Just Design: Pasts, Presents, and Future Trajectories of Technology

Article · February 2023

DOI: 10.35650/JT.3049.d.2023

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By: Nassim Parvin

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February 1, 2023

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Parvin, Nassim. "Just Design: Pasts, Presents, and Future Trajectories of Technology." Just Tech. Social Science Research Council. February 1, 2023. DOI: https://doi.org/10.35650/JT.3049.d.2023.

ABSTRACT

Products and technologies reflect injustices in the world such as racism, sexism, and ableism. And all too often, they exacerbate those injustices in overt and insidious ways. How can we understand and address the harms brought forth by design and technology? Where is the nexus of accountability and justice? This field review begins with provisional definitions of design and justice, followed by an overview of scholarship that surfaces how technologies both create and worsen injustices. In response, it offers two necessary conditions for advancing social justice in and through design. The first is making design processes more inclusive through democratic strategies such as participatory and codesign methods. The second, which the review identifies as a major gap in research and practice, is recognizing design as a mode of practical ethical inquiry in ways that enables designers to deal with the inherent ethical uncertainty of design situations. In conclusion, the review outlines educational and institutional barriers to ethical design and offer suggestions for future investigation.

Design is purposeful—and the purposes it serves matter. This simple idea has found a new potency given the many recently raised criticisms directed at design that capture its inadequacies, harms, and injustices, both overt and insidious. Hostile architecture, violent data, killing robots, and the New Jim Code—these are only some examples of how technologies have brought forth injustices and inequities (Benjamin 2019; Hoffmann 2021; Parvin 2018; Rosenberger 2017). Consequently, social justice has emerged as a central value for understanding and voicing the ills of technology and for remedying and redirecting them. But how do we make sense of the harm brought forth by design? Where is the nexus of accountability and justice?

This essay offers provisional definitions of design and justice, followed by an overview of scholarship that surfaces how technologies both create and worsen injustices. Subsequently, I outline two necessary conditions for advancing social justice in and through design. The first is making design processes more inclusive through democratic strategies, such as participatory and codesign methods that help surface diverse voices and salient issues. The second, which I identify as a major gap in research and practice, is recognizing and reorienting design as a mode of practical ethical inquiry. This foregrounds the need for enabling designers with theoretical and practical tools to deal with the inherent ethical uncertainty of design situations. In conclusion, I identify educational and institutional barriers, offering suggestions for future investigation.

The Entanglements of Design and Justice

I start with a broad definition of design as a purposeful human activity rooted in the history of design practice and discourse. Ethics is intrinsic, if not assumed, in formal definitions and cultural assumptions about design, either through recognizing design's purposeful nature or more directly by asserting its role to serve people and communities.[1] Herbert Simon's (1968) definition of design, for example, captures its purposiveness as "those activities that aim at changing existing situations to *preferred* ones" (emphasis mine), and it remains a favorite in design discourse.[2] Richard Buchanan's formulation of design as "the art of forethought" encompasses the intentional—and thus value-laden—nature of design (see Buchanan 2001b). This definition underlines design as a purposeful human activity (i.e., a systemic method, or an art) marked by anticipation of patterns of action and interaction and their consequences.[3]

Who are the ultimate beneficiaries of design, and what political and power arrangements are reinforced or weakened by practices and products of design?

These definitions render design as "ethics by other means" (Verbeek 2016), making it evident that social justice is critical to design. This is compelling, however, only if designers are willing to move beyond the superficial affirmations of professional identities to grapple with the depth of questions such as these: Why design? How does design practice find its purpose and make its judgments? What are the grounds for favoring some purposes, needs, or courses of action over others? Who designs and for whom? Whose purposes are advanced by design? Who are the ultimate beneficiaries of design, and what political and power arrangements are reinforced or weakened by practices and products of design? How do the injustices brought about by products and services intersect with larger systemic issues, such as capitalism, colonialism, neoliberalism, racism, sexism, homophobia, and ableism?

Research in recent years has shed light on the subtle and not-so-subtle ways designed products and processes exacerbate social injustices or introduce new ones. This research uncovers a complex web of relationships that surely exceeds the bounds of a short review and defies any simplified groupings. For the sake of analytical clarity, however, I review this research under three broad themes: materials and resources, powers and people, and methods and practices.

Photo by Joshua Smith.

Materials and Resources

Thinking through the materials and materiality of designed artifacts reveals many ethical issues and concerns. Industrial and engineering products, in particular, raise questions about both the origins and destinations of materials—from mines to landfills—and every step in between. For example, how do practices of extraction and disposal affect local communities? What do these practices mean for future generations and ecologies? What are their ties to expansive ideologies that extend the logic of racism and colonialism—especially the thirst for cheap labor and materials? We can ask about the toxicity of materials and processes of production, including the consumption of great amounts of energy, the demand for inhumane labor, and the pollution of air and water in the process, too (Chan, Selden, and Pun 2020; Gabrys 2013; Grossman 2006; Nakamura 2014; Smith, Sonnenfeld, and Pellow 2006). We can disclose the complicity of industrial design practices in the planned obsolescence of products and the driving force of a neoliberal, capitalistic ethos that destroys the lives and livelihoods, not only of humans but also of other species.

The efficient production of material goods to increase their access stands out as one of the earliest concerns of design. In the early twentieth century, efficiency in the production of material goods, especially those for meeting basic human needs, such as clothing or shelter, was considered to be one response to the social ills that gave rise to world wars. Designers committed to producing more affordable and durable products, using streamlined materials and processes. This goal was laudable but co-opted by capitalist and consumerist culture that moved commitment from addressing needs to creating wants. Victor Papanek's *Design for the Real World* (1971) is often credited for early warning against this trend in design, especially as related to environmental issues (Clarke 2013).

Social justice concerns for materiality are extended to (seemingly) immaterial products and technologies too. Digital technologies require a great supply of energy, both in their production and use (Crawford 2021). The applications we depend on, such as digital maps that offer best routes within split seconds, depend on huge amounts of data, The quality, ownership, and moderation of digital content are a matter of concern alongside labor conditions under which they are produced, moderated, and/or stored.

Sustainability as a matter of justice has also drawn a lot of critical attention. What species might count as a participants and stakeholders in design processes (e.g., Santos et al. 2021)? What would happen if efforts to achieve sustainability fail (Tomlinson et al. 2013)? Should there be material limits to computing? If so, what are they, and how should they be implemented or assessed? Such research foregrounds broader philosophical questions that have been raised by

feminist and Indigenous scholars, such as how we understand our relationships to the land and other species (e.g., Haraway 2016; Liboiron 2021) or the role of design and design education in (re)shaping capitalistic and neoliberal trajectories (e.g., Escobar 2018; Nardi 2019; Wilde 2020).

The materials used in the design of technologies introduce important ethical and political challenges.

More broadly, novel and emerging materials from synthetic biology (e.g., genetically modified crops and animals) to cognitive enhancement technologies (e.g., microchips for brain implantation) open new areas of ethical inquiry in design theory and practice as they expand possibilities for new products, such as artificial wombs. Design theorists have shown how these products reveal deeply held assumptions in technoscientific imaginaries and narratives. For example, Irina Aristarkhova's (2005, 2009) incisive readings of artificial wombs and reproductive technologies draw together assumptions such as the framing of motherhood as "clever incubators" or anxieties about the maternal body manifesting themselves in "a desire for self-creation." As these examples show, the materials used in the design of technologies introduce important ethical and political challenges.

People and Power

Technologies are neither neutral nor inevitable but rather mired in politics. A related but distinct area of design and technology criticism thus engages issues of power and authority of both designers and designed products—that is *the politics of the artificial* (Margolin 2002).

