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THINK PIECE

Cripping the History of Computing

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In 2012, Google's widely watched self-driving car commercial featured a blind man enjoying his test ride across a sunny California landscape, showcasing the pleasurable freedom on offer from the new technology.[1] Six years later, when design scholar Jutta Treviranus presented data to autonomous vehicle machine learning models of a wheelchair user who moved by rolling backward, the vehicles' algorithms "all chose to run her over."[2] Ironically, one of the pioneers in car automation, Ralph Teetor, the inventor of "auto pilot and cruise control," was a blind man.[3] This latter history of disability innovation, however, has been displaced by contemporary discourses of computational charity and practices of algorithmic cruelty. Such paradoxes abound in the history of computing.

Surveying scholarship in science and technology studies (STS), media studies, and critical disability studies, I argue that disability—in all its diversity and fluidity—is not only a prominent yet underexamined theme in the history of computing; it can also be a critical method that offers important insights into how computing systems have been imagined, built, promoted, and used.

Echoing Mar Hicks's call for "queering our approach,"[4] this Think Piece invites historians of computing to "crip" their inquiries by denaturalizing able-bodiedness as the default human condition. "Crip" is an originally derogatory term repurposed with in-group pride by disabled people[5] to amplify political activism against "compulsory able-bodiedness."[6] I follow disability scholar Alison Kafer's political/relational model of disability, in defining disability not as a bodily defect to be repaired (the "medical model") or merely the result of a disabling environment (the "social model"), but produced through interactions between specific bodies, material, and social context.[7] I apply the framework of "crip technoscience" championed by disability scholars Aimi Hamraie and Kelly Fritsch, which foregrounds disabled people as designers and experts of technoscience, while rejecting technologies built to exclude or eliminate disability.[8] I also draw upon a rich scholarship that spotlights the centrality of disability in media studies,[9] in which the computer is a key artifact. I argue here that disability is not only empirically significant in computing history; it is also methodologically generative for unpacking computationally encoded norms about bodies and minds, and contextualizing the computer in new genealogies and relationships.

EMPIRICAL SIGNIFICANCE: DISABILITY AS PROBLEM, RESOURCE, OR AFTERTHOUGHT

Disability has an intertwined history with the history of computing. Synthesizing existing accounts, I argue that objectified notions of disability figured routinely in computing's past as problems for intervention and resources for thought (or actual) experiments, all the while also—perhaps contradictorily—an afterthought for technological exclusion or harm. There is notably a scarcity of historical analysis of disabled inventors, researchers, and workers in computing, in part due to archival bias. More crip technoscientific histories await discovery.

A Problem to Fix

Disabilities, primarily understood by computing pioneers as illnesses to be cured, provided sites for early-stage applications for many technologies. The field of cybernetics, which frequently "mixed metaphors from engineering and biology,"[10] is emblematic. Ronald Kline's account shows cyberneticians' considerable interest in developing prosthesis for deaf people, blind people, amputees, and patients of diabetes.[11] The most publicized project was Norbert Wiener's "hearing glove," which Wiener deemed "the first constructive application of cybernetics to human beings."[12]

Most of these cybernetic prostheses were designed *against*, rather than *with*, disability. Wiener's "hearing glove," for instance, was based on his belief that "deaf-mutes" produced speech with "a grotesque

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and harsh intonation," which was a "highly inefficient form" of communication.[13] The "hearing glove" was thus more about making deaf people *speak* legibly to hearing people than facilitating mutual communication. Projects like this showcased the prowess of cybernetic innovation by making disabled body-minds "normal."

A Resource to Extract

The paternalistic framings of disability obscured how much computing pioneers depended upon disabled persons as epistemic resources, as objects "to think with." Central to the interest of cyberneticians, as Kline argues, was not the *fusion* of human and machine, but the *analogy* between them.[14] Disability, conceived as deviance in human biology, was often invoked as "marginal cases"[15] to inform essentialized knowledge about information and intelligence. Media historian Mara Mills has written on this pattern extensively.[16] Mills shows, for example, that deafness enabled hearing engineers to deconstruct speech information and theorize notions of "input" and "feedback" in communication.[17]

Disability thus played a more implicit yet formative role in computing, precisely by informing the human–machine analogy. Metaphor, argues Paul Edwards, is a major mode of representation deployed to organize theories in computing.[18] And essentialized disability metaphors were ubiquitous. Alan Turing referenced Helen Keller to illustrate the feasibility of training machines without a typical human body.[19] In 1970, Japanese roboticist Masahiro Mori used the "eerie sensation" of prosthetic hands to argue for a lower degree of human-likeness in robot design.[20] Analogies between machine and disabled bodies were also "a recurring theme" in Marvin Minsky's AI labs at MIT, where he would invoke disabled people's ability to think as proof of disembodied intelligence.[21]

