), the largest group of computing professionals at the time. The ACM wanted to remain "neutral" on questions of building technology for the Vietnam war. "ACM's neutral position is in fact support for the status quo," wrote the CPP in its May 1969 newsletter. See *Interrupt: The Newsletter of Computer Professionals for Peace*, May 1969, p. 1, https://eli.naeher.name/pdfs/interrupt-7.pdf.

44. If you are a Black woman in the United States, you are intimately familiar with how your simple participation in everyday encounters becomes political. Writes Patricia Hill Collins, "Oppression is not simply understood in the mind—it is felt in the body in myriad ways. Moreover, because oppression is constantly changing, different aspects of an individual U.S. Black woman's self-definitions intermingle and become more salient: Her gender may be more prominent when she becomes a mother, her race when she searches for housing, her social class when she applies for credit, her sexual orientation when she is walking with her lover, and her citizenship status when she applies for a job. In all of these contexts, her position in relation to and within intersecting oppressions shifts." *Black Feminist Thought*, 274–275.

45. See Michael K. Brown, Martin Carnoy, Elliott Currie, David B. Oppenheimer, David Wellman, and Marjorie M. Shultz, *Whitewashing Race: The Myth of a Color-Blind Society* (Berkeley: University of California Press, 2003).

46. Kiddada Green, talk delivered at the 2014 First Food Forum, Kellogg Foundation, March 24, 2014. Viewable online at https://www.youtube.com/watch?v=MXyTrFRGRt4.

47. Scholars like Costanza-Chock are thinking about what it might take to create models and metrics for equity. Their Intersectional Media Equity Index (https://cmsw.mit.edu/media-communication-intersectional-analysis/), for example, is a speculative metric that would quantify "media ownership (who owns the media), employment in media firms (who works in the media), content production (who makes the media), standing (who gets to speak in the media), and attention (who gets listened to)." Although they admit that all sorts of questions remained unanswered—for instance, how the community or identity categories of the index would be determined and what "communication reparations" would look like for groups who have historically been targets of the media—they speculate that "a project to gather and make legible various indicators of equity in the media and communications system would be potentially very

powerful" in light of the limited studies of representation in the media that presently exist. See "Media, Communication, and Intersectional Analysis: Ten Comments for the International Panel on Social Progress," *Global Media and Communication* 14, no. 2 (2018): 201–209.

48. Seeta Pena Gangadharan, Virginia Eubanks, and Solon Barocas, *Data and Discrimination: Collected Essays* (Washington, DC: Open Technology, 2014).

49. Robin DiAngelo, *White Fragility: Why It's So Hard for White People to Talk about Racism* (New York: Beacon, 2018).

50. See the hashtag #TechWontBuildIt: https://twitter.com/hashtag/techwontbuildit?lang=en.

51. For an in-depth discussion of co-liberation, see Ana María León, "Spaces of Co-liberation," in *Dimensions of Citizenship*, ed. Nick Axel, Nikolaus Hirsch, Ann Lui, and Mimi Zeiger (Los Angeles: Inventory Press, 2018), http://dimensionsofcitizenship.org/essays/spaces-of-co-liberation/.

52. Although this quote ended up circulating on the internet as the work of one person—Lilla Watson—Watson herself describes it as the outcome of a collective process, and she desired that it be credited as "Aboriginal activists group, Queensland, 1970s." See Watson, "Attributing Words," *Unnecessary Evils*, November 3, 2008, http://unnecessaryevils.blogspot.com/2008/11/attributing -words.html.

53. See Tawana Petty, "Anti-racism Organizing Has Staled," *EclectaBlog*, December 2, 2017, https://www.eclectablog.com/2017/12/anti-racism-organizing-has-staled.html.

54. Seeta Peña Gangadharan, Tawana Petty, Tamika Lewis, and Mariella Saba, *Digital Defense Playbook: Community Power Tools for Reclaiming Data* (Detroit: Our Data Bodies, 2018), https://www.odbproject.org/wp-content/uploads/2019/03/ODB_DDP_HighRes_Single.pdf; see also https://store.alliedmedia.org/products/our-data-bodies-digital-defense-playbook.

55. Gangadharan et al., *Digital Defense Playbook*.

56. Although the ODB project is admirable for how it has forged connections within and across communities, it is not impossible to design for the general public with a goal of co-liberation in mind. For instance, the Appolition app (https://appolition.us/), based on an idea by scholar and filmmaker Kortney Ryan Ziegler and implemented by tech entrepreneur Tiffany Mikell, converts users' spare change into bail money to subvert what Michelle Alexander, author of *The New Jim Crow*, has called "the unconscionable practice of cash bail." Those who can afford to pay bail can go home to await their trial, whereas those who can't remain incarcerated, resulting in the loss of income, job, and other forms of security. The bail system produces a two-tiered system that, once again, privileges the rich.

57. For coverage of the #TechWontBuiltIt hashtag and its results, see "Solidarity Letter: Tech Won't Build it," *Science for the People* (blog), September 25, 2018, https://scienceforthepeople .org/2018/09/25/solidarity-letter-tech-wont-build-it/; Shirin Ghaffary, "Microsoft Workers Are Demanding the Company Cancel Its $480 Million Contract with the US Military," *Vox*, February 22, 2019, https://www.recode.net/2019/2/22/18236290/microsoft-military-contract-augmented -reality-ar-vr; Drew Harwell, "Amazon Met with ICE Officials over Facial-Recognition Systems

that Could Identify Immigrants," *Washington Post*, October 23, 2018, https://www.washington post.com/technology/2018/10/23/amazon-met-with-ice-officials-over-facial-recognition-system -that-could-identify-immigrants/; and Kate Conger, "Google Plans Not to Renew Its Contract for Project Maven, a Controversial Pentagon Drone AI Imaging Program," *Gizmodo*, June 1, 2018, https://gizmodo.com/google-plans-not-to-renew-its-contract-for-project-mave-1826488620.

58. This is not to say that these problematic alliances have disappeared. Google, for instance, continues to work on several other DoD projects. See Jill Aitoro, "Forget Project Maven: Here Are a Couple Other DoD Projects Google Is Working On," *C4ISRNET*, March 13, 2019, https://www.c4isrnet.com/it-networks/2019/03/13/forget-project-maven-here-are-a-couple -other-dod-projects-google-is-working-on/.

59. See Corinne Iozzio, "The *Playboy* Centerfold that Helped Create the JPEG," *Atlantic*, Febru- ary 9, 2016, https://www.theatlantic.com/technology/archive/2016/02/lena-image-processing -playboy/461970/.

60. Individual software engineers have begun rejecting recruiter efforts from large companies whose values are not aligned with theirs and then publishing their responses to Twitter with the hashtag #TechWontBuildIt (see note 58). For example, engineer Anna Geiduschek posted her response to an Amazon recruiter: "Thanks for reaching out. I'm sure you're working on some interesting problems over there at AWS, however, I would never consider working for Amazon until you drop your AWS contract with Palantir." (Palantir provides software to US Immigration Customs and Enforcement, the agency responsible for separating thousands of young children from their parents at the US-Mexico border in 2018.). At an industry-wide level, the #MoreTh- anCode research report recently published an inventory of organizations that mobilize technol- ogy in combination with social justice values: https://morethancode.cc/orglist/.

61. Horace Mann is credited as one of the first advocates of universal public education; his ideals have been utilized again and again, as recently as by the Obama administration to illus- trate its commitment to poverty reduction through public education. But as was true of so many nineteenth-century figures we will meet throughout this book, Mann was severely constrained by the ideas of his time. In public speeches, Mann argued that men and women could not be treated as equals in the education system because their anatomy is different: "There is not one single organ in structure, position and function alike in man and woman, and therefore there can be no equality between the sexes." So, the radical part of Mann's social imaginary for the time was that he imagined an education system that treated all white, Anglo-Saxon, Christian men, regardless of class background, as worthy of education. But women, nonbinary people, people of color, immigrants, disabled people, non-Christians, and others remained excluded from the equalizing. For a recent assessment of Mann's legacy, including a discussion of the lines cited above, see David Rhode, Kristina Cooke, and Himanshu Ojha, "The Decline of the 'Great Equalizer,'" *Atlantic*, December 19, 2012, https://www.theatlantic.com/business/archive/2012/12/ the-decline-of-the-great-equalizer/266455/.

62. From S. M. Wes, M. Whittaker, and K. Crawford, *Discriminating Systems: Gender, Race and Power in AI* (April 2019, AI Now Institute), https://ainowinstitute.org/discriminatingsystems.html.

63. This does not mean there are *no* data ethics courses, only that it is not the norm to address these concerns in introductory coursework. There is a list compiled by social computing researcher Casey Fiesler of hundreds of courses that specifically address ethics in technical fields at http://bit.ly/tech-ethics-syllabi.

64. An April 2019 report from the AI Now Institute, has an excellent characterization of pipeline research and its shortcomings. See Sarah Myers West, Meredith Whittaker, and Kate Crawford, *Discriminating Systems: Gender, Race, and Power in AI*, https://ainowinstitute.org/discriminating systems.pdf.

65. In their paper "'Anyone Can Edit,' Not Everyone Does," Heather Ford and Judy Wajcman offer an excellent summary of the feminist research into women in STEM. See Ford and Wajc-man, "'Anyone Can Edit,' Not Everyone Does: Wikipedia's Infrastructure and the Gender Gap," *Social Studies of Science* 47, no. 4 (March 2017): 511–527. Although this chapter focuses on the transformations that need to happen in individual classrooms and workshops, we should also think about feminist interventions at the scale of programs and institutions. The single most important action an educational institution could take to interrupt the Man Factory model is to *not* house its data science programs in exclusively technical disciplines. Computer science, statistics, and engineering are extremely important fields for data science, but the humanities and social sciences have far more sophisticated and current models for dealing with the social, political, legal, and ethical concerns that arise in all the human and environmental application areas of data science. The solution to the "ethics issue" in the data science curriculum will not be found by adding ethics courses or by funding big AI ethics initiatives that sit in computer science departments. Rather, it will be found when foundations and institutions begin to value and integrate knowledge in a transdisciplinary model. In practice, this might mean that data science is housed outside of the academic department system and placed within its own insti-tute or transdisciplinary center. In this way, the institution could legitimize historical, local, and domain-specific knowledge, even as some of the disciplinary assets of computation are (and should remain) its methods for abstraction and scale.

66. These concepts ranged from basic topics like ratios and probability to more advanced ideas about combinatorics and modeling For more on the City Digits curriculum, see "City Digits: Local Lotto," Center for Urban Pedagogy, accessed July 30, 2019, http://welcometocup.org/Projects/CityStudies/CityDigits. Their curriculum was aligned with the Common Core standards for the state of New York.

67. For recent reportage on this phenomenon, see Meghan Keneally, "Mega Millions Lottery: Where Does Lottery Money Go in Different States," ABC News, October 22, 2018, https://abcnews.go.com/US/mega-millions-lottery-lottery-money-states/story?id=58661412; and Peter O'Dowd, interview with Liberty Vittert, *Here & Now*, October 23, 2018, https://www.wbur.org/hereandnow/2018/10/23/where-do-lottery-profits-go.

68. Laurie H. Rubel, Vivian Y. Lim, Maren Hall-Wieckert, and Mathew Sullivan, "Teaching Math-ematics for Spatial Justice: An Investigation of the Lottery," *Cognition and Instruction* 34, no. 1 (2016): 1–26.

69. Youth came up with scenarios to illustrate these probabilities. For example, you would have to drink 15,444 Arizona iced teas to consume four million calories; or wait sixty-one years for four million M subway trains to pass you on the platform.

70. As Rubel describes: "We brought them to Brooklyn College to present to faculty there. We had a group of New York City school kids, and each kid led a small group of faculty from lots of disciplines, showing them how to read the maps and how to interpret some of the data. That was neat." The students subsequently presented at Math for America (https://mathforamerica.org/our-model) and a national conference on math and social justice in San Francisco. Quote from Laurie Rubel, interview by Catherine D'Ignazio, July 25, 2018.

71. This is not to say that these women identified themselves as feminists; we note only that the identities of organizational leadership matter in ways that are both symbolic and material. They reflect how much an organization has prioritized the voices of minoritized bodies and, conversely, how much "privilege hazard" the organization faces by overvaluing the voices of majoritized bodies.

72. Rubel et al., "Teaching Mathematics for Spatial Justice."

73. Rubel et al., "Teaching Mathematics for Spatial Justice."

74. Donna J. Haraway, *Staying with the Trouble: Making Kin in the Chthulucene* (Durham, NC: Duke University Press, 2016).

3   On Rational, Scientific, Objective Viewpoints from Mythical, Imaginary, Impossible Standpoints

1. Alberto Cairo, "Emotional Data Visualization: Periscopic's 'U.S. Gun Deaths' and the Challenge of Uncertainty," Peachpit, April 3, 2013, http://www.peachpit.com/articles/article.aspx?p=2036558.

2. Nicole Amare and Alan Manning, *A Unified Theory of Information Design: Visuals, Text and Ethics* (New York: Routledge, 2016).

3. Theodore M. Porter, *Trust in Numbers: The Pursuit of Objectivity in Science and Public Life* (Princeton, NJ: Princeton University Press, 1996).

4. But is such distance possible? Pearson's own work, like that of so many important figures in statistical history, was influenced by his own deeply problematic beliefs. For more on Pearson and his support of the eugenics movement, in particular, see chapter 5. Pearson as quoted in Jonathan Gray, *The Data Epic: Visualisation Practices for Narrating Life and Death at a Distance,* in *Data Visualization in Society*, ed. H. Kennedy and M. Engebretsen (Amsterdam: Amsterdam University Press, 2019).

5. Adam Crymble, "The Two Data Visualization Skills Historians Lack," *Thoughts on Public & Digital History* (blog), March 13, 2013, http://adamcrymble.blogspot.com/2013/03/the-two-data-visualization-skills.html.

6. Haraway goes so far as to link the god trick of visualization with vision itself. She writes, "The eyes have been used to signify a perverse capacity—honed to perfection in the history of science tied to militarism, capitalism, colonialism, and male supremacy—to distance the knowing subject from everybody and everything in the interests of unfettered power." The redlining map in chapter 2 is a perfect example of such unfettered power: the pretense of distance and omniscience in the service of gender and race oppression. Donna Haraway, "Situated Knowledges: The Science Question in Feminism and the Privilege of Partial Perspective," *Feminist Studies* 14, no. 3 (1988): 575–599.

7. Edward R. Tufte, *The Visual Display of Quantitative Information*, 2nd ed. (Cheshire, CT: Graphics Press, 2015). For an example of how his ideas are used by contemporary practitioners, see "Maximiizing the Data-Ink Ratio in Dashboards and Slide Decks," *plotly,* December 11, 2017, https://medium.com/@plotlygraphs/maximizing-the-data-ink-ratio-in-dashboards-and-slide -deck-7887f7c1fab.

8. Mushon Zer-Aviv, "DataViz—The UnEmpathic Art," October 19, 2015, https://responsibledata .io/dataviz-the-unempathetic-art/.

9. Stephanie A. Shields, *Speaking from the Heart: Gender and the Social Meaning of Emotion* (Cambridge: Cambridge University Press, 2002).

10. Witney Battle-Baptiste and Britt Rusert, eds., *WEB Du Bois's Data Portraits: Visualizing Black America* (Hudson, NY: Chronicle Books, 2018); Laura Bliss, "The Hidden Histories of Maps Made by Women: Early North America," *CityLab*, March 21, 2016, https://www.citylab.com/ design/2016/03/women-in-cartography-early-north-america/471609/; and Lauren Klein, Caroline Foster, Adam Hayward, Erica Pramer, and Shivani Negi, "The Shape of History: Reimagining Elizabeth Palmer Peabody's Feminist Visualization Work," *Feminist Media Histories* 3, no. 3 (Summer 2017): 149–153. More about all of these visualizations and the contexts in which they were created can be found on Lauren's interactive book in progress, *Data by Design*, at http:// dataxdesign.io/.

11. Aristotle, *The Rhetoric and the Poetics* (New York: Random House, 1954).

12. Thanks go to M. Richard Zinman for helping us fact-check whether the men wore robes or tunics, as well as what their head garb consisted of.

13. Jessica Hullman and Nicholas Diakopoulos, "Visualization Rhetoric: Framing Effects in Narrative Visualization," *IEEE Transactions on Visualization and Computer Graphics* 17, no. 12 (December 2011): 2231–2240.