Langdon Winner (1980) has argued persuasively against the neutrality of technology, putting forward that "artifacts have politics" in two ways. One is that they function as a means of settling political issues or exerting power, such as the design of low overpasses to prevent buses used by people of color or those of lower socioeconomic status from accessing public parks. Second, some technologies "require" or are "strongly compatible with" particular kinds of political relationships. For example, nuclear plants are more compatible with a hierarchical mode of governance given the disastrous nature of any small mishap, whereas solar panels are more compatible with a democratic mode of governance because of their distributed nature and overall safety.[4] We can find parallels in digital technologies, such as smart cities that rely on integrated "command and control" centers for storing and processing enormous amounts of data. These centers demand a high level of security, remaining inaccessible to public scrutiny and governance. This characteristic renders them largely antidemocratic, thus reinforcing power and privilege in their design process and products.

Different axes of discrimination pertaining to race, gender, class, religion, ethnicity, and ability (and their intersections) may serve as analytical lenses to bring technologies under scrutiny.

Being attentive to the intersectional workings of power and privilege and the positionality of designers, design teams, and design organizations brings forward a key question:[5] Whose bodyminds do technologies serve and center through their features and narratives?[6] Even a cursory examination in response to this question reveals a world built by and for economically privileged, white, cisgender, male bodies. Examples abound. They range from the seemingly mundane tools such as plastic straws (e.g., Wong 2019) to the deeply entrenched infrastructures of patient records and classification systems (e.g., Bowker and Star 2000). Different axes of discrimination pertaining to race, gender, class, religion, ethnicity, and ability (and their intersections) may serve as analytical lenses to bring technologies under scrutiny.

I. Racism

Digital technologies benefit from and reinforce systemic oppression, especially racism in the United States. Race itself is theorized as a technology (Chun 2009; Coleman 2009) that (re)produces the conditions and possibilities of inequality and subordination. Institutional racism shapes design processes and design education that in turn form products and technologies that reinforce racism. Scholars in science and technology studies (STS)—Lisa Nakamura (2002), Ruha Benjamin (2019), Simone Browne (2015), and Alondra Nelson et al. (2001) among them—have illustrated a myriad of ways that technologies such as search algorithms, security cameras, and electronic health records solidify and obscure discriminatory practices. Data assumed to be objective arbiters for decision-making stigmatize and marginalize people, affecting their livelihoods and even taking their lives. Think, for example, of the heavy surveillance and policing of Black and Brown neighborhoods in the United States that produces deeply biased data about crime. Predictive policing apps draw on this data, digitally marking certain neighborhoods as hot spots for crime, leading to more policing and surveillance that targets Black and Brown youth, and thus playing into a cycle of incarceration and stigmatization that reinforces the school-to-prison pipeline (Eubanks 2018).

II. Sexism

Technologies are both the provenance and consequence of gendered relations. STS scholars have studied related issues ranging from divisions of labor, participation barriers, and quality of access to the gendered nature of cultures of science and technology that reinforces the domination and marginalization of women.[7] Dolores Hayden, for instance, offers a close reading of the spatial arrangements in homes and cities as both a reflection of the devaluing of women's labor and a way of further reinforcing this depreciation, issues that are echoed in more recent scholarship on feminist cities (e.g., Kern 2020). In the United States, for example, office furniture reflects gendered ideas about women's bodies and the subordination of their labor (Kaufmann-Buhler 2019). Secretarial chairs are designed with a modest seat detached from the back and are generally much smaller than executive chairs, which feature a large and sturdy back attached to the seat. The dominance of male designers and relegation of women to seemingly less important and decidedly less recognized areas of design, such as textiles, can be traced to the early days of design professionalization such as occurred at the Bauhaus,[8] the effects of which reverberate to this day.

In gaming, consider the dominance of white male characters and the racist and sexist stereotypes displayed in hypersexualized depictions of women.

Such sexist patterns are discernible in virtually all other products and services, given the patriarchal cultures and systems from which they arise. Digital artifacts are no exception. Consider the racial and gendered politics of female voices in digital assistants such as Alexa and Siri (e.g., Phan 2019; Strengers and Kennedy 2020); how search engine algorithms discriminate against people of color, specifically women of color (Noble 2018); or how they reinforce mainstream expectations and experiences, exemplified in pregnancy apps that focus on experiences of mothering as opposed to pregnancy loss (Andalibi 2021). In gaming, consider the dominance of white male characters and the racist and sexist stereotypes displayed in hypersexualized depictions of women. Racism and sexism have within cultures of game design and in some gaming communities emerged as important topics of scholarship (e.g., DePass 2018; Kocurek 2016; Mukherjee 2017). Feminist approaches to games education and community have risen in response (e.g., Chee et al. 2021; Rouse et al. 2020).

What's more, traditional concepts of gender frame it as a binary, immutable, and physiologically discernible concept, thus erasing trans and nonbinary people from public discourse and public life. The male/female binary persists in everything from research processes and methods to digital infrastructures, such as those designed for identification purposes, with links to databases with fixed categories. These products shape the day-to-day experiences of trans and nonbinary individuals, who have to work against them to assert their existence. Some such products are forms and databases that systematically fail to recognize the identities of trans people, thus denying the legitimacy of their self-knowledge, as documented in research by Os Keyes (2018; 2021), Katta Spiel (2021), and Morgan Klaus Scheuerman (2020), among others. Transphobia, as manifest in technologies and products, presents a world where even the idea of trans and nonbinary gender struggles for existence and legitimacy.

III. Ableism

"Staying alive is a lot of work for a disabled person in an ableist society" are the words of scholar and activist Alice Wong (2020). Design scholarship centered on questions of disability and access has grown in recent years.[9] This research both brings to focus the numerous ways the built environment fails to meet the needs of people with disabilities, and questions how the concepts of disability and accessibility have been defined and operationalized in an ableist manner. For instance, the medical model conceives of disability as an impairment. This idea produces a range of technologies and policies meant to address, fix, or remove disability—a phenomena that Ashley Shew frames as technoableism (2020). In contrast, social models trace disability in the misalignment between bodies and the physical and social worlds—or as "misfit" (Garland-Thomson 2011; Hendren 2020).

Responses to these issues have opened an important field of inquiry and domain of possibility. For example, crip technoscience (e.g., Hamraie et al. 2019) and crip HCI (e.g., Bennett 2020; Williams et al. 2021) are offered for both their critical and generative possibilities, affirming the active presence and agency of people with disabilities in shaping questions and approaches to technoscience. Mills and Sterne (2017) outline strategies for thinking in terms of *dismedia*, drawing attention to disability as a constituting dimension of media, and media as a constituting dimension of disability. The growth of scholarship in this area is also significant for its questioning of dominant interpretations of mainstream concepts such as time and embodiment or care and community (e.g., Forlano 2017; Kafai 2021; Kafer 2013).[10]

IV. Colonialism

In pondering "Who designs, and for whom?" we might also remember that the built world is neither apolitical nor ahistorical. As Ahmed Ansari notes (Schultz et al. 2018, 87–89), we cannot overlook the violent histories of slavery, colonialism, and imperialism leading up to the Industrial Revolution, which produced everything from railroads to timetables and also the structures of work and life that may seem like common sense today. Any rethinking of design practices and products is contingent upon careful reading and rereading of this history that has shaped current and evolving trajectories. In his scholarship,

Mahmoud Keshavarz (2018) draws attention to technologies that reinforce national hegemonies such as borders and passports. He argues that not only Black and Brown bodies are framed as illegal travelers across the artificial constructs of borders; but also, that ideas, languages, and ways of being and knowing are rendered illegitimate, ill-formed, incomprehensible, and even nonsensical (Schultz et al. 2018, 87–89).

Design practices, such as critical and speculative design, are found to be elitist in contrast to critical material practices, such as passport forgery, that are overlooked within Western professionalization and specializations of design (Keshavarz 2018). This argument is echoed in Deepa Butoliya's research, which foregrounds *jugaad* as a critical material practice from beyond the Anglo-European sphere that also reflects the significance of class and economic status as a significant axis of oppression.[11] Decolonial and postcolonial studies of science and technology are critical for (re)imagining worlds and narratives (e.g., Amrute and Murillo 2020; Bidwell 2016; Philip et al. 2012; Tunstall 2020), especially for challenging binaries such as east/west, north/south, and here/there (Prieto-Ñañez 2016; Schultz et al. 2018).[12]

Dissenting voices who might challenge the direction of technology are silenced and differences are flattened, as exemplified by Timnit Gebru's controversial departure from Google.

The methods and practices of design, too, have been subject to scrutiny as epistemic and political sites that produce (unjust) technologies. The absence of diversity in design and engineering teams reflects broader social and political disparities. Moreover, diversity initiatives are all too often undermined, given that more dominant value structures and industry cultures remain unchanged. Dissenting voices who might challenge the direction of technology are silenced and differences are flattened, as exemplified by Timnit Gebru's controversial departure from Google. Banu Subramaniam (2014, 200–22) offers an expansive analysis of the question of diversity in science (and technology). She highlights the inadequacy of initiatives focused on women's participation instead of on the gendered and radicalized nature of institutions of science and technology. Metaphors such as "leaky pipelines" frame diversity in reductive ways and put the burden of participation on those at the margins, while it is the environments of science and technology that are hostile to women and members of marginalized groups.

The axes of oppression are important for critical analyses of design and technology, especially in analyses that focus on who designs and for whom; and relatedly, who are the ultimate beneficiaries of design, and what political arrangements are reinforced or weakened by practices and products of design. It is important to note, however, that the axes of oppression are not meant as an additive framework but as an analytical tool to foreground the compounded experiences of oppression. For example, we may consider the importance of gender in the digital divide by noting that a million fewer women than men have a smartphone or can access the internet with a mobile device. Probing deeper, we see class as a compounding factor in that it shapes not only women's lack of purchasing power but also access to education and literacy. Women without disabilities may be able to use the internet by borrowing phones from friends and family, but women with disabilities or who are immigrants will have to overcome additional barriers (Laghaei et al. 2021). Focusing on a single axis fails to consider the complex experiences of oppression. Collectively, however, the various axes of oppression are suggestive of a complex entanglement of design and politics that emphasizes the systemic and structural nature of oppression.[13]

How can we address these injustices? How can we design products and technologies that are more just and equitable? In what follows, I briefly discuss two key conditions: making design processes more inclusive through democratic strategies, such as participatory and codesign methods, and recognizing design as a mode of practical ethical inquiry—one that prescribes radical changes to design education and practice.

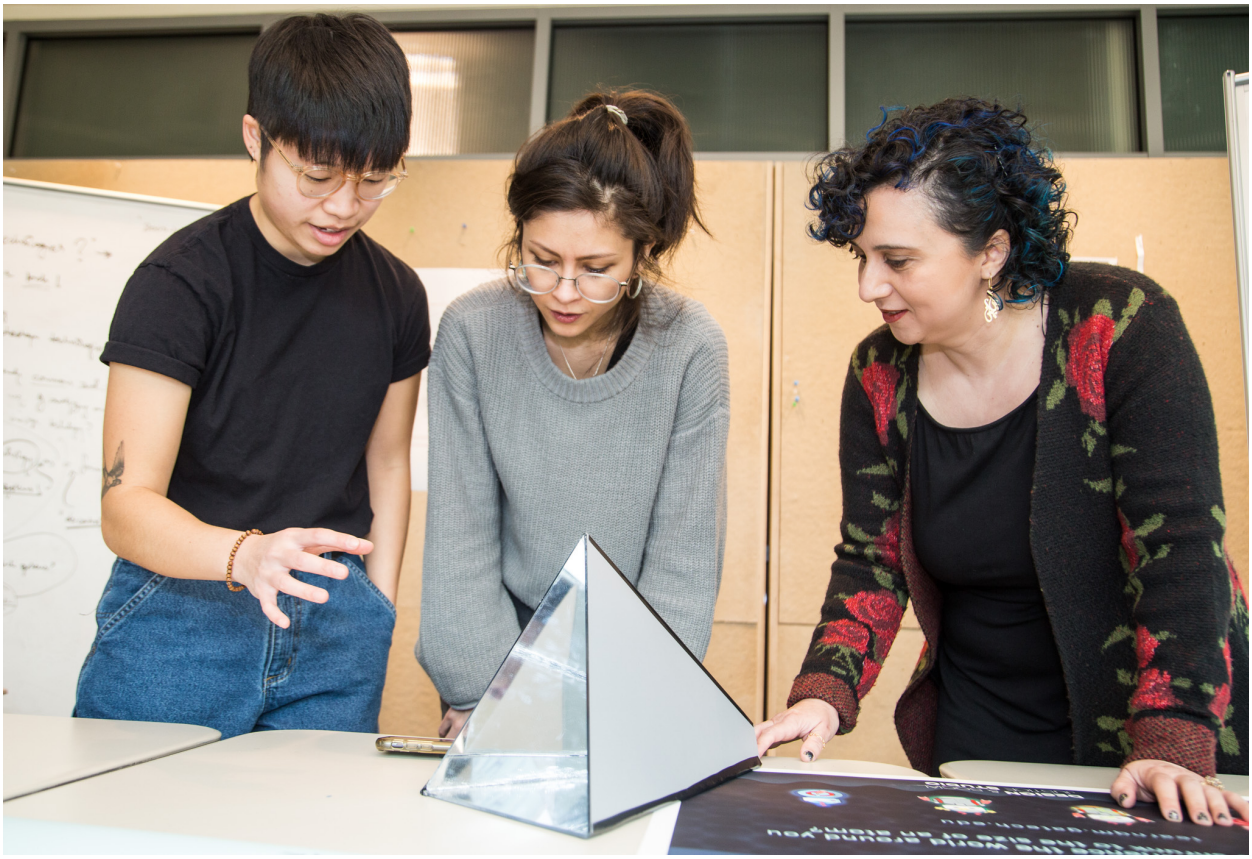

Photo by Joshua Smith.

Inclusive and Participatory Processes and Practices

The first condition for addressing and remedying the injustices brought forth by design and technology is to make design processes more inclusive and representative of their diverse users.[14] Participatory and codesign strategies that involve the potential users in the design process have garnered much attention, given their liberatory and democratic ethos. These processes engage diverse communities who are directly or indirectly affected by the introduction of new technologies or changes to old ones by surfacing salient issues and creating a forum for multiple voices. It is important to note, however, that participatory methods do not necessarily render the design process or its products just. For example, participatory design has been used to shape the role of designers as mere facilitators. This move could potentially undercut accountability by arguing that designers meant only to advance the will of the community and had little or no role in framing the problem or advancing a set of interventions.[15] Participatory design, too, could be a process used to identify the opportunities for design and designers (Hargraves 2018; Parvin 2018) rather than to advance just and equitable interventions, a truism that resonates with Linda Tuhiwai Smith's (2013) observation:

> At a common-sense level research was talked about both in terms of its absolute worthlessness to us, the Indigenous world, and its absolute usefulness to those who wielded it as an instrument. It told us things already known, suggested things that would not work, and made careers for people who already had jobs.