14. See Jonathan Stray, *The Curious Journalist's Guide to Data* (New York: Columbia Journalism School, 2016), https://legacy.gitbook.com/book/towcenter/curious-journalist-s-guide-to-data/ details; and Mike Bostock, Shan Carter, Amanda Cox, and Kevin Qualy, "One Report, Diverging Perspectives," *New York Times*, October 5, 2012, https://archive.nytimes.com/www.nytimes.com/ interactive/2012/10/05/business/economy/one-report-diverging-perspectives.html.

15. Since the 1950s, there has been a line of research focused on the important framing effects of titles of news articles on interpretation. More recently, scholars are showing that titles of visualizations are similarly important anchors for people to make sense of data graphics in popular media. For example, see Michelle A. Borkin, Zoya Bylinskii, Nam Wook Kim, Constance May Bainbridge, Chelsea S. Yeh, Daniel Borkin, Hanspeter Pfister, and Aude Oliva, "Beyond Memorability: Visualization Recognition and Recall," *IEEE Transactions on Visualization and Computer Graphics* 22, no. 1 (2016): 519–528.

16. See Stray, "The Curious Journalist's Guide to Data."

17. See Hullman and Diakopoulos, "Visualization Rhetoric."

18. Helen Kennedy, Rosemary Lucy Hill, Giorgia Aiello, and William Allen, "The Work That Visualisation Conventions Do," *Information, Communication & Society* 19, no. 6 (March 16, 2016): 715–735.

19. Haraway, "Situated Knowledges."

20. Sandra Harding, "'Strong Objectivity': A Response to the New Objectivity Question," *Synthese* 104, no. 3 (September 1995): 331–349.

21. Linda Alcoff, "Cultural Feminism versus Post-Structuralism: The Identity Crisis in Feminist Theory," *Signs: Journal of Women in Culture and Society* 13, no. 3 (1988): 405–436.

22. Nieca Goldberg, *Women Are Not Small Men: Life-Saving Strategies for Preventing and Healing Heart Disease in Women* (New York: Ballantine Books, 2002).

23. Most studies also continue to treat sex and gender as binary classifications, which they are not. (We address that in the next chapter.) And for more on what Carolina Criado-Perez calls the *gender data gap*, check out her book *Invisible Women: Data Bias in a World Designed for Men* (New York: Abrams, 2019).

24. Resisting binary thinking is a multipurpose tool in the feminist toolbox. We discuss the false gender binary in chapter 4. Feminist thinkers have demonstrated how other binaries also need a complete rethinking—like reason/emotion, nature/culture, subject/object, body/world, speaker/receiver, universal/particular, facts/values, and traditional/modern, among others. In short, beware binaries! They are probably hiding a hierarchy behind them.

25. Evelyn Fox Keller and Barbara McClintock, *A Feeling for the Organism: The Life and Work of Barbara McClintock*, 10th anniversary ed. (New York: Freeman, 1984).

26. Luke Stark, "Come on Feel the Data (and Smell It)," *Atlantic*, May 19, 2014, https://www.theatlantic.com/technology/archive/2014/05/data-visceralization/370899/.

27. If you're interested in appetites, Lauren's historical research deals with the cultural significance of appetite and eating in the early United States. See Lauren F. Klein, *An Archive of Taste: Race and Eating in the Early United States* (Minneapolis: University of Minnesota Press, 2020).

28. "Vision Impairment and Blindness," World Health Organization, October 11, 2018, http://www.who.int/news-room/fact-sheets/detail/blindness-and-visual-impairment.

29. Aimi Hamraie, "A Smart City Is an Accessible City," *Atlantic*, November 6, 2018, https://www.theatlantic.com/technology/archive/2018/11/city-apps-help-and-hinder-disability/574963/.

30. You can see the full performance of *A Sort of Joy (Thousands of Exhausted Things)* at https://vimeo.com/133815147.

31. This critique is at least as old as Linda Nochlin's canonical 1971 essay: "Why Have There Been No Great Women Artists?," in *Woman in Sexist Society: Studies in Power and Powerlessness*, ed. Vivian Gornick and Barbara Moran (New York: Basic Books, 1971), 344–366.

32. By Whitney Chadwick in Guerrilla Girls, *Confessions of the Guerilla Girls* (New York: Harper-Collins, 1995).

33. Feminist ruckuses with the Metropolitan Transit Authority continue today. In 2015, the menstruation start-up company THINX was also told their ads—featuring women with eggs and grapefruit—were too suggestive and that the word *period* wouldn't be allowed. After the public cried foul (MTA trains were already cluttered with cleavage due to easily approved advertisements for plastic surgery), the ads did run. In another subway-related incident, the woman-led sex toy company Dame sued the MTA for censorship in 2019 when it refused to run Dame's ads. See Rachel Krantz, "THINX Underwear Ads on NYC Subway Are Up—but the Company Has Another Big Announcement," *Bustle*, November 9, 2015; and Leila Ettachfini, "MTA Quietly Bans Sex Toys from Advertising on NYC Subway," *Vice*, January 10, 2019.

34. Wattenberg states: "A moment of insight, in which people see facts and patterns for themselves, can be rhetorically powerful" (2). See Robert Kosara, Sarah Cohen, Jérôme Cukier, and Martin Wattenberg, "Panel: Changing the World with Visualization," in *IEEE Visualization Conference Compendium* (Piscataway, NJ: IEEE, 2009).

35. In "The Eyes Have It," Ben Shneiderman writes about the design of graphic user interfaces to support data exploration for the purposes of analysis. There is clearly a different context and set of goals than an artistic performance, yet folks in the information visualization community have also showed how "overview first" doesn't necessarily apply for all analytic tasks in user interface design either. Still, it's useful to think about when "the whole picture" doesn't (and can't) provide the whole emotional picture and determine what strategies one might pursue to do so. See Shneiderman, "The Eyes Have It: A Task by Data Type Taxonomy for Information Visualizations," *The Craft of Information Visualization*, September 1996, 364–371; and Timothy Luciani, Andrew Burks, Cassiano Sugiyama, Jonathan Komperda, and G. Elisabeta Marai, "Details-First, Show Context, Overview Last: Supporting Exploration of Viscous Fingers in Large-Scale Ensemble Simulations," *IEEE Transactions on Visualization and Computer Graphics* 25, no. 1 (August 20, 2018): 1225–1235.

36. D'Ignazio and Sutton were struck by the similarity of Boston coastline maps from the past (seventeenth and eighteenth centuries) with the future predictions based on climate change (the year 2100 estimated with a seven-foot storm surge). The neighborhoods that Bostonians created

in the 1800s by trucking in gravel and dirt are the most vulnerable ones to rising sea levels in the future. In *Boston Coastline: Future Past*, the artists led a walking tour of the past/future coastline that was punctuated by microlectures from community members working on climate adaptation. Participants wore messages as they walked and then stenciled them into a timeline on the Boston Common to close the walk. Catherine D'Ignazio and Andi Sutton, "Boston Coastline: Future Past," kanarinka.com, 2018, accessed March 13, 2019, http://www.kanarinka.com/project/boston-coastline-future-past/.

37. Mikhail Mansion's project is called "Two Rivers." One chair sits on a platform in the Providence River and logs data about the currents and shifts in the water. Visitors to a gallery are invited to sit on a second chair and feel, in real-time, the motion of the Providence River at a distance. Mikhail Mansion, "Two Rivers (2011)," Vimeo, October 1, 2011, https://vimeo.com/29885745.

38. The Data Zetu project ("our data" in Swahili), in collaboration with a number of partners in Tanzania, ran the Data Khanga Design Challenge in which participants designed *khangas*—fabrics that traditionally carry social messages in East Africa. Designers worked to incorporate statistics about gender equality and health into their khangas. Models wore the winning designs in a fashion show to which all participants were invited. Maana Katuli, "Young Artists Use Fashion and Data to Promote Dialog on Sexual Health," Medium, March 28, 2018, https://medium.com/data-zetu/young-artists-use-fashion-and-data-to-promote-dialog-on-sexual-health-517429662ec2.

39. *Core Sample* is a GPS-based sound walk by Teri Rueb from 2007. Teri Reub, "Core Sample—2007," *Teri Rueb* (blog), 2007, accessed March 13, 2019, http://terirueb.net/core-sample-2007/.

40. *FM Radio Map* from 2006 is a paper map that plots the location of commercial and pirate radio stations in London. Viewers can use a modified radio to listen to each radio station by placing metal contacts on the station locations. The back of the map uses graphite to conduct electricity from the metal contacts to a small radio that tunes in to the station selected. Jo-Anne Green, "Simon Elvins' Silent London," *Networked_Music_Review* (blog), July 11, 2006, http://archive.turbulence.org/networked_music_review/2006/07/11/simon-elvins-silent-london/.

41. *A Piece of the Pie* by Annina Rüst leverages pie metaphors to make pie charts and literal, edible pies. Her robot also tweets its data about gender representation in technical fields. Annina Rüst, "A Piece of the Pie Chart", 2013, accessed March 13, 2019, http://www.anninaruest.com/pie/.

42. A 2010 study by Scott Bateman and colleagues in computer science at the University of Saskatchewan found that "embellished" charts—such as bar charts in the form of monsters—do not hinder people's ability to accurately read them—and in fact, they are actually easier to remember. When polled two to three weeks later, people were much more likely to recall the message of an embellished chart over a minimalist chart that displayed the same data. People also thought the "junk charts," decorated with monsters, were more attractive and enjoyed them more. (Duh. Who doesn't like monsters better than bar charts?!) Likewise, in 2016, Michelle Borkin and colleagues showed that visualizations that make use of novel presentation styles are more memorable. Relating the visual form to the topical content of a chart *can really work*. So, as data journalist Mona Chalabi says, "If it's about farts, draw a butt for god's sakes." See Scott Bateman,

Regan L. Mandryk, Carl Gutwin, Aaron Genest, David McDine, and Christopher Brooks, "Useful Junk?: The Effects of Visual Embellishment on Comprehension and Memorability of Charts," in *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (New York: ACM, 2010), 2573–2582; Michelle A. Borkin, Zoya Bylinskii, Nam Wook Kim, Constance May Bainbridge, Chelsea S. Yeh, Daniel Borkin, Hanspeter Pfister, and Aude Oliva, "Beyond Memorability: Visualization Recognition and Recall," *IEEE Transactions on Visualization and Computer Graphics* 22, no. 1 (2015): 519–528; and Bryony Stone, "'If It's about Farts, Draw a Butt for God's Sakes': Mona Chalabi Tells Us How to Illustrate Data," *It's Nice That* (blog), March 8, 2018, https://www.itsnicethat.com/articles/mona-chalabi-illustration-internationalwomensday-080318.

43. You can read more about these chart forms and their purposes and functions at the Data Visualisation Catalogue, https://datavizcatalogue.com/.

44. According to work by Sarah Belia and colleagues, researchers themselves have a hard time understanding confidence intervals. See Sarah Belia, Fiona Fidler, Jennifer Williams, and Geoff Cumming, "Researchers Misunderstand Confidence Intervals and Standard Error Bars," *Psychological Methods* 10, no. 4 (2005): 389–396.

45. Take, for example, the weather report. Forecasts such as "There's a 30 percent chance of rain tomorrow" are generally interpreted by the public to mean "It will rain 30 percent of the time" or "It will rain in 30 percent of my area," and not as a 30 percent probability of it raining. The standard meteorological measure is *probability of precipitation* (PoP), which takes both time and geography into account. PoP is calculated by multiplying a confidence measure (that rain will occur somewhere in a geographic area in a given time period) by an area measure (the percentage of the geographic area that will receive any rain in a given time period). In an installment of her series Just the Facts, data journalist Mona Chalabi detailed how the weather industry has an acknowledged "wet bias," meaning forecasters consistently overpredict rain so as not to make people angry that they didn't bring umbrellas. Mona Chalabi, "Is the National Weather Service Lying to You?," *Guardian*, March 17, 2017, https://www.theguardian.com/us-news/2017/mar/17/national-weather-service-forecasting-temperatures-storms.

46. Hullman and colleagues did a study on hypothetical outcome plots, which animate different simulated outcomes for a single quantity. By viewers seeing where the outcomes tended to land animated over time, they were able to infer more about the probability of variation than in standard violin plots and error bars. Jessica Hullman, Paul Resnick, and Eytan Adar, "Hypothetical Outcome Plots Outperform Error Bars and Violin Plots for Inferences about Reliability of Variable Ordering," *PLOS ONE* 10, no. 11 (2015): e0142444.

47. Richard Porczak (@tsiro), "Straight up: the NYT needle jitter is irresponsible design at best and unethical design at worst and you should stop looking at it," Twitter, November 8, 2016, 9:58 p.m., https://twitter.com/tsiro/status/796185282718511104. J. K. Trotter, "*The New York Times* Live Presidential Election Meter Is Fucking with Me," *Gizmodo*, November 8, 2016, https://gizmodo.com/the-new-york-times-live-presidential-meter-is-fucking-w-1788732314.

48. Gregor Aisch, "Why We Used Jittery Gauges in Our Live Election Forecast," Vis4.net, November 14, 2018, https://www.vis4.net/blog/2016/11/jittery-gauges-election-forecast/.

49. Email to Catherine D'Ignazio and Lauren Klein, January 7, 2019.

50. Margaret Wickens Pearce, "'Coming Home' Map," Canadian-American Center, 2018, accessed March 13, 2019, https://umaine.edu/canam/publications/coming-home-map/.

51. Margaret Pearce, interview by Catherine D'Ignazio, March 15, 2019.

52. As Pearce and Hornsby write, "To be 'coming home' is itself a kind of reconciliation, a moving away from settler time and moving toward Indigenous time." M. Pearce and S. Hornsby, "The Making of Coming Home," *Canadian Geographer* 64, no. 1 (2020).

53. No god trick reveals *everything* because that would be impossible at any scale. The trick part is that it gives the viewer the impression that everything is revealed.

54. Pearce and Hornsby, "The Making of Coming Home."

55. Elizabeth Grosz, in "Architectures of Excess," explains: "Communities, which make language, culture, and thus architecture their modes of existence and expression, come into being not through the recognition, generation, or establishment of universal, neutral laws and conventions that bind and enforce them, but through the remainders they cast out, the figures they reject, the terms that they consider unassimilable, that they attempt to sacrifice, revile and expel" (152). Grosz, "Architectures of Excess," in *Architecture from the Outside: Essays on Virtual and Real Space* (Cambridge, MA: MIT Press, 2006), 151–166. Also see Shaowen Bardzell, "Feminist HCI: Taking Stock and Outlining an Agenda for Design," in *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (New York: ACM, 2010), 1301–1310.

56. Michaelanne Dye, Neha Kumar, Ari Schlesinger, Marisol Wong-Villacres, Morgan G. Ames, Rajesh Veeraraghavan, Jacki Oneill, Joyojeet Pal, and Mary L. Gray, "Solidarity across Borders: Navigating Intersections towards Equity and Inclusion," in *Companion of the 2018 ACM Conference on Computer Supported Cooperative Work and Social Computing—CSCW 18* (New York: ACM, 2018), 487–494.

57. Collins, *Black Feminist Thought*.

58. As more designers and illustrators enter the field, a new generation of data visualizers is challenging the antiemotion and antiembellishment dogma. These include Jessica Bellamy, Giorgia Lupi, Stefanie Posavec, Federica Fragapane, and Kelli Anderson, among many others. On a practical level, engineering productive collisions between data science people (sophisticated in analytic methods and abstraction) and artists, designers, media folks, and humanists (sophisticated in rhetoric, form, and embodiment) might be the surest way to overcome the false binary of reason versus emotion.

4   "What Gets Counted Counts"

1. For coverage of Munir's remarks, see Nadia Khomami, "I Thought It's Now or Never, Says Student Who Came Out as Non-binary to Obama," *Guardian*, April 24, 2016, https://www.theguardian.com/world/2016/apr/24/now-or-never-says-student-who-came-out-as-non-binary

-to-obama. Munir, who has since graduated, is now an activist, writer, and public speaker. Their website is https://mariamunir.com.

2. See, for example, Rena Bivens and Oliver L. Haimson, "Baking Gender into Social Media Design: How Platforms Shape Categories for Users and Advertisers," *Social Media and Society* (October–December 2016), 1–12, which documents how five of the eight most popular social media sites (as of 2016) required new users to input a gender as part of the signup process, and of those five, "all but one (Google+) conceptualized gender as a binary" (4).