Nonetheless, a commitment to participatory and codesign strategies, reflexive and ethnographic methods, and other critical modes of collective and collaborative engagements offers a hopeful beginning for more democratic modes of design practice. When grounded in feminist, antiracist, and decolonial ways of knowing, they stand in contrast to the dominant top-down strategies. Related initiatives include collective commitments such as "Manifest-No" (Cifor et al. 2020) and "Ten Principles of Disability Justice" (Berne et al. 2018), as well as audits, protests, and other grassroots movements with the potential to challenge injustices in technology development and application.[16]

Design itself has been employed as a process and practice that can bare assumptions and manifest injustices and contradictions that may be invisible otherwise. Artistic, experimental, and storied methods have played a crucial role in response to mainstream technology development. The strategies vary, yet they share a common character in their detachment from instrumental demands or for-profit cliental and industry demands. Noteworthy among them are

those with long-term implications for widespread adoption, such as mapping technology, or those that reveal contradictions when the technology is used in a new domain or within a different set of power dynamics. For example, Hayri Dortdivanlioglu (2021) uses mapping to render visible the smart sensors and closed-circuit television cameras deployed in a notably Black neighborhood in Atlanta, thus helping the audience to identify and push back against surveillance and its uneven impacts on racialized communities. Hemangini Gupta's (2020) satirical manual to build a "postcolonial" robot foregrounds the prevalence and absurdity of Silicon Valley ethos within startup cultures in India. Experimental and exploratory, such design can be used not only for criticism but also for envisioning alternate possibilities and futures that depart from the mainstream.

Design as Ethical Inquiry

The concern for design and justice may begin with power but cannot end with it. No matter where we are in the social web, sooner or later we must confront these questions: What is social justice? On what grounds might some courses of action be favored over others? In other words, what we are against must be conjoined and complemented by what we are for—not in good intention or in declaration of an unflinching commitment but in thoughtful formulation of the situation that's before us, courses of action that are possible and plausible, and judgment on which action may be worthy of pursuit in the face of uncertainty.

The reality we must face is that ethical situations—that is, situations from which ethical questions arise—are messy and uncertain.

The potential shifts in power and perspective that emerge from making design processes more inclusive can be transformative of products and technologies created. However, to deal with the complexity and messiness of design situations, designers need to creatively and critically engage and envision the short- and long-term effects of their design and to consider the nuances of its historical roots and ethical and political ramifications. The reality we must face is that ethical situations—that is, situations from which ethical questions arise—are messy and uncertain. In these situations, existing ethical theories may seem contradictory or prove inadequate for addressing the complex set of concerns and issues that arise. What we need then, complementing research that surfaces and reorients our attention to injustice, is to restore design ethics as a serious mode of inquiry and imagination as opposed to application of ready-made theory to problems already framed and products already made (JafariNaimi et al. 2015).[17]

For example, the question of self-driving cars is often framed as a matter of designing an algorithm that can make the best (i.e., least fatal) life-and-death decision when an accident is inevitable (i.e., how to design the best "kill algorithm"). The challenge, then, is often framed as a choice of utilitarian ethics, care ethics, or some other theory that competes for a seemingly established vision, albeit a contradictory vision, of justice. We may, however, recast the challenge as one of identifying design possibilities that can be responsive to an expansive view of justice—as offered by the plurality of the forenamed theories—and potentially move away from the problem of designing the best kill algorithm altogether. In this example, we consider the situation differently by asking: What is the history of mobility, and how did cars come to dominate mobility infrastructures? What mobility infrastructures and possibilities does the introduction of self-driving cars foreclose? What would it be like to live in a city where at any moment you can be the target of a kill algorithm? Does that make for a livable city? (JafariNaimi 2018) In this way, the ambiguity of the situation and the plurality of theories of justice offer a rich starting point for both better understanding and addressing the situation. These theories serve as hypotheses that help frame and reframe what is at stake in ethical situations and what possibilities we may envision in response, both individually and collectively. At the same time, new circumstances and new technologies test the limits and applicability of theories of justice in ways that add to their depth and richness.

The history of moral philosophy and the plurality of ethical theories testify that it is both misguided and futile to aim for a universally agreed upon moral theory. Alternatively, the idea that moral theories are a matter of political opposition and disagreements reduces those theories to a matter of individual or group choice and inclination. It is no surprise then that these moral theories effectively continue the status quo—a phenomena that has been referred to as "ethics-washing" (Bietti 2020).

And it is in the face of the inherent uncertainty of ethical situations when and where it becomes apparent that advancing social justice is not as straightforward of an endeavor as it may appear. Even when pursued with goodwill and genuine concern for the advancement of justice, ready-made theories or ideological commitments to this or that theory are quick to turn into dogma, clouding our ability to engage fully with the subtleties of new experiences and new circumstances. Unless we settle for the naive application of some ideological authority, power alone is not the remedy. Nor are ethical codes and standards of much help.[18] Such criteria turn into mindless checklists that have gained much popularity in spite of their generic nature and limited application, thus creating a pseudoethical approach at best. The end result is, more often than not, comically compliant rather than ethical, as brilliantly portrayed in a parody developed by Keyes et al. (2019).

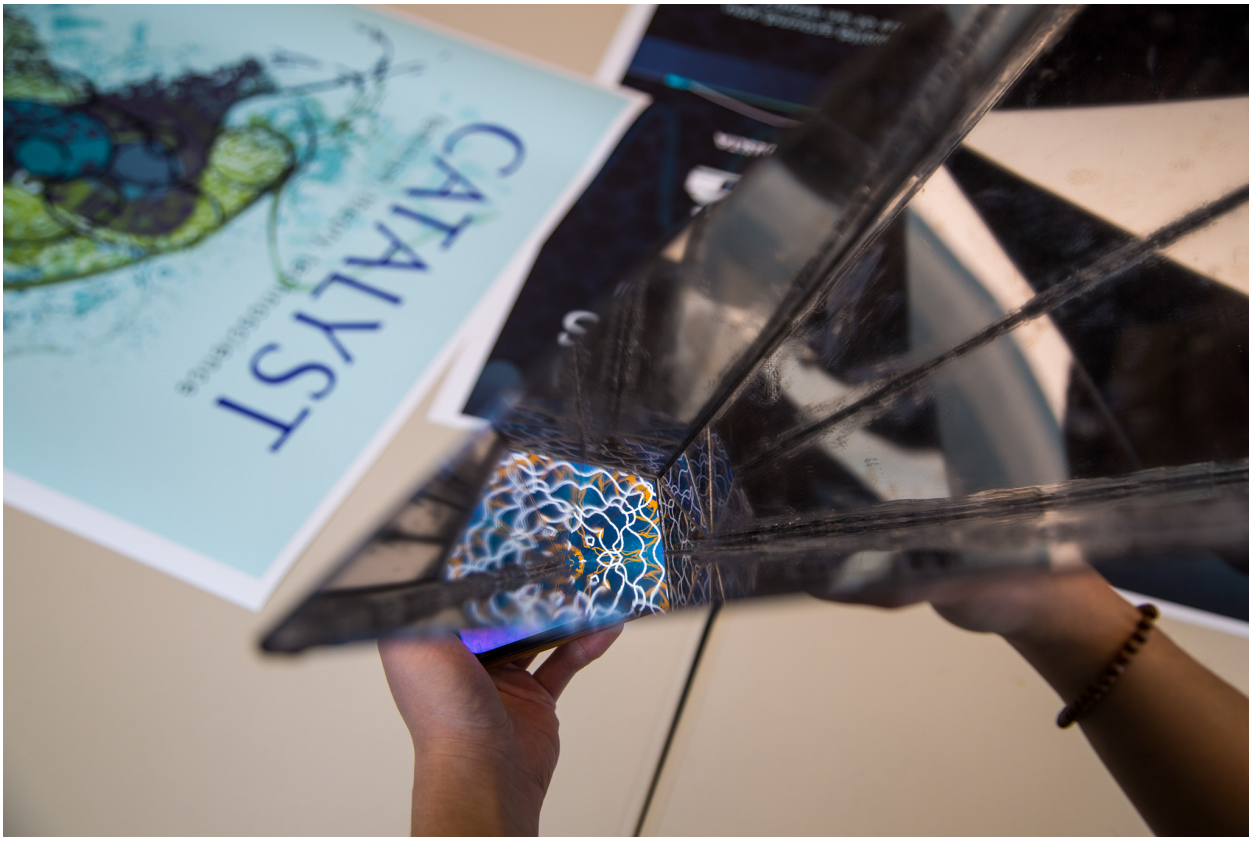

Photo by Joshua Smith.

Considering these points, a substantial engagement with ethics remains a challenge for design, engineering, and other forms of material and immaterial intervention.[19] Ethical theories are difficult to comprehend, let alone connect to in everyday design practices. Such theories are also inherently plural, even contradictory—as an example, think ethics of care versus utilitarianism—which makes them appear at odds with the empirically driven spirit of design. Yet, they are absolutely necessary if we are to approach situations of uncertainty with an expansive ethical imagination commensurate with their nuances and complexities.

An expansive approach to ethics in design demands a thorough rethinking of the education of designers and engineers to integrate moral and political philosophy and related disciplines, such as history, alongside technical and design instruction. My choice of the verb *integration* is deliberate here to highlight that what I am suggesting entails a thorough revision of engineering and design curricula. To be sure, the current approach of offering a couple of ethics courses is woefully inadequate (e.g., Leydens and Lucena 2018), not the least because the ethical issues and theories discussed are not engaged beyond those courses in other parts of the curricula. An integrative approach toward ethics in education would give prominence to ethical inquiry as a strategy to examine and question the practices, expectations, and purposes of disciplinary methods and commitments (e.g., Riley et al. 2009). It would aim to engage students with the situated nature of ethical inquiry, highlighting how societal structures are entangled with the process of knowledge-making (Anupam 2022) and thereby rethinking structures of knowledge-making, such as siloed disciplines (Cech 2014) as well as cultures and constitutions of excellence. Doing so has potential for the formation of coalitions and alliances that can challenge disciplinary and ideological dogmas and remain resilient when contending with the vexing questions of design and justice. Such an integrative approach to ethics and design strengthens the possibility of advancing social justice both in theory and practice.

Acknowledgements

I am especially grateful to Aditya Anupam, Irina Aristarkhova, Terra Gasque, Robert Rosenberger, Rebecca Rouse, Sarah Schoemann for their generous suggestions and insights at various stages of this writing. I would also like to thank SSRC for the opportunity alongside reviewers Nazanin Andalibi and Aimi Hamraie who provided valuable feedback.

Recommended Readings

Atanasoski, Neda, and Kalindi Vora. 2019. *Surrogate Humanity: Race, Robots, and the Politics of Technological Futures*. Durham, NC: Duke University Press.

Hargraves, Ian. 2018. "Care and Capacities of Human-Centered Design." *Design Issues* 34, no. 3: 76–88. https://doi.org/10.1162/desi_a_00498.

Rosenberger, Robert. 2017. *Callous Objects: Designs Against the Homeless*. Minneapolis: University of Minnesota Press.

Smith, Linda Tuhiwai. 2013. *Decolonizing Methodologies: Research and Indigenous Peoples*. London, UK: Zed Books.

Schultz, Tristan, Danah Abdulla, Ahmed Ansari, Ece Canlı, Mahmoud Keshavarz, Matthew Kiem, Luiza Prado de O. Martins, and Pedro J.S. Vieira de Oliveira. 2018. "What Is at Stake with Decolonizing Design? A Roundtable." *Design and Culture* 10, no. 1: 81–101. https://doi.org/10.1080/17547075.2018.1434368.

References

Ali, Syed Mustafa. 2016. "A Brief Introduction to Decolonial Computing." *XRDS: Crossroads, The ACM Magazine for Students* 22, no. 4: 16–21. https://doi.org/10.1145/2930886.

Amrute, Sareeta, and Luis Felipe R. Murillo. 2020. "Introduction: Computing in/from the South." *Catalyst: Feminism, Theory, Technoscience* 6, no. 2. https://doi.org/10.28968/cftt.v6i2.34594.

Andalibi, Nazanin. 2021. "Symbolic Annihilation through Design: Pregnancy Loss in Pregnancy-related Mobile Apps." *New Media & Society* 23, no. 3: 613–631. https://doi.org/10.1177/1461444820984473.

Anupam, Aditya. 2022. "Teaching Scientific Inquiry as a Situated Practice: A Framework for Analyzing and Designing Science Games." *Learning, Media and Technology* 47, no. 1: 125–142. https://doi.org/10.1080/17439884.2021.2020285.

Aristarkhova, Irina. 2005. "Ectogenesis and Mother as Machine." *Body & Society* 11, no. 3: 43–59. https://doi.org/10.1177/1357034×05056190.

———. 2009. "Man as Hospitable Space: The Male Pregnancy Project." *Performance Research* 14, no. 4: 25–30. https://doi.org/10.1080/13528160903552907.

Asaro, Peter M. 2000. "Transforming Society by Transforming Technology: The Science and Politics of Participatory Design." *Accounting, Management and Information Technologies* 10, no. 4: 257–90. https://doi.org/10.1016/s0959-8022(00)00004-7.

Atanasoski, Neda, and Kalindi Vora. 2019. *Surrogate Humanity: Race, Robots, and the Politics of Technological Futures*. Durham, NC: Duke University Press.

Bailey, Moya. 2021. *Misogynoir Transformed: Black Women's Digital Resistance*. New York: NYU Press.

Batel, Susana, and Patrick Devine-Wright. 2017. "Energy Colonialism and the Role of the Global in Local Responses to New Energy Infrastructures in the UK: A Critical and Exploratory Empirical Analysis: Local Responses to New Energy Infrastructures in the UK." *Antipode* 49, no. 1: 3–22. https://doi.org/10.1111/anti.12261.

Benjamin, Ruha. 2019. *Race After Technology: Abolitionist Tools for the New Jim Code*. Medford, MA: Polity Press.

Bennett, Cynthia L. 2020. "Toward Centering Access in Professional Design." PhD diss., University of Washington.

Berne, Patricia, Aurora Levins Morales, David Langstaff, and Sins Invalid. 2018. "Ten Principles of Disability Justice." *WSQ: Women's Studies Quarterly* 46, no.1–2: 227–30. https://doi.org/10.1353/wsq.2018.0003.

Bidwell, Nicola J. 2016. "Decolonising HCI and Interaction Design Discourse." *XRDS: Crossroads, The ACM Magazine for Students* 22, no. 4: 22–27. https://doi.org/10.1145/2930884.

Bietti, Elettra. 2020. “From Ethics Washing to Ethics Bashing: A View on Tech Ethics from within Moral Philosophy.” In *Proceedings of the 2020 Conference on Fairness, Accountability, and Transparency (FAT* ’20)*, Association for Computing Machinery, New York, NY, USA, 210–219. https://doi.org/10.1145/3351095.3372860.

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

Browne, Simone. 2015. *Dark Matters: On the Surveillance of Blackness*. Durham, NC: Duke University Press.

Buchanan, Richard. 2001a. “Design Research and the New Learning.” *Design Issues* 17, no. 4: 3–23. https://doi.org/10.1162/07479360152681056.

———. 2001b. “Design and the New Rhetoric: Productive Arts in the Philosophy of Culture.” *Philosophy & Rhetoric* 34, no. 3: 183–206. https://www.jstor.org/stable/40238091.

Butoliya, Deepa. 2018. “Critical Jugaad: A (Post) Critical Investigation into Marginal Making Practices from Beyond the Anglo-European Sphere.” *Making Futures* 5: 1–16.

Cech, Erin A. 2014. “Culture of Disengagement in Engineering Education?” *Science, Technology, & Human Values* 39, no. 1: 42–72. https://doi.org/10.1177/0162243913504305.

Chan, Jenny, Mark Selden, and Ngai Pun. 2020. *Dying for an iPhone: Apple, Foxconn, and the Lives of China’s Workers*. Haymarket Books.