3. Email to Lauren Klein, July 18, 2018.

4. In this chapter and throughout the book, we attempt to use "man" instead of "male," and "woman" instead of "female," in our discussions of gender. Here, however, our use of "male" and "female" reflects the terminology most commonly employed in online forms. As for the assertion that there are "millions of nonbinary people in the world," how many millions of nonbinary people actually are there? We don't really know. In their 2015 "Non-Binary Gender Identities Fact Sheet," the American Psychological Association explains, "Because there is limited research on individuals with non-binary gender identities, it is difficult to estimate the exact number of people who identify as non-binary. … From the limited research that has [included nonbinary as a response category when asking about gender], it is estimated that non-binary individuals make up 25–35% or more of *transgender* populations. However, these studies sampled only transgender populations and did not capture non-binary individuals who do not identify as transgender." The Williams Institute has asserted that 0.3 percent of US adults are transgender. But this figure is likely an underestimate, both for the reasons described by the APA and for the additional personal reasons that might impact an individual's decision to self-disclose. See Mona Chalabi, "Why We Don't Know the Size of the Transgender Population," *FiveThirtyEight*, July 29, 2014, https://fivethirtyeight.com/features/why-we-dont-know-the-size-of-the-transgender-population/.

5. There are some exceptions. Countries that allow some form of nonbinary or third-gender designations on passports include Australia, Canada, Denmark, India, the Netherlands, New Zealand, and the United Kingdom, though some restrictions (like medical or legal documentation) apply.

6. Email to Lauren Klein, July 18, 2018.

7. Joni Seager, "Missing Women, Blank Maps, and Data Voids: What Gets Counted Counts," talk at the Boston Public Library, March 22, 2016, https://civic.mit.edu/2016/03/22/missing-women-blank-maps-and-data-voids-what-gets-counted-counts/.

8. Seager, "Missing Women."

9. The Calling the Shots project, from which this example is drawn, is exemplary in its attention to the categories of data collection, as well as the processes by which categories are ascribed to individual records. See the project website at https://www.southampton.ac.uk/cswf/, as well as the discussion offered by two of the project team members, Natalie Wreyford and Shelley Cobb, in "Data and Responsibility: Toward a Feminist Methodology for Producing Historical Data on Women in the Contemporary UK Film Industry," *Feminist Media Histories* 3, no. 3 (Summer 2017): 107–132.

10. Quoted in Natalie Wreyford and Shelley Cobb, in "Data and Responsibility: Toward a Feminist Methodology for Producing Historical Data on Women in the Contemporary UK Film Industry," *Feminist Media Histories* 3, no. 3 (Summer 2017): 108.

11. Ann Oakley, "Paradigm Wars: Some Thoughts on a Personal and Public Trajectory," *International Journal of Social Research Methodology* 2, no. 3 (1999): 247–254.

12. According to Bivens and Haimson, Google+ was the first of the major social media sites to offer "other" as a gender category, which it included as early as 2011. But Facebook was the first to receive wide media coverage for the decision. See Will Oremus, "Here Are All the Different Genders You Can Be on Facebook," *Slate*, February 13, 2014, http://www.slate.com/blogs/future _tense/2014/02/13/facebook_custom_gender_options_here_are_all_56_custom_options.html.

13. In another essay, Bivens observes that the options vary according to the user's language choice, and in some languages a binary choice remains the only option. See Rena Bivens, "The Gender Binary Will Not Be Deprogrammed: Ten Years of Coding Gender on Facebook," *New Media and Society* 19, no. 6 (2017): 880–898.

14. Note that these choices vary according to language and geography.

15. Bivens, "The Gender Binary Will Not Be Deprogrammed."

16. The canonical work on the politics of classification systems is Geoffrey C. Bowker and Susan Leigh Star, *Sorting Things Out: Classification and Its Consequences* (Cambridge, MA: MIT Press, 2000), which we discuss later in this chapter. On gender as a social construct, see Judith Butler, *Gender Trouble: Feminism and the Subversion of Identity* (New York: Routledge, 1990), which we also discuss later in this chapter. More recently, work in the field of transgender studies has shown how an insistence on the social construction of gender inadvertently (or, some argue, quite intentionally) reinforces another false binary between gender and "biological" sex. While we touch on this issue later in the chapter as well, interested readers may wish to consult, for example, Julian Gill-Peterson's *Histories of the Transgender Child* (Minneapolis: University of Minnesota Press, 2018).

17. In addition, all of these structures must be maintained over time in order to maintain their structural integrity, as Oliver Haimson noted in a comment on the draft version of this manuscript. The Golden Gate Bridge must be reinforced and repaired. The Facebook Ads API must be patched and versioned. And the gender binary must also be actively maintained if it is to endure. This maintenance takes the form of the many small acts that reinforce the gender binary, such as the M/F checkboxes we routinely encounter on forms, as well as those that reinforce the roles those genders should play (e.g., gifts of dolls for girls and trucks for boys). We would argue that this structure is well past due for an upgrade. For a more in-depth discussion of maintenance, see chapter 7.

18. Aristotle saw women as inferior to free men but higher than enslaved men, and he gave written form to many of the stereotypes that exist to this day, such as women being more sentimental and emotional than men (see chapter 3). He also illogically claimed that only paler women had orgasms and that men had more teeth than women (and did not bother to check; all genders have the same number of teeth). Charlotte Witt and Lisa Shapiro, "Feminist History

of Philosophy," in *The Stanford Encyclopedia of Philosophy* (Fall 2018 Edition), ed. Edward N. Zalta, https://plato.stanford.edu/archives/fall2018/entries/feminism-femhist/.

19. Thomas Laqueur, *Making Sex: Body and Gender from the Greeks to Freud* (Cambridge, MA: Harvard University Press, 1992).

20. In fact, in the United States, the sex binary took much longer to solidify than the black/white divide. While many state laws already limited voting rights to men, it was not until the passage of the Fourteenth Amendment, in 1868, which granted voting rights to "male citizens," that sex difference entered the Constitution for the first time.

21. Ibram X. Kendi, *Stamped from the Beginning* (New York: Bold Type Books, 2016).

22. To learn more about Linnaeus's *Systemae Naturae*, first published in 1735, visit *Linné Online*, Upsala University, accessed July 31, 2019, http://www2.linnaeus.uu.se/.

23. Julia Angwin, Jeff Larson, Lauren Kirhner, and Surya Mattu. "Minority Neighborhoods Pay Higher Car Insurance Premiums than White Areas with the Same Risk," ProPublica, April 5, 2017, https://www.propublica.org/article/minority-neighborhoods-higher-car-insurance-premiums-white-areas-same-risk.

24. Blaise Agüera y Arcas, Margaret Mitchell, and Alexander Todorov, "Physiognomy's New Clothes," Medium Artificial Intelligence, May 6, 2017, https://medium.com/@blaisea/physiognomys-new-clothes-f2d4b59fdd6a.

25. Miriam Posner and Lauren F. Klein, "Editor's Introduction—Data as Media," *Feminist Media Histories* 3, no. 3 (Summer 2017): 1–8.

26. Geoffrey C. Bowker and Susan Leigh Star, *Sorting Things Out: Classification and Its Consequences* (Cambridge, MA: MIT Press, 2000).

27. Representative Carrie Meek (D-FL) of the Black Caucus stated that she was "very troubled" by the recommendation and reminded Congress that the purpose of counting race was to permit enforcement of antidiscrimination laws and the equal protection provisions of the Fourteenth Amendment of the Constitution. See Alice Robbin, "Classifying Racial and Ethnic Group Data in the United States: The Politics of Negotiation and Accommodation," *Journal of Government Information* 27, no. 2 (March 2000): 129–156.

28. For an excellent visual timeline of the evolution of racial categories on the US census, see "What Census Calls Us: A Historical Timeline," created by Pew Research: https://www.pewsocialtrends.org/interactives/multiracial-timeline/.

29. Lizette Alvarez, "Meet Mikey, 8: U.S. Has Him on Watch List," *New York Times*, January 13, 2010, https://www.nytimes.com/2010/01/14/nyregion/14watchlist.html.

30. See Joe Sharkey, "With Hair Pat-Downs, Complaints of Racial Bias," *New York Times*, August 15, 2001, https://www.nytimes.com/2011/08/16/business/natural-hair-pat-downs-warrant-a-rethinking.html. For a more scholarly exploration of this same issue, see Simone Browne,

"'What Did TSA Find in Solange's Fro': Security Theater at the Airport," in *Dark Matters: Race and the Surveillance of Blackness* (Durham, NC: Duke University Press, 2015), 131–160.

31. See, for example, Haroon Moghul, "The Unapologetic Racial Profiling of Muslims Has Become America's New Normal," *Quartz*, April 20, 2016, https://qz.com/665317/the-unapologetic-racial-profiling-of-muslims-has-become-americas-new-normal/; and Assia Boundaoui's film, *The Feeling of Being Watched* (2018), which documents the government surveillance experienced by an Arab-American community in Bridgeview, Illinois: http://www.feelingofbeingwatched.com/.

32. Sasha Costanza-Chock, "Design Justice, A.I., and Escape from the Matrix of Domination," *Journal of Design and Science*, last updated July 26, 2018, https://jods.mitpress.mit.edu/pub/costanza-chock.

33. Dean Spade, *Normal Life: Administrative Violence, Critical Trans Politics, and the Limits of the Law* (Boston: South End Press, 2011). Security pat-downs in particular have long been the focus of criticism and scholarly critique. Angela Davis, in her work on pat-downs in prison, has argued that they are a form of state-sponsored assault: *Are Prisons Obsolete?* (New York: Seven Stories Press, 2013). Shoshana Magnet and Tara Rodgers extend Davis's critique to airport screenings in "Stripping for the State: Whole Body Imaging Technologies and the Surveillance of Othered Bodies," *Feminist Media Studies* 12 (2012): 101–118. Poet Stacey Waite's "On the Occasion of Being Mistaken for a Man by Security Personnel at Newark International Airport," in *Love Poem to Androgyny* (Mint Hill, NC: *Main Street Rag*, 2006), offers a personal meditation on this experience. Paisley Currah and Tara Mulqueen, in "Securitizing Gender: Identity, Biometrics, and Transgender Bodies at the Airport," *Social Research* 78, no. 2 (Summer 2011): 557–582, provide a scholarly analysis of the experience that Waite describes.

34. The philosopher Michel Foucault has described this state of affairs as "the power to make live and let die." Foucault is also responsible for the concept of *biopower*, also known as the *distribution of life chances*, which we reference in chapter 2 in our analysis of redlining maps.

35. Although we do not discuss this particular issue here, "bathroom bills" and other attempts to police public bathroom use along the lines of binary gender is perhaps the most pervasive and most publicized instance of this form of administrative (and sometimes physical) violence. The National Conference of State Legislatures maintains the web page, "Bathroom Bill Legislative Tracking," which provides links to updates (and legal challenges) to the numerous states that attempted to pass such bills. See http://www.ncsl.org/research/education/-bathroom-bill-legislative-tracking635951130.aspx.

36. Jan Diehm and Amber Thomas, "Someone Clever Once Said Women Were Not Allowed Pockets," *Pudding*, August 2018, https://pudding.cool/2018/08/pockets/.

37. Victoria and Albert Museum, "A History of Pockets," accessed July 31, 2019, http://www.vam.ac.uk/content/articles/a/history-of-pockets/.

38. Butler, *Gender Trouble*.

39. American Medical Association, "AMA Adopts New Policies at 2018 Interim Meeting," November 13, 2018, https://www.ama-assn.org/press-center/press-releases/ama-adopts-new-policies-2018-interim-meeting.

40. On the former, see Aniruddha Dutta and Raina Roy, "Decolonizing Transgender in India: Some Reflections," *TSQ: Transgender Studies Quarterly* 1, no. 3 (August 2014): 320–337. On the latter, see Qwo-Li Driskill, "Doubleweaving Two-Spirit Critiques: Building Alliances between Native and Queer Studies," *GLQ: A Journal of Gay and Lesbian Studies* 16, no. 1–2 (April 2010): 69–92.

41. There are some exceptions. For example, states like Oregon and California allow nonbinary gender markers on identification documents.

42. Aliya Saperstein, "Gender Identification," in *Pathways: The Poverty and Inequality Report*, 2018, 5–8, https://inequality.stanford.edu/sites/default/files/Pathways_SOTU_2018_gender-ID.pdf.

43. This is an extension of the nation's originary attempt to assert control over portions of its population, as well as the populations of Indigenous peoples, who did not conform to its racist, colonialist, cis-sexist, and heteronormative ideas about who should be allowed to thrive. There is a particularly grim tradition of the weaponization of these terms and the categories that underlie them in the United States, where normative categories of gender and sexuality have long been imposed on Indigenous populations—first by European colonial powers, and then by the US government. These terms and others push back against what Two-Spirit scholar Qwo-Li Driskill characterizes as "the ways colonial projects continually police sexual and gender lines." In the United States, in particular, we must remain aware of how categories of gender and sexuality were once deployed on behalf of European colonial powers to subjugate and dispossess the Indigenous populations they encountered and whose land and resources they sought; and we might view the Trump administration's attack on the rights of transgender people as an extension of this originary attempt to consolidate power and control. See Ann Laura Stoler, *Race and the Education of Desire: Foucault's* History of Sexuality *and the Colonial Order of Things* (Durham, NC: Duke University Press; 1995); Deborah Miranda, "Extermination of the Joyas: Gendercide in Spanish California," in *The Transgender Studies Reader 2*, ed. Susan Stryker and Aren Z. Aizura (New York: Routledge, 2013), 347–360; and Susan Stryker and Paisley Currah, "Introduction," *TSQ: Transgender Studies Quarterly* 1, no. 1–2 (May 2014): 1–18.

44. See Oliver Haimson (@oliverhaimson), commenting on the Positive Voices survey from the United Kingdom, "This is the best 2-step gender measure I've seen. … I think asking the second question is invasive if you don't actually need that data," Twitter, April 5, 2019, 5:25 a.m., https://twitter.com/oliverhaimson/status/1114142113007009792.

45. When is sex classification actually necessary? Heath Fogg Davis argues that it isn't in many cases. See *Beyond Trans: Does Gender Matter?*, vol. 2 (New York: NYU Press, 2018).

46. FollowBias (not available any longer) was a Twitter application circa 2017 that would give you a breakdown of what percentage of men you were following on Twitter and what percentage of women (it stuck to the binary). It would attempt to detect gender based on people's names on

Twitter, and show the user aggregated statistics like "80% of the people you follow are men," with the idea that that might nudge them toward following more women—particularly important for the journalists that it was trying to influence. See J. Nathan Matias, Sarah Szalavitz, and Ethan Zuckerman, "FollowBias: Supporting Behavior Change toward Gender Equality by Networked Gatekeepers on Social Media," in *Proceedings of the 2017 ACM Conference on Computer Supported Cooperative Work and Social Computing* (New York: ACM, 2017), 1082–1095. It is part of a not-uncontroversial class of technology known as *automated gender detection* (in which applications try to infer gender from names or handwriting or blogging style) or *automated gender recognition* (in which applications try to infer gender from photographs, video, or audio). On the one hand, these automated systems have been used to survey vast archives of research papers to quantify gender bias in scientific publishing. On the other hand, these same systems have been used to attempt to create bathroom security systems based on binary, heteronormative, scientifically incorrect notions of gender. A 2018 study found that transgender individuals see high risks for harm stemming from the use of these technologies. See Foad Hamidi, Morgan Klaus Scheuerman, and Stacy M. Branham, "Gender Recognition or Gender Reductionism?: The Social Implications of Embedded Gender Recognition Systems," in *Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems* (New York: ACM, 2018), 8. And also Os Keyes, "The Misgendering Machines: Trans/HCI Implications of Automatic Gender Recognition," in *Proceedings of the ACM on Human-Computer Interaction* 2, no. CSCW (2018): article 88.

47. Brittney Cooper and Margaret Rhee, "Introduction: Hacking the Black/White Binary," *Ada: A Journal of Gender, New Media, and Technology* 6 (January 2015), https://adanewmedia.org/2015/01/issue6-cooperrhee/.

48. Claire Cohen, Patrick Scott, and Ellie Kempster, "Born Equal. Treated Unequally." *Telegraph*, March 8, 2018, https://www.telegraph.co.uk/women/business/women-mean-business-interactive/.