Chee, Florence M., Larissa Hjorth, and Hugh Davies. 2021. “An Ethnographic Co-Design Approach to Promoting Diversity in the Games Industry.” *Feminist Media Studies* 22, no. 6: 1–17. https://doi.org/10.1080/14680777.2021.1905680.

Chun, Wendy Hui Kyong. 2009. “Introduction: Race and/as Technology; or, How to Do Things to Race.” *Camera Obscura: Feminism, Culture, and Media Studies* 24, no. 1: 7–35. https://doi.org/10.1215/02705346-2008-013.

Cifor, Marika, Patricia Garcia, TL Cowan, Jasmine Rault, Tonia Sutherland, Anita Say Chan, Lauren Klein, Catherine D’Ignazio, and Niloufar Salehi. 2020. “No: Critical Refusal as Feminist Data Practice.” In *Conference Companion Publication of the 2020 Computer Supported Cooperative Work and Social Computing*, ACM, Virtual Event USA, 199–202. https://doi.org/10.1145/3406865.3419014.

Coleman, Beth. 2009. “Race as Technology.” *Camera Obscura: Feminism, Culture, and Media Studies* 24, no.1 (70): 177–207. https://doi.org/10.1215/02705346-2008-018.

Clarke, Alison J. 2013. “‘Actions Speak Louder.’ Victor Papanek and the Legacy of Design Activism.” *Design and Culture* 5, no. 2: 151–68. https://doi:10.2752/175470813×13638640370698.

Collins, Patricia Hill, and Sirma Bilge. 2020. *Intersectionality*. New York: John Wiley & Sons.

Cooke, Bill, and Uma Kothari, eds. 2001. *Participation: The New Tyranny?* New York: Zed Books.

Costanza-Chock, Sasha. 2020. *Design Justice: Community-led Practices to Build the Worlds We Need*. Cambridge, MA: MIT Press.

Crawford, Kate. 2021. *The Atlas of AI: Power, Politics, and the Planetary Costs of Artificial Intelligence*. New Haven, CT: Yale University Press.

DePass, Tanya, ed. 2018. *Game Devs and Others: Tales from the Margins*. New York: Routledge.

Dortdivanlioglu, Hayri. 2021. “Mapping Invisible Surveillance on the North Avenue Smart Corridor, Atlanta.” *Catalyst: Feminism, Theory, Technoscience* 7, no. 2. https://doi.org/10.28968/cftt.v7i2.36687.

Duran, Serasu, Atalay Atasu, and Luk N. Van Wassenhove. 2021. “Cleaning after Solar Panels: A Circular Outlook.” *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.3860571.

Escobar, Arturo. 2018. *Designs for the Pluriverse: Radical Interdependence, Autonomy, and the Making of Worlds*. Durham, NC: Duke University Press.

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

Forlano, Laura. 2017. “Data Rituals in Intimate Infrastructures: Crip Time and the Disabled Cyborg Body as an Epistemic Site of Feminist Science.” *Catalyst: Feminism, Theory, Technoscience* 3, no. 2: 1–28. https://doi.org/10.28968/cftt.v3i2.28843.

Forlano, Laura, Molly Wright Steenson, and Mike Ananny, eds. 2019. *Bauhaus Futures*. Cambridge, MA: MIT Press.

Fritsch, Kelly, Aimi Hamraie, Mara Mills, and David Serlin. 2019. “Introduction to Special Section on Crip Technoscience.” *Catalyst: Feminism, Theory, Technoscience* 5, no. 1: 1–10. https://doi.org/10.28968/cftt.v5i1.31998.

Gabrys, Jennifer. 2013. *Digital Rubbish: A Natural History of Electronics*. Ann Arbor: University of Michigan Press.

Garland-Thomson, Rosemarie. 2011. “Misfits: A Feminist Materialist Disability Concept.” *Hypatia* 26, no. 3: 591–609. https://doi.org/10.1111/j.1527-2001.2011.01206.x.

Greene, Daniel, Anna Lauren Hoffmann, and Luke Stark. 2019. “Better, Nicer, Clearer, Fairer: A Critical Assessment of the Movement for Ethical Artificial Intelligence and Machine Learning.” In *Proceedings of the 52nd Hawai'i International Conference on System Sciences*.

Grossman, Elizabeth. 2006. *High Tech Trash: Digital Devices, Hidden Toxics, and Human Health*. Washington, DC: Island Press.

Gupta, Hemangini. 2020. “Postcolonial Assembly Protocols for Unnamed Automation Projects.” *Catalyst: Feminism, Theory, Technoscience* 6, no. 2. https://doi.org/10.28968/cftt.v6i2.34456.

Guersenzvaig, Ariel. 2021. *The Goods of Design: Professional Ethics for Designers*. Washington, DC: Rowman & Littlefield.

Hamraie, Aimi, and Kelly Fritsch. 2019. “Crip Technoscience Manifesto.” *Catalyst: Feminism, Theory, Technoscience* 5, no. 1: 1–33. https://doi.org/10.28968/cftt.v5i1.29607.

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

Harding, Sandra. 1992. “Rethinking Standpoint Epistemology: What Is ‘Strong Objectivity?’” *The Centennial Review* 36, no. 3: 437–70.

Hargraves, Ian. 2018. “Care and Capacities of Human-Centered Design.” *Design Issues* 34, no. 3: 76–88. https://doi.org/10.1162/desi_a_00498.

Hayden, Dolores. 1980. “What Would a Non-Sexist City Be Like? Speculations on Housing, Urban Design, and Human Work.” *Signs: Journal of Women in Culture and Society* 5, S3: S170–87. https://doi.org/10.1086/495718.

Hendren, Sara. 2020. *What Can a Body Do?: How We Meet the Built World*. New York: Penguin.

Hoffmann, Anna Lauren. 2021. “Terms of Inclusion: Data, Discourse, Violence.” *New Media & Society* 23, no. 12: 3539–56. https://doi.org/10.1177/1461444820958725.

Huppatz, DJ. 2015. “Revisiting Herbert Simon’s ‘Science of Design’.” *Design Issues* 31, no. 2: 29–40. https://doi.org/10.1162/desi_a_00320.

JafariNaimi (now Parvin), Nassim, Lisa Nathan, and Ian Hargraves. 2015. “Values as Hypotheses: Design, Inquiry, and the Service of Values.” *Design Issues* 31, no. 4: 91–104. https://doi.org/10.1162/DESI_a_00354.

JafariNaimi (now Parvin), Nassim. 2018. “Our Bodies in the Trolley’s Path, or Why Self-Driving Cars Must *Not* Be Programmed to Kill.” *Science, Technology, & Human Values* 43, no. 2: 302–23. https://doi.org/10.1177/0162243917718942.

Kafai, Shayda. 2021. *Crip Kinship: The Disability Justice and Art Activism of Sins Invalid*. Vancouver, Canada: Arsenal Pulp Press.

Kafer, Alison. 2013. *Feminist, Queer, Crip*. Bloomington: Indiana University Press.

Kaufmann-Buhler, Jennifer. 2019. “If the Chair Fits: Sexism in American Office Furniture Design.” *Journal of Design History* 32, no. 4: 376–91. https://doi.org/10.1093/jdh/epz022.

Kern, Leslie. 2020. *Feminist City: Claiming Space in a Man-made World*. New York: Verso.

Keshavarz, Mahmoud. 2018. *The Design Politics of the Passport: Materiality, Immobility, and Dissent*. London: Bloomsbury.

Keyes, Os, Jevan Hutson, and Meredith Durbin. 2019. "A Mulching Proposal: Analysing and Improving an Algorithmic System for Turning the Elderly into High-Nutrient Slurry." In *Extended Abstracts of the 2019 CHI Conference*, Association for Computing Machinery, New York, NY, USA: 1–11. https://doi.org/10.1145/3290607.3310433.