49. Lisa Charlotte Rost, "An Alternative to Pink & Blue: Colors for Gender Data," *Datawrapper*, July 10, 2018, https://blog.datawrapper.de/gendercolor/.

50. Sam Morris, Juweek Adolphe, and Erum Salam, "Does the New Congress Reflect You?," *Guardian*, updated June 7, 2019, https://www.theguardian.com/us-news/ng-interactive/2018/nov/15/new-congress-us-house-of-representatives-senate.

51. Visualization expert Andy Kirk has an excellent talk about creative strategies to represent absences, nulls, and zeros—what he calls the *design of nothing*. Andy Kirk, "The Design of Nothing: Null, Zero, Blank," YouTube, May 28, 2014, https://www.youtube.com/watch?v=JqzAuqNPYVM.

52. See note 16 for a discussion of the false binary between sex and gender. For more on Montañez's design process, see her blog post, "Visualizing Sex as a Spectrum," *Scientific American Blog Network*, August 29, 2017, https://blogs.scientificamerican.com/sa-visual/visualizing-sex-as-a-spectrum/.

53. Montañez, "Visualizing Sex as a Spectrum."

54. Anne Fausto-Sterling, *Sexing the Body: Gender Politics and the Construction of Sexuality* (New York: Basic Books, 2000). For a distillation of this argument, see Fausto-Sterling, "Why Sex Is Not Binary," *New York Times*, October 25, 2018, https://www.nytimes.com/2018/10/25/opinion/sex-biology-binary.html.

55. The website of the Intersex Campaign for Equity cites Fausto-Sterling as the source of this statistic, and further notes that this statistic "makes being intersex about as common as having red hair (1%-2%)." Hida Viloria, "How Common is Intersex? An Explanation of the Stats," April 1, 2015, Intersex Campaign for Equality, https://www.intersexequality.com/how-common-is-intersex-in-humans/.

56. Oliver L. Haimson and Anna Lauren Hoffmann, "Constructing and Enforcing 'Authentic' Identity Online: Facebook, Real Names, and Non-normative Identities," *First Monday* 21, no. 6 (June 10, 2016), https://doi.org/10.5210/fm.v21i6.6791.

57. Haimson and Hoffman write that we must imagine "alternative conceptions of safety that may hinge on obscurity or invisibility—strategies that are often employed by those with marginalized or non-normative identities (like trans people) or those managing risks of physical and emotional danger if found (like abuse survivors)." "Constructing and Enforcing 'Authentic' Identity Online."

58. To learn more about the Colored Conventions Project, visit http://coloredconventions.org/. An anthology of essays about the Colored Conventions and the Colored Conventions Project, *Colored Conventions in the Nineteenth Century and the Digital Age*, ed. P. Gabrielle Forman, Jim Casey, and Sarah Patterson, is in preparation.

59. "CCP Corpus and Word Trends," accessed July 31, 2019, http://coloredconventions.org/intro-corpus.

60. As the document explains, "This is our shared commitment to recovering a convention movement that includes women's activism and presence—even though it's largely written out of the minutes themselves." See "Teaching Partner Memo of Understanding," accessed July 31, 2019, http://coloredconventions.org/memo-of-understanding.

61. A *breast pump* is a machine that helps postpartum mothers, nonbinary parents, and trans dads remove breastmilk from their breasts when they are not with their nursing baby or unable to nurse them. Breast pumps can be lifesaving in the case of premature babies and helpful for parents that work outside the home. They suck, literally and figuratively, and many parents tell stories of pumping in closets, server rooms, and bathrooms. In the US context, breast pumps are a mediocre workaround for a larger social problem, which is the lack of a comprehensive paid family leave policy that would support parents to care for their new babies. The co-organizers of the 2014 breast pump hackathon were Tal Achituv, Catherine D'Ignazio, Alexis Hope, Taylor Levy, Alexandra Metral, David Raymond, and Che-Wei Wang.

62. Catherine D'Ignazio, Alexis Hope, Becky Michelson, Robyn Churchill, and Ethan Zuckerman, "A Feminist HCI Approach to Designing Postpartum Technologies: 'When I First Saw a

Breast Pump I Was Wondering if It Was a Joke,'" CHI'16 (May 2016). More information on the hackathons can be found at https://www.makethebreastpumpnotsuck2018.com.

63. It is a product of the hegemonic domain of the matrix of domination that so many stigmatized cultural topics have to do with women's bodies. Along with breastfeeding, there is abortion, miscarriage, birth, menstruation, sex, sexual assault, domestic violence, fertility, and more. The cultural taboos around speaking publicly on these topics leads individuals to thinking of these shared experiences as being purely personal—and blaming themselves for any trauma they experience. You may have heard the phrase, "The personal is political." This comes from an essay of the same name by activist Carol Hanisch in 1970 about the practice of "consciousness-raising" in the 1960s and 1970s. She wrote of these gatherings, "One of the first things we discover in these groups is that personal problems are political problems. There are no personal solutions at this time. There is only collective action for a collective solution." Although wholly underexplored in data science (but explored in other fields), there is an opening here to use story-sharing— qualitative data collection in a community—as a collective healing process and the basis for political action. This was one of the main goals of the breast pump hackathon, as well as the Make Family Leave Not Suck Policy Summit that accompanied it.

64. Our reflection process and reflections themselves are described in Alexis Hope, Catherine D'Ignazio, Josephine Hoy, Rebecca Michelson, Jennifer Roberts, Kate Krontiris, and Ethan Zuckerman, "Hackathons as Participatory Design: Iterating Feminist Utopias," in *Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems* (New York: ACM, 2019), 61.

65. Jenn Roberts, of Versed Education Group, suggested many of the key accountability structures, including drafting a values statement, convening an advisory board, and thinking about participation numbers that truly make a space welcoming versus tokenizing for marginalized groups.

66. An interesting team interaction occurred during this process. When establishing metrics for racial diversity, Catherine (the executive director) proposed, "How about 50 percent people of color?" Jenn Roberts, the equity and inclusion lead, reminded the team that a space equally filled by white people and people of color will still feel like a white-dominated space, so we increased our goal to 70 percent. For more information on the demographics of the event and the process, see "Building Community at our Hackathon," Medium, April 3, 2018, https://medium.com/make -the-breast-pump-not-suck-hackathon/building-community-at-our-hackathon-a08a76bb5ea6.

5   Unicorns, Janitors, Ninjas, Wizards, and Rock Stars

1. Vincent Del Giudice and Wei Lu, "America's Rich Get Richer and the Poor Get Replaced by Robots," *Bloomberg.com*, April 26, 2017, https://www.bloomberg.com/news/articles/2017-04-26/ america-s-rich-poor-divide-keeps-ballooning-as-robots-take-jobs.

2. "Wages: Median (Old) San Francisco-Oakland-Fremont, CA Metro Area," National Equity Atlas, 2018, accessed March 19, 2019, http://nationalequityatlas.org/indicators/Wages:_Median _(old)/Over_time:7616/San_Francisco-Oakland-Fremont,_CA_Metro_Area/false/. "Snapshot of

Poverty: San Francisco County," United Way, 2017, accessed March 19, 2019, https://uwba.org/wp-content/uploads/2017/10/SanFrancisco-Snapshot.pdf.

3. "About/Acerca De Nosotros," Anti-Eviction Mapping Project, 2016, accessed March 19, 2019, https://www.antievictionmap.com/about.

4. *Counterpoints: Bay Area Data and Stories for Resisting Displacement* will be published by PM Press in 2020.

5. Eviction Defense Collaborative, "City of Change: Fighting for San Francisco's Vanishing Communities," Evictiondefense.org, 2016, accessed March 19, 2019. http://www.antieviction mappingproject.net/EDC_2016.pdf.

6. Eviction Defense Collaborative, "City of Change."

7. Anti-Eviction Mapping Project, *Tech Bus Stops and No-Fault* evictions, accessed August 6, 2019, http://www.antievictionmappingproject.net/techbusevictions.html.

8. See Rebecca Solnit, "Diary," *London Review of Books* 35, no. 3 (2013): 34–35, https://www.lrb.co.uk/v35/n03/rebecca-solnit/diary.

9. Anti-Eviction Mapping Project, *Narratives of Displacement and Resistance*, accessed August 6, 2019, http://www.antievictionmappingproject.net/narratives.html.

10. In her book *Gentrification and Resistance*, Laura Naegler, a professor of cultural criminology, links cleanliness with gentrification: "Dirt—or as antonym, cleanliness—becomes a symbolic means to demarcate the actors legitimately appropriating and using a certain space." Laura Naegler, *Gentrification and Resistance: Cultural Criminology, Control, and the Commodification of Urban Protest in Hamburg*, vol. 50 (Berlin: LIT Verlag, 2012).

11. So-called data dashboards are increasingly a trend in cities attempting to demonstrate how they are keeping with the times. In "Mission Control: A History of the Urban Dashboard," Shannon Mattern shows how these dashboards also enact a particular form of control. *Places Journal* (March 2015), https://placesjournal.org/article/mission-control-a-history-of-the-urban-dashboard/.

12. Katie Lloyd Thomas, "Lines in Practice: Thinking Architectural Representation through Feminist Critiques of Geometry," *Geography Research Forum* 21 (2016): 57–76.

13. Hadley Wickham, "Tidy Data," *Journal of Statistical Software* 59, no. 10 (2014): 1–23.

14. See Thomas H. Davenport and D. J. Patil, "Data Scientist: The Sexiest Job of the 21st Century," *Harvard Business Review*, October 2012, https://hbr.org/2012/10/data-scientist-the-sexiest-job-of-the-21st-century.

15. See Davenport and Patil, "Data Scientist."

16. Steve Lohr, "For Big-Data Scientists, 'Janitor Work' Is Key Hurdle to Insights," *New York Times*, August 17, 2014, https://www.nytimes.com/2014/08/18/technology/for-big-data-scientists-hurdle-to-insights-is-janitor-work.html.

17. *Eugenics* describes the view that humans should control the evolution of their species by encouraging the reproduction of "superior" kinds of people (namely, white ones) and discouraging the reproduction of all others (where "discouraging" took the form of forced sterilization and, in its worst instantiations, murder and death). Karl Pearson held the first Eugenics chair at the University of London, where he developed many of the statistical concepts and methods still in use today. For more on this history, see Spade and Rohlfs, "Legal Equality, Gay Numbers and the (After?)Math of Eugenics."

18. Banu Subramaniam, *Ghost Stories for Darwin: The Science of Variation and the Politics of Diversity* (Urbana: University of Illinois Press, 2014).

19. While we can no longer point to examples like the state-level eugenics program that prompted World War II, scholars point out—rightly—that certain eugenic assumptions have never gone away. There is a long history of the United States employing sterilization programs in prisons, for example. See David M. Perry, "Our Long, Troubling History of Sterilizing the Incarcerated," *The Marshall Project* (blog), July 26, 2017, https://www.themarshallproject.org/2017/07/26/our-long-troubling-history-of-sterilizing-the-incarcerated. For a data-based project that attempts to reckon with this history's roots, see Jacqueline Wernimont and Alexandra Minna Stern, "The Eugenic Rubicon: California's Sterilization Stories" (2017), accessed August 6, 2019, http://scalar.usc.edu/works/eugenic-rubicon-/index.

20. That being said, a point about the inherent racism of certain statistical techniques could be made. For a detailed critique along these lines, see Wendy H. K. Chun, "On Patterns and Proxies, or the Perils of Reconstructing the Unknown," *Accumulation*, September 25, 2018, https://www.e-flux.com/architecture/accumulation/212275/on-patterns-and-proxies/.

21. Katie Rawson and Trevor Muñoz, "Against Cleaning," in *Debates in the Digital Humanities 2019*, ed. Matthew K. Gold and Lauren F. Klein (Minneapolis: University of Minnesota Press, 2019), 290.

22. Yanni A. Loukissas, *All Data Are Local: Thinking Critically in a Data-driven Society* (Cambridge, MA: MIT Press, 2019); see also Anne Luther, "Local Data Design: An Interview with Professor Yanni Loukissas," *Data Matters*, July 13, 2017, https://data-matters.nyc/?p=18579.

23. Reuben S. Rose-Redwood, "Indexing the Great Ledger of the Community: Urban House Numbering, City Directories, and the Production of Spatial Legibility," *Journal of Historical Geography* 34, no. 2 (2008): 286–310.

24. This is a point that Rose-Redwood makes with respect to the nineteenth century as well. It wasn't just the mail carrier who needed these signs. Rather, the street names were for the "stranger, merchant, or businessman"—this from an 1838 Philadelphia business directory—who came from elsewhere to operationalize a new landscape in the service of their own profit. See Rose-Redwood, "Indexing the Great Ledger of the Community," 295.

25. "Front End Engineer," Amazonjobs, accessed March 19, 2019, https://www.amazon.jobs/en/jobs/700028/front-end-engineer.

26. Gayatri Chakravorty Spivak, *Can the Subaltern Speak? Reflections on the History of an Idea* (New York: Columbia University Press, 2010). The idea that the data cannot speak for themselves is something we will return to at length in chapter 6.

27. We exclude the unicorn from this assessment, as it is a mythical creature that does not have a readily apparent gender.

28. "Janitors & Building Cleaners: Race & Ethnicity," Data USA, accessed March 19, 2019, https://datausa.io/profile/soc/37201X/#demographics. See also Andrew Ti, "Team, We Have to Give up on Ninja," Angry Asian Man (blog), September 21, 2016, http://blog.angryasianman.com/2016/09/team-we-have-to-give-up-on-ninja.html.

29. See Daniela Aiello, Lisa Bates, Terra Graziani, Christopher Herring, Manissa Maharawal, Erin McElroy, Pamela Phan, and Gretchen Purser, "Eviction Lab Misses the Mark," *ShelterForce*, August 22, 2018, https://shelterforce.org/2018/08/22/eviction-lab-misses-the-mark/.

30. Matthew Desmond, interview by Catherine D'Ignazio, April 5, 2019.

31. Manissa M. Maharawal and Erin McElroy. "The Anti-Eviction Mapping Project: Counter Mapping and Oral History toward Bay Area Housing Justice," *Annals of the American Association of Geographers* 108, no. 2 (December 1, 2016): 380–389.

32. As information studies professor Johanna Drucker has stated, "Knowledge is partial ... Knowledge is situated ... Knowledge is historical." From her talk at the Unflattening and Enacting Visualization Workshop at the City University of New York, June 9, 2016.

33. Feminist standpoint theory, developed by Sandra Harding and elaborated by later feminist thinkers, asserts that there are group-based experiences, *standpoints*, that go beyond individual, specific experiences. As Maggie Walter and Chris Anderson, the authors of the book *Indigenous Statistics*, write, "It is our position in social space, our capital relationalities, that shapes our life chances, and while we experience relationalities and life chances as individuals, we share this position with those of similar social, economic, cultural, *and* racial capitals" (emphasis theirs). Note how this is different than a call for simple diversity in individual perspectives—what people in the tech industry characterize as *thought diversity* or *cognitive diversity*. This means explicitly acknowledging and taking steps to address the unjust structural forces at play in our work, including racism, sexism, and more. Walter and Andersen, *Indigenous Statistics*.

34. See David Weinberger, "Transparency: The New Objectivity," *KMWorld*, August 28, 2009, http://www.kmworld.com/Articles/Column/David-Weinberger/Transparency-the-new-objectivity-55785.aspx.

35. See Eric Roston and Blacki Miglozzi, "What's Really Warming the World?," *Bloomberg Businessweek*, June 24, 2015, https://www.bloomberg.com/graphics/2015-whats-warming-the-world.

36. At other times, reflexivity can be more difficult to implement. Databases and charts, like the data themselves, are often very good at obscuring the perspectives of their human creators, as we discuss in chapter 3. But this is a technical problem as much as an ideological one and could be addressed through the development of different file formats and metadata standards.

For example, spreadsheets are described as "broken" when they have notes and metadata at the top. But they are only broken because this is a convention that has been encoded into software and implemented in most data-processing scripts. It would be very easy to develop a different format in which authors, participants, and process notes were expected to appear at the top of the file. Or a standard in which each field in a database is annotated with its business purpose and the person who requested it. These additions to metadata norms and standards, like the idea of pluralism itself, would help to further elucidate a project's human actors, research questions, methods, and results, and allow them to be more fully explored by others seeking to build on them. In other words: reflexivity values scientific reproducibility and takes it one step further on the path to knowledge and discovery.

37. Additional examples of visualizing and crediting data workers are discussed in chapter 7.

38. In the interest of self-disclosure: Catherine D'Ignazio is an organizer in the Public Lab community. Public Lab creates open-source, low-cost, environmental-monitoring technologies that include aerial imaging, devices to log water-quality parameters, and a cardboard spectrometer to detect contaminants. The organization has grassroots chapters around the world. As Catherine and her colleagues wrote in a paper about the community, "The goal of Public Lab projects is to create or curate live archives of data, collected and produced in a decentralized manner. On the one hand, these data support scientific investigation, advocacy, and, in some cases, regulatory actions. On the other hand, they foster diverse participation and collaboration of concerned residents and local organizations in the development of techno-scientific tools and methods." Pablo Rey-Mazon, Hagit Keysar, Shannon Dosemagen, Catherine D'Ignazio, and Don Blair, "Public Lab: Community-based Approaches to Urban and Environmental Health and Justice," *Science and Engineering Ethics* 24, no. 3 (May 3, 2018): 971–997.

39. This helpful summary comes in the context of Nash's own critique of the limits of intersectionality and its cooptation by the academy. See Jennifer C. Nash, "Re-Thinking Intersectionality," *Feminist Review* 89, no. 1 (June 2008): 1–15; see also her recent book, *Black Feminism Reimagined: After Intersectionality* (Durham, NC: Duke University Press, 2019).

40. Michaelanne Dye, Neha Kumar, Ari Schlesinger, Marisol Wong-Villacres, Morgan G. Ames, Rajesh Veeraraghavan, Jacki Oneill, Joyojeet Pal, and Mary L. Gray, "Solidarity across Borders," in *Companion of the 2018 ACM Conference on Computer Supported Cooperative Work and Social Computing—CSCW 18* (New York: ACM, 2018), 487–494.

41. "Design Justice Network Principles," Design Justice, accessed March 19, 2019, http://designjusticenetwork.org/network-principles/. Professor of informatics Shaowen Bardzell makes a similar call for design that starts first and foremost with the perspective of the "marginal user." See Shaowen Bardzell, "Feminist HCI," in *Proceedings of the 28th International Conference on Human Factors in Computing Systems—CHI 10* (New York: ACM, 2010), 1301–1310.

42. "A Step Change: DataKind Raises $20M Investment to Support the Data Science for Social Good Ecosystem," DataKind, January 22, 2019, https://www.datakind.org/blog/a-step-change-datakind-raises-20m-investment-to-support-the-data-science-for-social-good-ecosystem.

43. "Data Science for Social Good Summer Fellowship," Data Science for Social Good, 2018, accessed March 19, 2019, https://dssg.uchicago.edu/.

44. Sara Hooker, "Why 'Data for Good' Lacks Precision," *Towards Data Science* (blog), July 22, 2018, https://towardsdatascience.com/why-data-for-good-lacks-precision-87fb48e341f1.

45. Hooker, "Why 'Data for Good' Lacks Precision."

46. This shift is particularly necessary in work involving partnerships across knowledge systems, in which the data—as a form of knowledge—are fundamentally connected to issues of power. For example, in many Indigenous communities, data relating to the community constitutes sacred knowledge and cannot (and should not) be easily shared. Platforms like Murkutu, designed by Kim Cristen and Craig Dietrich, which enable fine-grained privacy controls for sharing digital cultural heritage materials, and classification systems like Ngā Upoko Tukutuku/Māori Subject Headings, developed by LIANZA, Te Rōpū Whakahau, and the National Library of New Zealand, represent thoughtful attempts to bridge issues of data access with cultural concerns. See http://mukurtu.org/about/ and https://natlib.govt.nz/nga-upoko-tukutuku.

47. Emily and Rahul Bhargava, interview by Catherine D'Ignazio, February 7, 2018.

48. Interview with Emily and Rahul Bhargava, 2018. For an insider account, see Rahul Bhargava's description, "Mural-ing Our Way to Data Literacy," MIT Center for Civic Media, August 6, 2013, https://civic.mit.edu/2013/08/06/mural-ing-our-way-to-data-literacy/.

49. Data murals like the one in Somerville are becoming a more common practice to tell a data-driven public story about an important issue. Detroit Future Schools undertook a series of data murals in 2015. See "Detroit Future Schools Data Murals Project: What Stories Can We Tell from Data?," August 7, 2015, https://www.alliedmedia.org/news/2015/08/07/detroit-future -schools-data-murals-project-what-stories-can-we-tell-data. In Dar Es Salaam, the Data Zetu project ("our data" in Swahili) ran a listening campaign in four low-income districts. They compiled the residents' concerns, as well as statistical data, into a data mural about teenage pregnancy and sexual health (https://datazetu.or.tz/). And there are many examples of participatory mapping that combine data collection and analysis with explicit acknowledgement of oppression with explicit goals around building community capacity and solidarity. For example, The Morris Justice Project is a collaboration between neighborhood residents in the South Bronx and academic institutions in New York City. Founded by a group of mothers in 2011, the project has been documenting policing behaviors in its members' neighborhood around Yankee Stadium, with a focus on New York's stop and frisk policy (http://morrisjustice.org/).

50. Digital Democracy home page, accessed August 6, 2019, https://www.digital-democracy.org/.

51. Westside Atlanta Land Trust Program home page, accessed August 6, 2019, https://www .helporginc.org/walt-2015.html.

52. In the process, they partnered with scholars Ellen Zegura, Amanda Meng, and Carl DiSalvo at the Georgia Institute of Technology, who wrote about the collaborative undertaking as a case of data activism and as care work. See Amanda Meng and Carl Disalvo, "Grassroots Resource

Mobilization through Counter-data Action," *Big Data & Society* 5, no. 2 (September 14, 2018); and Ellen Zegura, Carl DiSalvo, and Amanda Meng, "Care and the Practice of Data Science for Social Good," in *Proceedings of the 1st ACM SIGCAS Conference on Computing and Sustainable Societies* (New York: ACM, 2018), 34.

53. Erhardt Graeff, "Digital Democracy: Participatory Mapping & Tool-building in the Amazon," MIT Center for Civic Media, September 14, 2017, https://civic.mit.edu/2017/09/14/digital-democracy-participatory-mapping-tool-building-in-the-amazon/.

54. Meng and DiSalvo make a strong case that these more *affective* outcomes of community data projects are understudied. Empowerment does not only come through achieving a specific policy win with data, but also through strengthening the social infrastructure of the community. They draw on Black feminist scholar Audré Lorde, who advocates for examination and self-actualization to precede social transformation: a community cannot articulate a more just world without understanding the oppressive conditions of the current one. Meng and Disalvo, "Grassroots Resource Mobilization through Counter-data Action."

55. The "data as a campfire" analogy is from Denise Ross, cofounder of the White House Police Data Initiative under Barack Obama. In her book, *Data | Action* (Cambridge, MA: MIT Press, 2020), urban science expert Sarah Williams makes a compelling case that collecting data can strengthen communities around their shared interests as well as build affective ties that are crucial to achieving civic goals.

56. Note the underlying paternalism of much of the "data for good" work: Who is in a position to do good for whom? Too often, data service work ends up being framed as charity work from benevolent experts for poor victims who can't help themselves. This framing reinscribes existing hierarchies, denies agency to people and communities, and does harm. For more on deficit narratives, see chapter 2.

57. María Isabel Casas-Cortés, "Social Movements as Sites of Knowledge Production: Precarious Work, the Fate of Care and Activist Research in a Globalizing Spain" (PhD diss., University of North Carolina at Chapel Hill, 2009).

58. Here we draw from discussions of feminist empiricism as theorized by Maitree Wickramasinghe and Donna Haraway, among others. As researcher Ambika Tandon helpfully summarizes, "Feminist empiricism is cognizant of the multiplicity of local knowledges, as well as their 'unequal translation and exchange' with dominant knowledge. It then looks at the translatability of knowledge between different social groups and communities in the matrix of oppression and privilege, with the aim of conducting and disseminating research in ways that speaks to a range of such groups." See Tandon, *Feminist Methodology in Technology Research* (Bangalore: Center for Internet and Society, 2018). In other words, while feminist empiricism acknowledges the value and dignity of local knowledge, it also asserts that there are strong reasons, grounded in social justice, to understand macrophenomena at the regional, country, or global level and beyond. On this point, postcolonial feminist theorist Chandra Mohanty explains, "These arguments are not against generalization as much as they are for careful, historically specific complex

generalizations." Chandra Talpade Mohanty, *Feminism without Borders* (Durham, NC: Duke University Press, 2003).

59. See "Mapping Environmental Justice," Environmental Justice Atlas, accessed March 19, 2019, https://ejatlas.org/. See also the scholarly papers that the team has written about its work: Leah Temper, D. Del Bene, and J. Martinez-Alier, "Mapping the Frontiers and Front Lines of Global Environmental Justice: The EJAtlas," *Journal of Political Ecology* 22, no. 1 (2015): 255–278; and Leah Temper, F. Demaria, A. Scheidel, D. Del Bene, and J. Martinez-Alier, "The Global Environmental Justice Atlas (EJAtlas): Ecological Distribution Conflicts as Forces for Sustainability," *Sustainability Science* 13, no. 3 (2018): 573–584. They discuss the challenges of such a large-scale mapping process in Leah Temper and D. Del Bene, "Transforming Knowledge Creation for Environmental and Epistemic Justice," *Current Opinion in Environmental Sustainability* 20 (2016): 41–49.

60. Grettel Navas and Daniela Del Bene, "Proyecto Hidroeléctrico Agua Zarca, Honduras," Environmental Justice Atlas, March 3, 2018, https://ejatlas.org/conflict/proyecto-hidroelectrico -agua-zarca-honduras.

61. Nina Lakhani, "Berta Cáceres: Seven Men Convicted of Murdering Honduran Environmentalist," *Guardian*, November 30, 2018, https://www.theguardian.com/world/2018/nov/29/ berta-caceres-seven-men-convicted-conspiracy-murder-honduras.

62. Partners include the Latin American Observatory of Mining Conflicts (OCMAL), the World Rainforest Movement (WRM), and the Brazilian Network of Environmental Justice (RBJA), among many others. Many of these organizations carry out their work using methods from participatory action research (PAR), which explicitly includes frontline communities in the process of knowledge production. PAR is an established methodological approach to academic research that values community-based knowledge, commits to producing knowledge in the interest of social change, and centers the leadership of affected communities. To learn more about the intersection of PAR and feminist approaches, see M. Brinton Lykes and Erzulie Coquillon, "Participatory Action Research and Feminisms," in *Handbook of Feminist Research: Theory and Praxis*, ed. Sharlene Nagy Hesse-Biber (Thousand Oaks, CA: SAGE, 2007), 297–326.

63. "Protect Kok-Zhailau," Ile-Alatau State National Nature Park, Kazakhstan, Environmental Justice Atlas, January 29, 2016, https://ejatlas.org/conflict/protect-kok-zhailau-ile-alatau-state -national-nature-park-kazakhstan.

64. Begüm Özkaynak, Beatriz Rodríguez-Labajos, Cem İskender Aydın, Ivonne Yanez, and Claudio Garibay, *Towards Environmental Justice Success in Mining Resistances: An Empirical Investigation*, Environmental Justice Organisations, Liabilities and Trade (EJOLT) Report No. 14, April 2015, http://www.ejolt.org/2015/04/towards-environmental-justice-success-mining-conflicts/.

65. Özkaynak et al., "Towards Environmental Justice Success in Mining Resistances."

6   The Numbers Don't Speak for Themselves

1. See Mona Chalabi, "Kidnapping of Girls in Nigeria Is Part of a Worsening Problem," *FiveThirtyEight*, May 8, 2014, https://fivethirtyeight.com/features/nigeria-kidnapping/.

2. You can see the whole thread on the archived version of Storify at https://web.archive.org/web/20140528062637/https://storify.com/AthertonKD/if-a-data-point-has-no-context-does-it-have-any-me, as well as on Simpson's account directly: Erin Simpson (@charlie_simpson), "So if #GDELT says there were 649 kidnappings in Nigeria in 4 months, WHAT IT'S REALLY SAYING is there were 649 news stories abt kidnappings," Twitter, May 13, 2014, 4:04 p.m., https://twitter.com/charlie_simpson/status/466308105416884225.

3. Kalev Leetaru, "The GDELT Project," GDELT, accessed May 12, 2018, https://www.gdeltproject.org/.

4. Here we place our work in the emerging field of dick studies, which includes videogame scholar Amanda Phillips, who theorizes masculinity in terms of hardness and flaccidity, and Jen Jack Gieseking, who points out that "size matters to lesbians too." See Phillips, "Dicks Dicks Dicks: Hardness and Flaccidity in (Virtual Masculinity)," *Flow: A Critical Forum on Media and Culture*, March 23, 2017, https://www.flowjournal.org/2017/11/dicks-dicks-dicks/; and Gieseking, "Size Matters to Lesbians, Too: Queer Feminist Interventions into the Scale of Big Data," *Professional Geographer* 70, no. 1 (2018): 150–156.

5. APIs allow a little program one writes to talk to other computers over the internet that are ready to receive data queries. Twitter, Zillow, and MOMA are some examples of large entities that have APIs available to programatically download data.

6. Here are some of our favorites: Dogs of Zurich (https://www.europeandataportal.eu/data/en/dataset/https-data-stadt-zuerich-ch-dataset-pd_stapo_hundenamen); UFO sightings (https://www.kaggle.com/NUFORC/ufo-sightings); all of the cartoon-based murals of Brussels (https://opendata.brussels.be/explore/dataset/comic-book-route/images/); Things Lost on the New York City subway system (http://advisory.mtanyct.info/LPUWebServices/CurrentLostProperty.aspx); and a list of abandoned shopping carts in Bristol (https://data.gov.uk/dataset/abandoned-shopping-trolleys-bristol-rivers). Some of the best of the newsletters include *Data Is Plural*, curated by Jeremy Singer-Vine, who is the data editor for Buzzfeed; and *Numlock News*, a daily email newsletter by Walt Hickey, which tries to provide some context around the numbers we see in the news.

7. "Scottish Witchcraft," Data.world, May 18, 2017, https://data.world/history/scottish-witchcraft.

8. Trevor Muñoz and Katie Rawson, "Data Dictionary," Curating Menus, 2016, accessed April 23, 2019, http://curatingmenus.org/data_dictionary/.

9. Haraway uses the phrase "unlocatable, and so irresponsible, knowledge claims." Donna Haraway, "Situated Knowledges: The Science Question in Feminism and the Privilege of Partial Perspective," *Feminist Studies* 14, no. 3 (Autumn 1988): 575–599, https://doi.org/10.2307/3178066.

10. For example, philosopher Lorraine Code argues that connecting knowledge to its specific biographic, historical, and geographic locations leads to "more responsible knowings." Code, *Ecological Thinking: The Politics of Epistemic Location* (New York: Oxford University Press, 2006).

11. Christine L. Borgman, *Big Data, Little Data, No Data: Scholarship in the Networked World* (Cambridge, MA: MIT Press, 2015).

12. "Open Knowledge International." Open Knowledge International. Accessed March 27, 2019. https://okfn.org/. The *Guardian* newspaper, out of the United Kingdom, launched the Free Our Data campaign in 2006 to petition government agencies to make public data available to taxpayers and companies for free. Among other things, they focused on geographic data collected by the Royal Ordnance Survey which had restrictive licenses on reuse by citizens. The campaign was largely successful: in 2010, the United Kingdom created the Open Government License and launched data.gov.uk, one of the first national data portals in the world. See Charles Arthur and Michael Cross, "Give Us Back Our Crown Jewels," *Guardian*, March 9, 2006, https://www.theguardian.com/technology/2006/mar/09/education.epublic.

13. See Peter R. Orszag, "Memorandum for the Heads of Executive Departments and Agencies Re: Open Government Directive," Washington, DC, Executive Office of the President, December 8, 2009, https://obamawhitehouse.archives.gov/sites/default/files/omb/assets/memoranda_2010/m10-06.pdf.

14. Although the movement under Obama was toward openness (Orszag, "Memorandum for the Heads of Executive Departments and Agencies Re: Open Government Directive"), the current administration has retreated from this position, according to a Sunlight Foundation audit, which found that "the Open Government Initiative, Open Government Partnership, and related programs, initiatives and partnerships across the federal government are being ignored, neglected or even forgotten in federal agencies." Briana Williams, "Under Trump, U.S. Government Moves from /Open to /Closed," Sunlight Foundation, January 24, 2018, https://sunlightfoundation.com/2018/01/24/under-trump-u-s-government-moves-from-open-to-closed/.