Keyes, Os. 2018. "The Misgendering Machines: Trans/HCI Implications of Automatic Gender Recognition." In *Proceedings of the ACM on Human-Computer Interaction* 2, no. CSCW: 1–22. https://doi.org/10.1145/3274357.

———. 2021. "(Mis)gendering." In *Uncertain Archives: Critical Keywords for the Age of Big Data*, edited by Nanna Bonde Thylstrup, Daniela Agostinho, Annie Ring, Catherine D'Ignazio, and Kristin Veel, 339–347. Cambridge, MA: MIT Press.

Kocurek, Carly A. 2016. "Identities." In *Debugging Game History: A Critical Lexicon*, edited by Henry Lowood and Raiford Guins, 237–46. Cambridge, MA: MIT Press.

Leydens, Jon A., and Juan C. Lucena. 2018. *Engineering Justice: Transforming Engineering Education and Practice*. New York: John Wiley & Sons, IEEE Press.

Laghaei, Mahtab., Meltzer, Julia., and Ondili, Mitchel. 2021. "Reflections of a Digital Divide: Representations of Gender, Diversity, and Device Use in Mobile Network Marketing." *A4AI Discussion Paper Series 1:1. Alliance for Affordable Internet*. *Proceedings of the ACM on Human-Computer Interaction* 2, no. CSCW: 1–22. https://a4ai.org/report/reflections-of-a-digital-divide-representations-of-gender-diversity-and-device-use-in-mobile-network-marketing/.

Liboiron, Max. 2021. *Pollution Is Colonialism*. Durham, NC: Duke University Press.

Margolin, Victor. 2002. *The Politics of the Artificial*. Chicago: University of Chicago Press.

Mills, Mara, and Jonathan Sterne. 2017. "Dismediation—Three Proposals, Six Tactics." In *Disability Media Studies*, edited by Elizabeth Ellcessor and William Kirkpatrick, 365–78. New York: NYU Press. https://doi.org/10.18574/nyu/9781479867820.003.0017.

Mukherjee, Souvik. 2017. *Videogames and Postcolonialism: Empire Plays Back*. Cham, Switzerland: Palgrave Macmillan.

Nakamura, Lisa. 2002. *Cybertypes: Race, Ethnicity, and Identity on the Internet*. Routledge.

———. 2014. "Indigenous Circuits: Navajo Women and the Racialization of Early Electronic Manufacture." *American Quarterly* 66, no. 4: 919–41. https://doi:10.1353/aq.2014.0070.

Nardi, Bonnie. 2019. "Design in the Age of Climate Change." *She Ji: The Journal of Design, Economics, and Innovation* 5, no. 1: 5–14. https://doi:10.1016/j.sheji.2019.01.001.

Nelson, Alondra, Thuy Linh Nguyen Tu, and Alicia Headlam Hines, eds. 2001. *Technicolor: Race, Technology, and Everyday Life*. New York: NYU Press.

Noble, Safiya Umoja. 2018. *Algorithms of Oppression: How Search Engines Reinforce Racism*. New York: NYU Press.

Papanek, Victor J. 1971. *Design for the Real World: Human Ecology and Social Change*. New York: Pantheon Books.

Parvin, Nassim. 2018. "Doing Justice to Stories: On Ethics and Politics of Digital Storytelling." *Engaging Science, Technology, and Society* 4: 515–34. https://doi.org/10.17351/ests2018.248.

Phan, Thao. 2019. "Amazon Echo and the Aesthetics of Whiteness." *Catalyst: Feminism, Theory, Technoscience* 5, no. 1: 1–38. https://doi.org/10.28968/cftt.v5i1.29586.

Philip, Kavita, Lilly Irani, and Paul Dourish. 2012. "Postcolonial Computing: A Tactical Survey." *Science, Technology & Human Values* 37, no. 1: 3–29. https://doi.org/10.1177/0162243910389594.

Prieto-Ñañez, Fabian. 2016. "Postcolonial Histories of Computing." *IEEE Annals of the History of Computing* 38, no. 2: 2–4. https://doi.org/10.1109/mahc.2016.21.

Riley, Donna, Alice L Pawley, Jessica Tucker, and George D. Catalano. 2009. "Feminisms in Engineering Education: Transformative Possibilities." *National Women's Studies Association Journal* 21, no. 2: 21–40. https://www.jstor.org/stable/20628172.

Rode, Jennifer Anna Lauren Hoffmann, Niloufar Salehi, and Lisa Nakamura. 2019. *Feminist Data Manifest-No*. https://www.manifestno.com.

Rosenberger, Robert. 2017. *Callous Objects: Designs Against the Homeless*. Minneapolis: University of Minnesota Press.

Rouse, Rebecca, and Amy Corron. 2020. "Levelling Up: A Critical Feminist Pedagogy for Game Design." *MAI: Journal of Feminism and Visual Culture*, January 27, 2020. https://maifeminism.com/leveling-up-a-critical-feminist-pedagogy-for-game-design.

Santos, Rodrigo dos, Saguna Shankar, Michelle Kaczmarek, and Lisa P. Nathan. 2021. "Who Are We Listening to? The Inclusion of Other-than-Human Participants in Design." *LIMITS Workshop on Computing within Limits*, June 14, 2021. https://doi.org/10.21428/bf6fb269.09f36751.

Scheuerman, Morgan Klaus, Jacob M. Paul, and Jed R. Brubaker. 2019. "How Computers See Gender: An Evaluation of Gender Classification in Commercial Facial Analysis Services." In *Proceedings of the ACM on Human-Computer Interaction* 3, no. CSCW: 1–33. https://doi.org/10.1145/3359246.

Schultz, Tristan, Danah Abdulla, Ahmed Ansari, Ece Canlı, Mahmoud Keshavarz, Matthew Kiem, Luiza Prado de O. Martins, and Pedro J.S. Vieira de Oliveira. 2018. "What Is at Stake with Decolonizing Design? A Roundtable." *Design and Culture* 10, no. 1: 81–101. https://doi.org/10.1080/17547075.2018.1434368.

Shew, Ashley. 2020. "Ableism, Technoableism, and Future AI." *IEEE Technology and Society Magazine* 39, no. 1: 40–85. https://doi.org/10.1109/mts.2020.2967492.

Simon, Herbert A. 1968. *The Sciences of the Artificial*. Cambridge, MA: MIT Press.

Simonsen, Jesper, and Toni Robertson, eds. 2013. *Routledge International Handbook of Participatory Design*. New York: Routledge.

Smith, Linda Tuhiwai. 2013. *Decolonizing Methodologies: Research and Indigenous Peoples*. London, UK: Zed Books.

Smith, Ted, David Allan Sonnenfeld, and David N. Pellow, eds. *Challenging the Chip: Labor Rights and Environmental Justice in the Global Electronics Industry*. Philadelphia: Temple University Press, 2006.

Spiel, Katta. 2021. "'Why Are They All Obsessed with Gender?' (Non)Binary Navigations through Technological Infrastructures." *Designing Interactive Systems Conference 2021*, 478–94. https://doi.org/10.1145/3461778.3462033.

Steele, Catherine Knight. 2021. *Digital Black Feminism*. New York: NYU Press.

Strengers, Yolande, and Jenny Kennedy. 2020. *The Smart Wife: Why Siri, Alexa, and Other Smart Home Devices Need a Feminist Reboot*. Cambridge, MA: MIT Press.

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

Sum, Cella M., Rahaf Alharbi, Franchesca Spektor, Cynthia L. Bennett, Christina N. Harrington, Katta Spiel, and Rua Mae Williams. 2022. "Dreaming Disability Justice in HCI." *CHI Conference on Human Factors in Computing Systems Extended Abstracts*, 1–5. https://doi.org/10.1145/3491101.3503731.

Tomlinson, Bill, Eli Blevis, Bonnie Nardi, Donald J. Patterson, M. SIX Silberman, and Yue Pan. 2013. "Collapse Informatics and Practice." *ACM Transactions on Computer-Human Interaction (TOCHI)* 20, no. 4: 1–26. https://doi.org/10.1145/2493431.