15. "The International Open Data Charter," Open Data Charter, accessed March 27, 2019, https://opendatacharter.net/principles/.

16. Tim Davies, "Exploring Participatory Public Data Infrastructure in Plymouth," *Public Sector Blogs*, September 11, 2017, https://www.publicsectorblogs.org.uk/2017/09/exploring-participatory-public-data-infrastructure-in-plymouth-tim-davies/.

17. *Zombie data* was named by Daniel Kaufmann, an economist with the Revenue Watch Institute. Joel Gurin, "Open Governments, Open Data: A New Lever for Transparency, Citizen Engagement, and Economic Growth," *SAIS Review of International Affairs* 34, no. 1 (Winter 2014): 71–82. While the name is certainly evocative, it's also important to acknowledge the history of zombies, which can be traced to seventeenth-century Haiti as a response to the incursion of slavery. As Mike Mariani helpfully summarizes, enslaved Haitians "believed that dying would release them back to *lan guinée*, literally Guinea, or Africa in general, a kind of afterlife where they could be free." But "those who took their own lives wouldn't be allowed to return to *lan guinée*. Instead, they'd be condemned to skulk the Hispaniola plantations for eternity, an undead slave at once denied their own bodies and yet trapped inside them—a soulless zombie." See Mariani, "The Tragic, Forgotten History of Zombies," *Atlantic*, October 28, 2015, https://www.theatlantic.com/entertainment/archive/2015/10/how-america-erased-the-tragic-history-of-the-zombie/412264/.

18. See Chris Anderson, "The End of Theory: The Data Deluge Makes the Scientific Method Obsolete," *Wired*, June 23, 2008, https://www.wired.com/2008/06/pb-theory/.

19. Fulvio Mazzocchi makes the connection between Bacon and big data in "Could Big Data Be the End of Theory in Science?," EMBO reports 16, no. 10 (2015): 1250–1255. While Bacon's *Novum Organum* (1620) was indeed a masterful work that influenced centuries of scientists, he was not alone in his promulgation of a (proto) scientific method. Margaret Cavendish (1623–1717), for example, was an author of both natural philosophy (as scientific theory was known at the time) and science fiction. In fact, her scientific treatise, *Observations upon Experimental Philosophy*, was published alongside her science fiction text, *The Blazing World* (1666), and together they worked to challenge the domination of science by men—a reality even in the seventeenth century.

20. Historian Matthew Jones has written an intellectual history of this line of thinking and demonstrates how it has led to a computational "culture of predictive utility" in which prediction is prized above other possible measures of success. See Jones, "How We Became Instrumentalists (Again)," *Historical Studies in the Natural Sciences* 48, no. 5 (November 5, 2018): 673–684.

21. Safiya Umoja Noble, *Algorithms of Oppression: How Search Engines Reinforce Racism* (New York: NYU Press, 2018), 80–81.

22. See https://clerycenter.org/policy-resources/the-clery-act/. The data include separate and specific numbers on sexual assault, dating violence, domestic violence, and stalking. It includes sexual assault incidents experienced by women, men, and nonbinary people.

23. The term *rape culture* was coined by second-wave feminists in the 1970s to denote a society in which male sexual violence is normalized and pervasive, victims are blamed, and the media exacerbates the problem. Rape culture includes jokes, music, advertising, laws, words, and images that normalize sexual violence. In 2017, following the election of a US president who joked about sexual assault on the campaign trail and the exposé of Harvey Weinstein's predatory behavior in Hollywood, high-profile women began speaking out against rape culture with the #MeToo hashtag. #MeToo, a movement started over a decade ago by activist Tarana Burke, encourages survivors to break their silence and build solidarity to end sexual violence.

24. In 2012, two members of BU's hockey team were charged with sexual assault, and a report by the university found that the team had created a "culture of sexual entitlement." See Mary Carmichael, "Graphic Details Emerge from BU Hockey Panel Reports," *Boston Globe*, September 6, 2012, https://www.boston.com/news/local-news/2012/09/06/graphic-details-emerge-from-bu -hockey-panel-reports.

25. The students' full story is excellent. You can read it here: Patrick Torphy, Michaela Halnon, and Jillian Meehan, "Reporting Sexual Assault: What the Clery Act Doesn't Tell Us," *Atavist*, April 26, 2016, https://cleryactfallsshort.atavist.com/reporting-sexual-assault-what-the -clery-act-doesnt-tell-us.

26. Sixteen staff members at the US Department of Education are devoted to monitoring the more than seven thousand higher-education institutions in the country, so it is unlikely that underreporting by an institution would be discovered, except in very high-profile cases. See Michael Stratford, "Clery Fines: Proposed vs. Actual," *Inside HigherEd*, July 17, 2014, https://www

.insidehighered.com/news/2014/07/17/colleges-often-win-reduction-fines-federal-campus-safety-violations. For example, the Sandusky Case at Penn State involved systematic sexual abuse of young boys by a football coach, and the university was subsequently fined $2.4 million for failing to properly report and disclose these crimes.

27. In this context, one might consider the decision of Christine Blasey Ford to testify about her assault by (now) US Supreme Court Justice Brett Kavanaugh. Coming forward involved relinquishing her privacy and reliving her trauma multiple times over, on a national stage.

28. Abigail Golden, "Is Columbia University Mishandling LGBT Rape Cases?," *Daily Beast*, April 30, 2014, https://www.thedailybeast.com/is-columbia-university-mishandling-lgbt-rape-cases?ref=scroll.

29. Sara Ahmed has written powerfully on the violent effects of this silencing of assault victims. "Silence enables the reproduction of the culture of harassment and abuse. When we don't speak about violence we reproduce violence. Silence about violence is violence," she explains. Ahmed, "Speaking Out," *Feministkilljoys* (blog), June 2, 2016, https://feministkilljoys.com/2016/06/02/speaking-out/.

30. Lisa Gitelman and Virginia Jackson, "Introduction," in *"Raw Data" Is an Oxymoron* (Cambridge, MA: MIT Press, 2013), 2. Here they are following a statement from information studies scholar Geoffrey Bowker, "Raw data is both an oxymoron and a bad idea; to the contrary, data should be cooked with care," as quoted in *Memory Practices in the Sciences* (Cambridge, MA: MIT Press, 2005). The dichotomy between "raw" and "cooked," in turn, owes its source to the renowned structural anthropologist Claude Levi-Strauss. His famous book, *The Raw and the Cooked* (1964), analogizes the process of transforming nature into culture as akin to the process of transforming raw food into cooked. Your false binary and hidden hierarchy alarm bells should already be going off; and indeed, much of the work of the feminist theory of the early 1970s was to challenge this false dichotomy, as well as the assumptions (and examples) that it rested upon. See Lévi-Strauss, trans. John Weightman and Doreen Weightman, *The Raw and the Cooked: Introduction to a Science of Mythology*, vol. 1 (New York: Harper & Row, 1969).

31. "Google Flu Trends," accessed August 6, 2019, https://www.google.org/flutrends/about/.

32. Sally Kestin and John Maines, "Cops among Florida's Worst Speeders, Sun Sentinel Investigation Finds," *Sun Sentinel*, February 11, 2012.

33. A brilliant idea—to try to link searches for flu symptoms to actual cases of the flu to see if one could predict where the next outbreak would be—Google Flu Trends seemed to work for the first couple years. Then, in the 2012–2013 flu season, Google estimated more than double the flu cases that the CDC did. This discrepancy was possibly due to media panic about swine flu, to Google updating its technology to include recommendations, or perhaps to something else. These are the dangers of prioritizing prediction and utility over causation and context: it all works temporarily, until something in the environment changes. See David Lazer, Ryan Kennedy, Gary King, and Alessandro Vespignani, "The Parable of Google Flu: Traps in Big Data Analysis," *Science* 343, no. 6176 (2014): 1203–1205.

34. In the paper "Tampering with Twitter's Sample API," Jürgen Pfeffer, Katja Mayer, and Fred Morstatter demonstrate how the opacity of sampling done by platforms makes the data vulnerable to manipulation. Pfeffer, Mayer, and Morstatter, "Tampering with Twitter's Sample API," *EPJ Data Science* 7, no. 1 (December 19, 2018).

35. Gaffney and Matias found that the supposedly complete corpus is missing at least thirty-six million comments and twenty-eight million submissions. At least fifteen peer-reviewed studies have used the dataset for research studies on topics like politics, online behavior, breaking news, and hate speech. Depending on what the researchers used the corpus for, the missing data may have affected the validity of their results. Devin Gaffney, and J. Nathan Matias, "Caveat Emptor, Computational Social Science: Large-Scale Missing Data in a Widely-Published Reddit Corpus," *PLOS ONE* 13, no. 7 (July 6, 2018).

36. Lauren F. Klein, "The Image of Absence: Archival Silence, Data Visualization, and James Hemings," *American Literature* 85, no. 4 (Winter 2013): 661–688.

37. The title of a book by Dave Dewitt, *The Founding Foodies: How Washington, Jefferson, and Franklin Revolutionized American Cuisine* (Naperville, IL: Sourcebooks, 2010).

38. The subject of Adrian Miller's *The President's Kitchen Cabinet: The Story of the African Americans Who Have Fed Our First Families, from the Washingtons to the Obamas* (Chapel Hill: University of North Carolina Press, 2017) and of Lauren's more academic book on the subject, *An Archive of Taste: Race and Eating in the Early United States* (Minneapolis: University of Minnesota Press, 2020).

39. See Nikhil Garg, Londa Schiebinger, Dan Jurafsky, and James Zou, "Word Embeddings Quantify 100 Years of Gender and Ethnic Stereotypes," *Proceedings of the National Academy of Sciences* 115, no. 16 (2018): E3635–E3644.

40. In 1970, Daniel Halloran and colleagues wrote, "Events will be selected for news reporting in terms of their fit or consonance with pre-existing images—the news of the event will confirm earlier ideas." James Dermot Halloran, Philip Ross Courtney Elliott, and Graham Murdock, *Demonstrations and Communication: A Case Study* (London: Penguin Books, 1970).

41. Desmond Patton, interview by Catherine D'Ignazio, August 30, 2018.

42. Patton, interview by D'Ignazio.

43. This method is described in detail in their paper: William R. Frey, Desmond U. Patton, Michael B. Gaskell, and Kyle A. McGregor, "Artificial Intelligence and Inclusion: Formerly Gang-Involved Youth as Domain Experts for Analyzing Unstructured Twitter Data," *Social Science Computer Review* (2018).

44. Patton, interview by D'Ignazio.

45. Collins, *Black Feminist Thought*.

46. See "Tressie McMillan Cottom—Upending Stereotypes of Black Womanhood with 'Thick,'" *The Daily Show with Trevor Noah*, video, 7:20, January 21, 2019, https://www.youtube.com/watch?v=EYNu6yvv8HU.

47. Context is crucial for understanding social media conversations. This becomes a particularly fraught problem once we start automating meaning-making with techniques like sentiment analysis and quantitative text analysis. Language and image meanings shift and change quickly, often based on local knowledge, culture, and circumstances. Mariana Giorgetti Valente, director of the Brazilian nonprofit InternetLab, gives the example of a 2010 attack on a gay man in São Paulo in which he was hit on the head with a neon lamp. The image of a lamp then became used in hate speech online. When somebody would subsequently speak out in support of gay rights on Brazilian social media, trolls would post a lamp to communicate a threat of violence. But how would a machine-learning classifier understand that an image of a lamp is a threat without knowing this local context? Valente and InternetLab are collaborating with IT for Change in India to see how they can incorporate context into the detection of hate-speech and anti-hate-speech practices online. Mariana Valente, interview by Catherine D'Ignazio, March 11, 2019.

48. One of the principles of this code is that "social workers recognize the central importance of human relationships." As new codes of ethics are developed for emerging work in machine learning and artificial intelligence, it may be useful to look toward those fields, like social work, that have long-standing histories and specific language for navigating social inequality. In a blog post, Catherine adapted the National Association of Social Workers Code of Ethics and replaced *social worker* with *data scientist* as a way of speculating about whether design and technical fields might ever be able to deal so explicitly with concepts of justice and oppression. Catherine D'Ignazio, "How Might Ethical Data Principles Borrow from Social Work?," Medium, September 2, 2018, https://medium.com/@kanarinka/how-might-ethical-data-principles-borrow-from-social-work-3162f08f0353.

49. Patton, interview by D'Ignazio.

50. Fatos Kaba, Angela Solimo, Jasmine Graves, Sarah Glowa-Kollisch, Allison Vise, Ross Macdonald, Anthony Waters, et al., "Disparities in Mental Health Referral and Diagnosis in the New York City Jail Mental Health Service," *American Journal of Public Health* 105, no. 9 (September 2015): 1911–1916.

51. Prison reform advocate and formerly incarcerated person Eddie Ellis states that terms like *prisoner*, *inmate*, *convict*, and *felon* "are no longer acceptable for us and we are asking people to stop using them." See Eddie Ellis, "Language," Prison Studies Project, accessed July 29, 2019, http://prisonstudiesproject.org/language/.

52. Pete Vernon, "Dancing around the Word 'Racist' in Coverage of Trump," *Columbia Journalism Review*, September 25, 2017, https://www.cjr.org/covering_trump/trump-racism.php.

53. As a nonhypothetical example of this, see the recent interactive feature from the *New York Times*, "Extensive Data Shows Punishing Reach of Racism for Black Boys," which models much of this advice in both naming racism and reflecting the findings of the study that served as the basis for the report. See https://www.nytimes.com/interactive/2018/03/19/upshot/race-class-white-and-black-men.html.

54. Kimberly Seals Allers, "What Privileged Kids—and Parents—Can Learn from Low-Income Youth," *Washington Post*, March 2, 2018.

55. How might we focus less attention on minoritized groups' disadvantages and more attention on dominant groups' unearned privileges? For example, instead of focusing on the women that are "missing" from data science and AI, perhaps we should be focusing on the overabundance of men in data science and AI who don't see it as a problem worth their time and energy (because the system works for them).

56. See Gisele S. Craveiro and Andrés M. R. Martano, "Caring for My Neighborhood: A Platform for Public Oversight," in *Agent Technology for Intelligent Mobile Services and Smart Societies* (Berlin: Springer, 2014), 117–126.

57. See Heather Krause, "Data Biographies: Getting to Know Your Data," Global Investigative Journalism Network, March 27, 2017, https://gijn.org/2017/03/27/data-biographies-getting-to-know-your-data/.

58. Timnit Gebru, Jamie Morgenstern, Briana Vecchione, Jennifer Wortman Vaughan, Hanna Wallach, Hal Daumeé III, and Kate Crawford, "Datasheets for Datasets," ArXiv.org, July 9, 2018.

59. Likewise, James Zou and Londa Schiebinger advocate for standardized metadata to accompany AI training datasets that spells out demographics, geographic limitations, and relevant definitions and collection practices. Zou and Schiebinger, "AI Can Be Sexist and Racist—It's Time to Make It Fair," *Nature*, July 18, 2018, https://www.nature.com/articles/d41586-018-05707-8.

60. "Data User Guides," accessed August 6, 2019, http://www.wprdc.org/data-user-guides/.

61. Emerson Engagement Lab, "Civic Data Ambassadors: Module 2 Video 3—Civic Data Guides," video, 6:25, March 18, 2018, https://vimeo.com/260650894.

62. "School Segregation Data," ProPublica, December 2017, https://www.propublica.org/datastore/dataset/school-segregation-charter-district-data.

63. WomanStats.org is solely focused on the status of women and does not collect any indicators on nonbinary people.

64. Valerie Hudson, interview with Catherine D'Ignazio, January 31, 2019.

65. "Codebook," WomanStats, accessed March 27, 2019, http://www.womanstats.org/new/codebook/.

66. "Codebook," http://www.womanstats.org/new/codebook/.

67. Moreover, if one of the goals is transparency and accountability, the institutions in power often have strong incentives to *not* provide context, so the data setting is rife with conflicts of interest. Indeed, Gebru and colleagues foresee challenges to publishers specifying ethical considerations on their datasheets because they may perceive it as exposing themselves to legal and public relations risks. See Gebru et al., "Datasheets for Datasets."