Tunstall, Elizabeth (Dori). 2020. "Decolonizing Design Innovation: Design Anthropology, Critical Anthropology, and Indigenous Knowledge." In *Design Anthropology: Theory and Practice*, edited by Wendy Gunn, Ton Otto, and Rachel Charlotte Smith, 232–50. https://doi.org/10.4324/9781003085195-17.

Vallor, Shannon. 2016. *Technology and the Virtues: A Philosophical Guide to a Future Worth Wanting*. Oxford, UK: Oxford University Press.

Verbeek, Peter-Paul. 2016. "Materializing Morality." *Science, Technology, & Human Values* 31, no. 3: 361–80. https://doi.org/10.1177/0162243905285847.

Wajcman, Judy. 1991. *Feminism Confronts Technology*. University Park: Penn State Press.

Wajcman, Judy. 2007. “From Women and Technology to Gendered Technoscience.” *Information, Communication & Society* 10, no. 3: 287–98. https://doi.org/10.1080/13691180701409770.

Weston, Anthony. 2001. *A 21st Century Ethical Toolbox*. New York: Oxford University Press.

Whitbeck, Caroline. 2011. *Ethics in Engineering Practice and Research*. Cambridge, UK: Cambridge University Press.

Wilde, Danielle. 2020. “Design Research Education and Global Concerns.” *She Ji: The Journal of Design, Economics, and Innovation* 6, no. 2: 170–212. https://doi.org/10.1016/j.sheji.2020.05.003.

Williams, Rua M., Kathryn Ringland, Amelia Gibson, Mahender Mandala, Arne Maibaum, and Guerreiro, Tiago. 2021. “Articulations toward a Crip HCI.” *Interactions* 28 (3): 28–37. https://doi.org/10.1145/3458453.

Winner, Langdon. 1980. “Do Artifacts have Politics?” *Daedalus* 109, no. 1: 121–36.

Wong, Alice. 2019. “The Rise and Fall of the Plastic Straw: Sucking in Crip Defiance.” *Catalyst: Feminism, Theory, Technoscience* 5, no. 1: 1–12. https://doi.org/10.28968/cftt.v5i1.30435.

———. 2020. *Disability Visibility: First-Person Stories from the Twenty-First Century*. New York: Vintage.

Footnotes

1 Elsewhere, Richard Buchanan defines design as "the human power of conceiving, planning, and making products that serve human beings in the accomplishment of their individual and collective purposes." See (Buchanan 2001a, 7–10).

2 The popularity of this definition is irrespective of the overall reductive nature of Simon's philosophy as documented by design historian Huppatz (2015) and the inescapable issues of power and purpose that remain unanswered: "The issue that remains when devising 'courses of action aimed at changing existing situations into preferred ones': Who determines the 'courses of action' and whose 'preferred situations' are we to design?" (Huppatz 2015, 40)

3 Understood as such, design may be recognizable in disciplines as diverse as engineering, public policy, and management, as well as practices more commonly associated with design, such as city planning and architecture, industrial and graphic design, and interaction and service design. The understanding of design as a "discipline and art of forethought" renders it as a fundamentally human activity, inclusive of practices that Western professionalization of design has overlooked, such as Indigenous ways of knowing and making. It is important thus to distinguish design as a human activity from design as a professional practice. The latter has often, if not always, been used as a tool of capitalism and colonialism, aligned with a consumerist neoliberal agenda.

4 See, for example, Duran et al. (2021) and Batel and Devine-Wright (2017).

5 Intersectionality is an analytical framework for recognition of the compounded effects of structural oppression and discrimination based on race, gender, disability, age, religion, or economic status (See Collins and Bilge 2020).

6 I follow Shayda Kafai (2021) in my use of *bodymind* as "a term of unification" that actively negates the false body/mind binary, reminding us that our bodies and our minds do not engage with the world in isolation. This term, as Kafai notes, has Indigenous roots.

7 For a brief history and overview of this research, see Wajcman (1991 and 2007).

8 The Bauhaus was a school of design established in Weimar, Germany, in 1919. The aim of the school was to merge art and craft to design tools, buildings, and processes that were responsive to the social and political issues of the time. The ideas developed at the Bauhaus became foundational for modern architecture and design around the world. Readers interested in this history may begin with the collection titled *Bauhaus Futures* (Forlano et al. 2019), a reflexive account of histories and futures of the Bauhaus at its 100th anniversary.

9 For a brief overview of scholarship in this area, see Fritsch et al. (2019).

10 Using Kafer's concept of "crip time" and an autoethnographic account of her own experience of using two medical devices—an insulin pump and a continuous glucose monitor—Laura Forlano (2017) foregrounds the tensions and alignments between the application of industrial clock time, her internal biological processes, and her personal and social experiences. Forlano draws on these elements to introduce four different ways she experiences time around diabetes data practices: slowing down, speeding up, liminal time, and sharing time.

11 See Butoliya (2018) foregrounds the tensions and alignments between the application of industrial clock time, her internal bio). The Hindi word *jugaad* has no direct translation in English. *Oxford English Dictionary* defines it as "flexible problem-solving that uses limited resources in an innovative way." We might recognize jugaad in the practices of creating makeshift tools with found materials to address day-to-day needs out of necessity. OED Online, "jugaad (n.)," accessed February 21, 2022, https://www.oed.com/view/Entry/54189995.

12 For a useful overview of the distinction between decolonial and postcolonial computing, see Ali (2016).

13 For other research on the entanglement of issues, see Atanasoski and Vora (2019), Bailey (2021), Costanza-Chock (2020), Steele (2021), and Sum et al. (2022).

14 This strategy is aligned with feminist philosophy of knowledge (e.g., Harding 1992) in that it emphasizes the importance of starting from marginalized lives. That is, it foregrounds perspectives, knowledges, and problems of those who have historically been sidelined or eliminated from practices of knowledge making.

15 I discuss the ethics and politics of participatory practices in the context of digital storytelling projects in Parvin (2018). Specifically, I foreground the ethos of responsiveness, responsibility, and communion as central to such practices. Peter Asaro (2000) offers a critical history of participatory design, an examination of its grounding in Marxist criticisms of technological rationalization, and a critical discussion of its commitment to procedural democracy. For a critical perspective on participatory design in the context of development, see Cooke and Kothari (2001). Historical accounts, theoretical analyses, and case examples may also be found in *Routledge International Handbook of Participatory Design* (Simonsen and Robertson 2013).

16 This website is also notable for drawing together a list of other justice-oriented manifestos and principles. For more, see https://www.manifestno.com.

17 When it comes to the question of action and redirection of design practices, however, social justice is often asserted as a given. This is reflected in broad generic statements that might read like this: design as a profession and a practice, in addition to the products and technologies it produces, must serve people, distribute goods and services fairly, treat everyone with respect and dignity, and ensure that it does not harm people and places in the process. This generic sense of justice does not account for the ambiguities and uncertainties that necessitate the recognition of design as a mode of practical ethical inquiry and activism. Instead, this sense of justice often treats design ethics as the question of whether an individual maverick will virtuously apply a set of ready-made and already-proven good principles to well-defined design problems.

18 And yet design and engineering ethics are often reduced to following rules. Ethics codes and standards abound as if they can settle all moral disputes, telling us the right way to think about moral problems. A quick survey on AI ethics alone produces hundreds of lists of values and declarations. As argued elsewhere, such strategies are falsely grounded in the identify/apply logic, one that has been prevalent in the discussions of design and engineering ethics in spite of its inadequacies highlighted in studies (see JafariNaimi et al. 2015).

19 Scholarship such as Guersenzvaig (2021), Vallor (2016), Weston (2001), and Whitbeck (2011) offer good starting points for this purpose.