68. Ricardo Ramírez, Balaji Parthasarathy, and Andrew Gordon, "From Infomediaries to Infomediation at Public Access Venues: Lessons from a 3-Country Study," in *Proceedings of the Sixth International Conference on Information and Communication Technologies and Development: Full Papers*, vol. 1 (New York: ACM, 2013), 124–132.

69. Shannon Mattern, "Public In/Formation," *Places Journal*, November 2016, https://placesjournal.org/article/public-information/.

70. "ProPublica Data Store," ProPublica, accessed August 6, 2019, https://www.propublica.org/datastore/.

71. See https://measuresforjustice.org/.

72. Aaron Brenner et al., "Civic Switchboard," accessed August 6, 2019, https://civic-switchboard.github.io/.

7 Show Your Work

1. The authors do not appear to have considered nonbinary genders, although they do maintain a category for "gender-neutral" usernames that cannot be categorized as either men's or women's names. It is also worth noting that this study led to Mozilla, an open-source software company, undertaking an experiment in gender-blind code reviews, in which the gender of a project contributor remains hidden. The results are yet to be published. On the initial study, see J. Terrell, A. Kofink, J. Middleton, C. Rainear, E. Murphy-Hill, C. Parnin, and J. Stallings, "Gender Differences and Bias in Open Source: Pull Request Acceptance of Women versus Men," *PeerJ Computer Science* 3 (2017): e111. On the Mozilla experiment, see, Judy McConnell, "Mozilla Experiment Aims to Reduce Bias in Code Reviews," *Mozilla Blog*, March 8, 2018, https://blog.mozilla.org/blog/2018/03/08/gender-bias-code-reviews/.

2. Claire Cain Miller, "GitHub Founder Resigns after Investigation," *New York Times*, April 21, 2014, https://bits.blogs.nytimes.com/2014/04/21/github-founder-resigns-after-investigation/.

3. Ethan Baron, "GitHub Paid Executive Less because She's Asian and Female, Fired Her for Complaining: Lawsuit," *Mercury News*, October 1, 2018, https://www.mercurynews.com/2018/10/01/github-paid-executive-less-because-shes-asian-and-female-fired-her-for-complaining-lawsuit/.

4. Coraline Ada Ehmke, "Antisocial Coding: My Year at GitHub," *Coraline Ada Ehmke* (blog), July 5, 2017, https://where.coraline.codes/blog/my-year-at-github/.

5. To explore the interactive version of the *Ship Map*, visit https://www.shipmap.org/.

6. For a summary of the cognitive demands required by this type of work, see, for instance, John Levi Martin, "Life's a Beach but You're an Ant, and Other Unwelcome News for the Sociology of Culture," *Poetics* 38, no. 2 (April 2010): 229–244.

7. Miriam Posner, "See No Evil," *Logic Magazine*, April 2018, https://logicmag.io/04-see-no-evil/.

8. Silvia Federici's *Wages against Housework* (Bristol, UK: Power of Women Collective and Falling Water Press, 1975) is the most in depth articulation of the goals of the campaign. The ephemera collection of the Barnard Center for Research on Women contains many of the flyers associated with the campaign and has made them available online at http://bcrw.barnard.edu/archive/workforce.htm. Louise Toupin's *Wages for Housework: A History of an International Feminist*

Movement, 1972–1977 (Vancover: University of British Columbia Press, 2018) provides a history of the movement.

9. On the positions and impact of the Wages for Housework movement and the International Feminist Collective, see *Wages for Housework: The New York Committee, 1972–1977*, ed. Silvia Federici and Arlen Austin (New York: Autonomedia, 2017).

10. Angela Davis, "The Approaching Obsolescence of Housework: A Working-class Class Perspective," in *Women, Race, & Class* (New York: Penguin Random House, 1983), 222–244. In other work, Davis traces this phenomenon back to the institution of slavery. See "Reflections on the Black Woman's Role in the Community of Slaves," *Massachusetts Review* 13, no. 1–2 (Winter/Spring 1972): 81–100. In the years since that foundational essay, scholars such as Stephanie Camp, Jennifer Morgan, and Thavolia Glymph have contributed additional historical and theoretical lenses on the racialization of domestic labor. See Camp, *Closer to Freedom: Enslaved Women and Everyday Resistance in the Plantation South* (Chapel Hill: University of North Carolina Press, 2004); Morgan, *Laboring Women: Reproduction and Gender in New World Slavery* (Philadelphia: University of Pennsylvania Press, 2004); and Glymph, *Out of the House of Bondage: The Transformation of the Plantation Household* (Cambridge: Cambridge University Press, 2008). Mignon Duffy, in *Making Care Count: A Century of Gender, Race, and Paid Care Work* (New Brunswick: Rutgers University Press, 2011), takes this history back up to the present.

11. Other organizations worked in concert with Wages for Housework in the late 1970s and early 1980s to tackle race and other intersectional differences. For example, Black Women for Wages for Housework had a mission to "see to it that challenging racism and challenging sexism, which reinforce each other, are prioritized equally." The group's members called for not only remunerating housework but all of their unwaged work over time, including reparations for slavery, imperialism, and neocolonialism. Wages Due Lesbians lobbied for additional funds to compensate the social discrimination faced by lesbians. WinVisibility fought for economic independence and recognition for disabled women. And the English Collective of Prostitutes sought to decriminalize sex work and fight poverty so that no woman would be forced into unwanted sex. See the listing of "Autonomous Organizations" included in the flyer for "The International Wages for Housework Campaign," Freedom Archives, accessed May 13, 2019, http://freedomarchives.org/Documents/Finder/DOC500_scans/500.020.Wages.for.Housework.pdf.

12. One of the first essays defining the term *invisible labor* was "Invisible Work" by Arlene Kaplan Daniels (*Social Problems* 34, no. 5 [1987]: 403–415), in which she writes that "gender expectations, and separation between the public and private worlds are mixed together with paid work to create a special type of problem for which women are expected to take responsibility." Since then it has become a broad, umbrella term for the many kinds of labor (often gendered) that go uncompensated, undervalued, or unseen.

13. Tiziana Terranova, "Free Labor: Producing Culture for the Digital Economy," *Social Text* 18, no. 2 (2000): 33–58.

14. "Netflix Prize," Netflix, accessed August 1, 2019, https://www.netflixprize.com/.

15. "MPs Expenses: The Guardian Launches Major Crowdsourcing Experiment," *Guardian*, June 23, 2009, https://www.theguardian.com/gnm-press-office/crowdsourcing-mps-expenses.

16. "EEBO-TCP: Early English Books Online," accessed August 1, 2019, https://www.textcreation partnership.org/tcp-eebo/.

17. When he coined the term in the mid-2000s, Jeff Howe argued that *crowdsourcing* was a powerful way to tap networked knowledge for corporate use. "The labor isn't always free, but it costs a lot less than paying traditional employees," he wrote in *Wired*. See Jeff Howe, "The Rise of Crowdsourcing," *Wired*, January 6, 2006, https://www.wired.com/2006/06/crowds/.

18. Ashe Dryden, "Programming Diversity," talk at Mix-IT, Lyon, France, April 29, 2014. Video and transcript available online at https://www.ashedryden.com/mixit-programming-diversity.

19. Benjamin Mako Hill and Aaron Shaw, "The Wikipedia Gender Gap Revisited: Characterizing Survey Response Bias with Propensity Score Estimation," *PLOS ONE* 8, no. 6. (June 2013): 1–5; and "Editor Survey 2011/Executive Summary," WikiMedia, accessed August 1, 2019, https://meta.wikimedia.org/wiki/Editor_Survey_2011/Executive_Summary. Neither of the studies consider nonbinary genders.

20. "#VisibleWikiWomen 2019," *Whose Knowledge?*, 2019, accessed April 12, 2019, https://whoseknowledge.org/initiatives/visiblewikiwomen-2019/.

21. Heather Ford and Judy Wajcman, "'Anyone Can Edit', Not Everyone Does: Wikipedia's Infrastructure and the Gender Gap," *Social Studies of Science* 47, no. 4 (2017): 511–527.

22. Veerle Miranda, "Cooking, Caring and Volunteering: Unpaid Work around the World," OECD Social, Employment and Migration Working Papers no. 116, March 3, 2011, https://www.oecd.org/berlin/47258230.pdf. The study did not consider nonbinary genders.

23. For more on the attention-leaching effects of capitalism, see McKenzie Wark, "Cognitive Capitalism," *Public Seminar*, February 19, 2015, http://www.publicseminar.org/2015/02/cog-cap/.

24. Mechanical Turk, also known as MTurk, is a marketplace for crowdsourced human labor—individuals and businesses that have "human intelligence tasks" can set up jobs for online workers to complete. Often repetitive, like describing images or taking surveys, the jobs are compensated in tiny financial increments that don't add up to a minimum hourly wage—not to mention a living wage. See Amazon Mechanical Turk, accessed April 22, 2019, https://www.mturk.com.

25. Amazon Mechanical Turk, accessed April 22, 2019, https://www.mturk.com.

26. Paul Hitlin, "Research in the Crowdsourcing Age, a Case Study," Pew Research Center: Internet & Technology, July 11, 2016, http://www.pewinternet.org/2016/07/11/research-in-the-crowdsourcing-age-a-case-study/.

27. Joel Ross, Lilly Irani, M. Six Silberman, Andrew Zaldivar, and Bill Tomlinson, "Who Are the Crowdworkers? Shifting Demographics in Mechanical Turk," in *CHI 2010: Imagine All the People* (New York: ACM, 2010), 2863–2872.

28. To view the documentary *Workers Leaving the Googleplex*, visit https://vimeo.com/15852288.

29. Lucy Yang, "13 Incredible Perks of Working at Google, According to Its Employees," *Insider*, July 11, 2017, https://www.thisisinsider.com/coolest-perks-of-working-at-google-in-2017-2017 -7#perhaps-one-of-googles-most-well-known-perks-employees-can-eat-every-meal-at-work-for -free-and-save-a-ton-of-money-1.

30. Lilly Irani, "Justice for 'Data Janitors,'" *Public Books*, January 15, 2015, https://www .publicbooks.org/justice-for-data-janitors/.

31. Scholars have uncovered many examples of "hidden figures" in the history of data work that have not yet (but probably should) become major motion pictures. For example, Lisa Nakamura has recently exposed the below-minimum-wage pay of the Navajo women who, in the early days of digital computing, were tapped to assemble integrated circuits for the largest electronics supplier in the country, Fairchild Semiconductor. Or consider the female line workers, called "little old ladies" by their colleagues in engineering, who were employed by the US military defense contractor Raytheon to weave the delicate core rope memory that was used on the computers that accompanied the Apollo astronauts to the moon—a contribution that Daniela Rosner and her team have explored. See Lisa Nakamura, "Indigenous Circuits: Navajo Women and the Radicalization of Early Electronic Manufacture," *American Quarterly* 66, no. 4. (2014): 919–941; and Daniela K. Rosner, Samantha Shorey, Brock R. Craft, and Helen Remick, "Making Core Memory: Design Inquiry into Gendered Legacies of Engineering and Craftwork," in *CHI 2018* (New York: ACM, 2018), 1–13.

32. "About," Turkopticon, December 28, 2018, https://turkopticon.ucsd.edu/.

33. Turkopticon (@turkopticon), "It is volunteer run and we're all burned out. ... I'll find resources for those who want to take over," Twitter, October 19, 2018, 12:05 a.m. https://twitter .com/turkopticon/status/1053044386374668289.

34. Andrea Chen, "The Laborers Who Keep Dick Pics and Beheadings Out of Your Facebook Feed," *Wired*, October 23, 2014, https://www.wired.com/2014/10/content-moderation/. Chen went on to collaborate with filmmaker Ciaran Cassidy on a short documentary called *The Moderators* (https://fieldofvision.org/the-moderators). Other work on the labor of content moderation includes Sarah T. Roberts, *Behind the Screen: Content Moderation in the Shadows of Social Media* (New Haven: Yale University Press, 2019), and Tarleton Gillespie, *Custodians of the Internet: Platforms, Content Moderation, and the Hidden Decisions that Shape Social Media* (New Haven: Yale University Press, 2018).

35. Mary Gray and Siddarth Suri, *Ghost Work: How to Stop Silicon Valley from Building a New Global Underclass* (New York: Houghton Mifflin Harcourt, 2019).

36. Filmmaker and author Astra Taylor has a word for this phenomenon: *fauxtomation*. Taylor, "The Automation Charade," *Logic*, October 2, 2018, https://logicmag.io/05-the-automation-charade/.

37. For an account of this episode in the context of capitalism, see Ian Baucom, *Specters of the Atlantic: Finance Capital, Slavery, and the Philosophy of History* (Durham, NC: Duke University Press, 2005).

38. Christina Sharpe, *In the Wake: On Blackness and Being* (Durham, NC: Duke University Press, 2016).

39. Marlene NourbeSe Philip, *Zong!* (Middletown, CT: Wesleyan University Press, 2011).

40. Philip's poem has become a touchstone of contemporary information studies scholarship. Miriam Posner, in "Seeing Like a Supply Chain" (forthcoming), connects *Zong!* to the history and present of capitalism. Jeffrey Moro connects the poem to digital data in "Want of Water, Want of Data: The Trans-Atlantic Slave Database and Oceanic Computing" (presented at SIGCIS 2018, Stored in Memory, St. Louis, Missouri, October 14, 2018).

41. Due to the systemic racism of the United States, those in prison are disproportionately Black and Latinx; those groups constitute around 32 percent of the US population, but comprised 56 percent of all incarcerated people in 2015 ("Criminal Justice Fact Sheet," NAACP, 2019, accessed April 23, 2019, https://www.naacp.org/criminal-justice-fact-sheet/). Scholars such as Michelle Alexander, who we mentioned in chapter 1, as well as filmmakers such as Ava DuVernay, have demonstrated how mass incarceration is a contemporary, legally permissible extension of slavery. And who benefits? Corporations. The Corrections Accountability Project released a comprehensive study in 2018 that maps and exposes all the commercial interests in the prison system: "The Prison Industrial Complex: Mapping Private Sector Players," Urban Justice Center: Corrections Accountability Project, April 2018. On the Victoria's Secret connection in particular, see Caroline Winter, "What Do Prisoners Make for Victoria's Secret?," *Mother Jones*, July/August 2008, https://www.motherjones.com/politics/2008/07/what-do-prisoners-make-victorias-secret/. On the BP oil spill, see Abe Louise Young, "BP Hires Prison Labor to Clean Up Spill while Coastal Residents Struggle," *Nation*, July 21, 2010, https://www.thenation.com/article/bp-hires-prison-labor-clean -spill-while-coastal-residents-struggle/. On incarceration as a new form of enslavement, see Ava DuVernay, *13th*, Netflix, documentary (Sherman Oaks, CA: Kandoo Films, 2016).

42. Siddharth Kara, "Is Your Phone Tainted by the Misery of the 35,000 Children in Congo's Mines?," *Guardian*, October 12, 2018, https://www.theguardian.com/global-development/2018/ oct/12/phone-misery-children-congo-cobalt-mines-drc.

43. Jacopo Ottaviani, "E-waste Republic," *Aljazeera*, accessed June 10, 2018, http://www.spiegel .de/international/tomorrow/electronic-waste-in-africa-recycling-methods-damage-health-and -the-environment-a-1086221.html. The narratives in the popular press that focus on the toxicity of these sites often overlook the ingenuity of those who work there. For scholarship on Ghana in particular, see Stephen J. Jackson, "Rethinking Repair," in *Media Technologies: Essays on Communication, Materiality and Society*, ed. Tarleton Gillespie, Pablo Boczkowski, and Kirsten Foot (Cambridge, MA: MIT Press, 2014), 221–239; for other geographic contexts, see Cuban artist Ernesto Orozo's concept of the "architecture of necessity," as elaborated in Alex Gil, "Interview with Ernesto Oroza," in *Debates in the Digital Humanities 2016*, ed. Matthew K. Gold and Lauren F. Klein (Minneapolis: University of Minnesota Press, 2016), 184–193; or Daniela Rosner's concept of "critical fabulations," in *Critical Fabulations: Reworking the Methods and Margins of Design* (Cambridge, MA: MIT Press, 2018).

44.   Safiya Umoja Noble and Robert Mejia, among others, have demonstrated these links in their essays in *The Intersectional Internet: Race, Sex, Class, and Culture Online*, ed. Safiya Umoja Noble and Brendesha M. Tynes (New York: Peter Lang International Academic Publishers, 2016).

45. Miranda Banks, "Production Studies," *Feminist Media Histories* 4, no. 2 (Spring 2018): 157–161. Also see Banks, "Gender Below-the-Line: Defining Feminist Production," in *Production Studies Cultural Studies of Media Industries*, ed. Vicki Mayer, Miranda J. Banks, and John T. Caldwell (London: Taylor and Francis Group, 2009), 87–98.

46. This work can also be connected to the area of research known as *maintenance studies*, as popularized by groups such as the Maintainers, which we discuss in more detail ahead. See "The Maintainers," accessed August 1, 2019, http://themaintainers.org/.

47.   Kate Crawford and Vladan Joler, "Anatomy of an AI System: The Amazon Echo as an Anatomical Map of Human Labor, Data and Planetary Resources," AI Now Institute and Share Lab, September 7, 2018, https://anatomyof.ai.

48. Sara Ahmed, "Making Feminist Points," *Feministkilljoys* (blog), September 11, 2013, https://feministkilljoys.com/2013/09/11/making-feminist-points/.

49. "Collaborators' Bill of Rights," in *Off the Tracks: Laying New Lines for Digital Humanities Scholars*, MediaCommons, 2011, http://mcpress.media-commons.org/offthetracks/part-one-models-for-collaboration-career-paths-acquiring-institutional-support-and-transformation-in-the-field/a-collaboration/collaborators%E2%80%99-bill-of-rights/. More recently, at UCLA, a team of eleven students and faculty members worked together to author the Student Collaborators' Bill of Rights. Supplementing the original document with ten additional principles, the student version of the document emphasizes the importance of empowering students to "make critical decisions about the intellectual design of a project or a portion of a project" and credit them accordingly. See Haley Di Pressi, Stephanie Gorman, Miriam Posner, Raphael Sasayama, and Tori Schmitt, with contributions from Roderic Crooks, Megan Driscoll, Amy Earhart, Spencer Keralis, Tiffany Naiman, and Todd Presner, "A Student Collaborators' Bill of Rights," June 8, 2018, https://humtech.ucla.edu/news/a-student-collaborators-bill-of-rights/.

50. See J. K. Gibson-Graham and the Community Economies Collective, *Cultivating Community Economies*, Next System Project, February 27, 2017, https://thenextsystem.org/cultivating-community-economies. Thanks go to Kate Diedrick for telling us about this work.

51. As a hack, the Drupal development community has begun to create "issues" in its bug-tracking system to document in-person meetings. When the issues are resolved at the close of each meeting, people who attended the meeting are entered into the system so that their participation is formally logged. See Angela Byron, "Proposal: Add a New 'Meetings' Component for Initiative (and Other?) Meetings," Drupal.org, June 22, 2018, https://www.drupal.org/project/drupal/issues/2976614.

52. Benjamin M. Schmidt, "A Brief Visual History of MARC Cataloging at the Library of Congress," *Sapping Attention* (blog), May 16, 2017, http://sappingattention.blogspot.com/2017/05/a-brief-visual-history-of-marc.html.

53. For more on Loukissas's work and his idea of the *data setting*, see chapter 5.

54. For a survey of this form of labor, see Amy S. Wharton, "The Sociology of Emotional Labor," *Annual Review of Sociology* 35 (August 2009): 147–165.

55. Arlie Russell Hochschild, *The Managed Heart: Commercialization of Human Feeling*, 3rd ed. (1979; Berkeley: University of California Press, 2012).

56. As an entry point, see Guillermina Altomonte, "Affective Labor in the Post-Fordist Transformation," Public Seminar, May 8, 2015, http://www.publicseminar.org/2015/05/affective-labor-in-the-post-fordist-transformation/. See also Melissa Gregg and Gregory J. Seigworth, eds., *The Affect Theory Reader* (Durham, NC: Duke University Press, 2010).

57. Enda Brophy and Jamie Woodcock, "The Call Centre Seen from Below: Issue 4.3 Editorial," *Notes from Below*, February 14, 2019, https://notesfrombelow.org/article/call-centre-seen-below-issue-43-editorial.

58. An increasing amount of scholarship exists on this phenomenon. See, for instance, Sara Ahmed, *On Being Included: Racism and Diversity in Institutional Life* (Durham, NC: Duke University Press, 2012).

59. The invisible labor of domestic work has long been the subject of scholarship in feminist geography. See, for example, Mei-Po Kwan, "Gender, the Home-Work Link, and Space-Time Patterns of Nonemployment Activities," *Economic Geography* 75, no. 4 (1999): 370–394, as well as her important essay, "Feminist Visualization: Re-envisioning GIS as a Method in Feminist Geographic Research," *Annals of the Association of American Geographers* 92, no. 4 (2002): 645–661. See also Marianna Pavlovskaya and Kevin St. Martin, "Feminism and Geographic Information Systems: From a Missing Object to a Mapping Subject," *Geography Compass* 1, no. 3 (2007): 583–606. Thanks to Shannon Mattern for alerting us to this work.

60. See "The Value of Self-tracking to Caregivers," in V. Rajiv Mehta and Dawn Nafus, "Atlas of Caregiving Pilot Study Report," 2016, 30–31, https://atlasofcaregiving.com/wp-content/uploads/2016/03/Study_Report.pdf.

61. See Giorgia Lupi, "Bruises—the Data We Don't See," Medium: Neuroscience, January 31, 2018, https://medium.com/@giorgialupi/bruises-the-data-we-dont-see-1fdec00d0036. Complete work viewable at https://www.youtube.com/watch?v=QvxVWukROTw.

62. Lupi, "Bruises."

63. Ellen Samuels, "Six Ways of Looking at Crip Time," *Disability Studies Quarterly* 37, no. 3 (2017), https://doi.org/10.18061/dsq.v37i3.5824.

64. Samuels, "Six Ways of Looking at Crip Time."

65. Mierle Laderman Ukeles, "Manifesto for Maintenance Art, 1969," Arnolfini, 1969, accessed April 23, 2019, https://www.arnolfini.org.uk/blog/manifesto-for-maintenance-art-1969.

66. In domestic work, for example, women represent 80 percent of the sixty-seven million workers across the globe. See Abigail Hunt and Fortunate Machingura, "A Good Gig? The Rise of On-Demand Domestic Work," *Overseas Development Institute* (December 2016): 1–43, https://www.odi.org/publications/10658-good-gig-rise-demand-domestic-work.

67. See, for example, Andrew L. Russell and Lee Vinsel, "Make Maintainers: Engineering Education and an Ethics of Care," in *Does America Need More Innovators?*, ed Matthew Wisnioski, Eric S. Hintz, and Marie Stettler Kleine (Cambridge, MA: MIT Press, 2019), 249–272; and Bethany Nowviskie, "Capacity through Care," in *Debates in the Digital Humanities 2019*, ed. Matthew K. Gold and Lauren F. Klein (Minneapolis: University of Minnesota Press, 2019), 424–426.

68. Hunt and Machingura, "A Good Gig?"

69. See "Alia," NDWA Labs, 2015, accessed April 23, 2019, https://www.ndwalabs.org/alia.

Conclusion: Now Let's Multiply

1. Google Walkout for Real Change, "Google Employees and Contractors Participate in Global 'Walkout for Real Change,'" Medium: Technology, November 2, 2018, https://medium.com/@GoogleWalkout/google-employees-and-contractors-participate-in-global-walkout-for-real-change-389c65517843.

2. The women that are hired into Google are not compensated equally to their male counterparts. The corporation is facing a class-action lawsuit about gender pay equity after the Department of Labor found "systemic compensation disparities against women pretty much across the entire workforce." The 31 percent figure is from Alex Morris, "When Google Walked: Rage Drove the Protests Last Year, but Can It Bring About Lasting Change at Tech Companies?," *New York Magazine*, February 5, 2019, http://nymag.com/intelligencer/2019/02/can-the-google-walkout-bring-about-change-at-tech-companies.html. See also Sam Levin, "Google Gender Pay Gap: Women Advance Suit that Could Affect 8,300 Workers," *Guardian*, October 26, 2018, https://www.theguardian.com/technology/2018/oct/26/google-gender-pay-gap-women-class-action-lawsuit.

3. Daisuke Wakabayashi and Katie Benner, "How Google Protected Andy Rubin, the 'Father of Android,'" *New York Times*, October 25, 2018, https://www.nytimes.com/2018/10/25/technology/google-sexual-harassment-andy-rubin.html.

4. Wakabayashi and Benner, "How Google Protected Andy Rubin."

5. Morris, "When Google Walked."

6. Morris, "When Google Walked."

7. Mar Hicks, "The Long History Behind the Google Walkout: Tech Companies Ignore Labor History at Their Own Peril," *Verge*, November 9, 2018, https://www.theverge.com/2018/11/9/18078664/google-walkout-history-tech-strikes-labor-organizing.

8. Moira Weigel, "Coders of the World, Unite: Can Silicon Valley Workers Curb the Power of Big Tech?," *Guardian*, October 31, 2017, https://www.theguardian.com/news/2017/oct/31/coders-of-the-world-unite-can-silicon-valley-workers-curb-the-power-of-big-tech.

9. Alex Press, "Code Red: Organizing the Tech Sector," *n+1*, no. 31 (Spring 2018), https://nplusonemag.com/issue-31/politics/code-red/.

10. See https://twitter.com/hashtag/TechWontBuildIt?src=hash.

11. The change was short-lived and caused an uproar in the open-source software development community, with prominent open-source advocates claiming that this constituted discrimination (against US Immigration and Customs Enforcement—which, to remind you, was separating young children from their parents at the border and putting them in jails). The case is a fascinating collision between the rising political consciousness of the tech sector and the libertarian values that drove the 1990s internet and rise of open-source software. See Daniel Oberhaus, "Open Source Devs Reverse Decision to Block ICE Contractors From Using Software," *Motherboard*, August 30, 2018, https://motherboard.vice.com/en_us/article/pawnwv/open-source-devs-reverse-decision-to-block-ice-contractors-from-using-software.

12. See https://www.techworker.coop/, and a partial list of global tech cooperatives can be found here: "Hng/tech-coops," GitHub, April 11, 2019, https://github.com/hng/tech-coops. The Design Action Collective's Points of Unity are available at https://designaction.org/about/points-of-unity/.

13. The Toronto Declaration was written by a coalition of technology and human rights groups. It advocates for standards to ensure that machine learning systems respect basic principles of human rights, including equality and non-discrimination. It was published on May 16, 2018, by Amnesty International and Access Now, and launched at RightsCon 2018 in Toronto, Canada. See https://www.accessnow.org/cms/assets/uploads/2018/08/The-Toronto-Declaration_ENG_08-2018.pdf.

14. Canada's principles for open government include commitments to gender equity, accessibility, and reconciliation. The last of these resolves to design all services and programs in collaboration and consultation with Indigenous communities. See Government of Canada, "Canada's 2018–2020 National Action Plan on Open Government," accessed July 31, 2019, https://open.canada.ca/en/content/canadas-2018-2020-national-action-plan-open-government#toc3-5.

15. See http://designjusticenetwork.org/network-principles/.

16. Una Lee, "Generating Shared Principles for Design Justice," *And Also Too*, July 13, 2016. Costanza-Chock is writing a longer book-length work called *Design Justice* (Cambridge, MA: MIT Press, 2020).

17. Una Lee et al., "Design Justice Network Principles," *Design Justice*, accessed April 23, 2019, http://designjusticenetwork.org/network-principles/.

18. UCIBrenICS, "Abolish Big Data—Yeshimabeit Milner," video, 58:09, March 8, 2019, https://www.youtube.com/watch?v=26lM2RGAdlM.

19. UCIBrenICS, "Abolish Big Data."

20. As quoted in Morris, "When Google Walked."

21. Mark Bergin and Josh Eidelson, "Inside Google's Shadow Workforce," *Bloomberg News*, July 25, 2018, https://www.bloomberg.com/news/articles/2018-07-25/inside-google-s-shadow-workforce.

22. Leah Fessler, "Google CEO Sundar Pichai's Full Memo Outlining Updated Sexual-Harassment Policies," *Quartz at Work*, November 8, 2019, https://qz.com/work/1456530/google-ceo-sundar-pichais-full-memo-to-employees-on-sexual-harassment.

23. Nick Bastone, "Google Has Publicly Stated That It Supports Employee Walkouts, But Its Latest Actions Say Otherwise," *Inc.*, January 24, 2019, https://www.inc.com/business-insider/google-asked-us-to-reconsider-rules-that-allow-employees-to-organize-without-fear-of-punishment.html.

24. See Kyle Wiggers, "How Google Treats Meredith Whittaker Is Important to Potential AI Whistleblowers," *Venture Beat*, April 24, 2019, https://venturebeat.com/2019/04/24/how-google-treats-meredith-whittaker-is-important-to-potential-ai-whistleblowers/.

25. See Julia Carrie Wong, "'I've Paid a Huge Personal Cost': Google Walkout Organizer Resigns over Alleged Retaliation," *Guardian*, June 7, 2019, https://www.theguardian.com/technology/2019/jun/07/google-walkout-organizer-claire-stapleton-resigns; Sugandha Lahoti, "#NotOk-Google: Employee-Led Town Hall Reveals Hundreds of Stories of Retaliation at Google," *Packt* (blog), April 27, 2019, https://hub.packtpub.com/notokgoogle-employee-led-town-hall-reveals-hundreds-of-stories-of-retaliation-at-google/; and Meredith Whittaker, "Onward! Another #GoogleWalkout Goodbye," Medium, July 16, 2019, https://medium.com/@GoogleWalkout/onward-another-googlewalkout-goodbye-b733fa134a7d.

26. In her 2019 talk "Abolish Big Data," Yeshimabeit Milner discusses how certain applications of AI and big data need to be outright abolished. As she defines it, "to abolish Big Data would mean [to] put data in the hands of people who need it most," as well as to name the "data-industrial complex." From UCIBrenICS, "Abolish Big Data."

27. See Dean Spade, *Normal Life: Administrative Violence, Critical Trans Politics, and the Limits of Law* (Durham, NC: Duke University Press, 2015); and Shaka McGlotten, "Black Data," in *No Tea, No Shade: New Writings in Black Queer Studies*, ed. E. Patrick Johnson (Durham, NC: Duke University Press, 2016), 262–286.

28. Walter and Andersen, *Indigenous Statistics*, and Kukutai, Tahu, and John Taylor, eds., *Indigenous Data Sovereignty: Toward an Agenda* (Canberra: ANU Press, 2016).

29. Lilly Irani, Janet Vertesi, Paul Dourish, Kavita Philip, and Rebecca E. Grinter, "Postcolonial Computing: A Lens on Design and Development," in *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (New York: ACM, 2010), 1311–1320. Mustafa Ali, "Towards a Decolonial Computing," in *Ambiguous Technologies: Philosophical Issues, Practical Solutions, Human Nature* (Lisbon: International Society of Ethics and Information Technology, 2014), 28–35.

30. Payal Arora, "Bottom of the Data Pyramid: Big Data and the Global South," *International Journal of Communication* 10 (March 14, 2016), https://ijoc.org/index.php/ijoc/article/view/ 4297; Stefania Milan and Emiliano Treré, "Big Data from the South(s): Beyond Data Universalism," *Television & New Media* 20, no. 4 (2019): 319–335; and a workshop, "Big Data from the South: Decolonization, Resistance and Creativity," Universiteit Van Amsterdam, December 3, 2018, https://www.spui25.nl/spui25-en/events/events/2018/12/big-data-from-the-south -decolonization-resistance-and-creativity.html.

31. See Margaret Mitchell, Simone Wu, Andrew Zaldivar, Parker Barnes, Lucy Vasserman, Ben Hutchinson, Elena Spitzer, Inioluwa Deborah Raji, and Timnit Gebru, "Model Cards for Model Reporting," in *Proceedings of the Conference on Fairness, Accountability, and Transparency* (New York: ACM, 2019), 220–229.

32. Clarity should not always be the goal of data communication. Confusion and disorientation can be extremely effective emotions for producing a new seeing of the world. For more about the *Decoding Possibilities* project, see https://elegantcollisions.com/decoding-possibilities.

Our Values and Our Metrics for Holding Ourselves Accountable

1. For more information on Jenn Roberts and Versed Education, see https://www .versededucationgroup.com/. To read the AADHum Initiative's "Statement of Our Values," see https://aadhum.umd.edu/conference/values/. To read the Colored Convention Project's project principles, see http://coloredconventions.org/ccp-principles.