Disabilities have often motivated thought experiments in computing in ways that disavow and objectify the disabled body.[22] Here, disability is essentially rendered a "narrative prosthesis"[23] to computing, not the other way around. Beyond a metaphor, disabled people have also been materially enrolled as research subjects.[24] This pattern, in which disability serves as a precursor, inspiration, or test case for technologies ultimately designed for the general public, is a trope that Mills calls "assistive pretext."[25]

An Afterthought to Excuse

Despite the prominence of disability in the publicity and theorization of computing, actual users with disabilities are often an afterthought. The intended users of computing have been abled-bodied by default, until challenged by disability activism.[26] Even for disability-inspired technologies, once becoming mainstream they often bring new forms of exclusion to disabled people.[27] Disabled users get bracketed into a "special" category whose needs are only addressed by "assistive" technologies—when in fact, "all useful technology is assistive."[28] Disabled people's tinkering, repurposing, and non-use of technology also warrant examination.

CRITICAL METHOD: REVISITING BODIES AND CONTEXTS

Beyond empirically recovering the hidden roles of disabled people, disability as a method can enrich historical knowledge of computing writ large. Here, I outline areas where critical disability studies can deconstruct computational assumptions about bodies and minds, and illuminate new forms of evidence.

Decoding Bodily Assumptions

Disability calls for norms about bodies and minds to be examined as contextual, contingent, and evolving, rather than held constant in history. Specifically, it illuminates how ideas to do with normalcy, capabilities, and users are reconfigured into and out of computing systems. Elizabeth Petrick's work on the history toward accessible computers is an example.[29]

Disability—if understood as produced relationally through interactions between individuals and infrastructure—can be especially fruitful for the historical studies of human–computer interaction (HCI). Petrick's recent historiography of HCI reveals the centrality of concerns about "capabilities" in debates about HCI—that is, whether machines should "augment" human capabilities by pushing the users to learn, or be made immediately "user-friendly" by adapting to human capabilities.[30] Embedded in these debates are preconceptions about "normal" human capabilities, which are social and historical constructs. Consider the "gloves" for example. Although both fraught with hearing-centrism, Wiener's "hearing glove" prescribed deaf people to *speak*, whereas more recent "sign language gloves" have claimed to augment deaf people's capabilities to *sign*.[31]

A relational understanding of disability highlights the materiality of the computer as well as the human body, a key variable insufficiently addressed in historical analyses of the computer.[32] Through a relational disability lens, historians can interrogate exactly what kinds of use and non-use are imagined and practiced. The inherent heterogeneity of human body-minds draws our attention to different epistemologies. For

instance, while sighted people typically process information from *whole to part*, nonvisual users tend to absorb information from *part to whole*.[33] In computing, this means that design based on "sensory translations" that simply map one sensory modality onto another can be counterproductive.[34] Disability hereby offers a far more expansive understanding of the human body in historical inquiries.

Calls for better historical understanding of disability also come from HCI practitioners. Disability HCI scholars like Cynthia Bennett and Rua Williams have been pioneering crip technoscience in contemporary computing research.[35] Without adequate awareness of the long history of ableist oppression and disability activism, they argue, even the best intended reforms to improve the "fairness" or "ethics"[36] of computing systems can fall short of disability justice.[37] Computer historians are the best equipped to incorporate disability awareness into the field's own histories.

Uncovering Missing Contexts

Methodologically, disability helps pivot historical attention toward previously unseen genealogies and alternative histories in technical development. Disabled people's knowledge and expertise should not be dismissed as irrelevant in technological innovation. Rather, failure to recognize the connections between the "center" stories of computing and disability innovation can be missed opportunities for historians. For instance, the history of autonomous driving systems, suggests media scholar Gerard Goggin, could incorporate histories of "wheeling, rolling, and gliding associated with the wheelchair and the scooter, and disability technologies associated with walking such as the cane, the walking stick, [and] prostheses."[38] Media scholar Meryl Alper expanded the history of mobile computing by attending to how it intertwined with communication aids for disabled individuals through their development, commercialization, use, and reuse.[39] Centering deaf actors, Mills uncovered that it was hearing aids that first provided a site for electronic miniaturization in as early as 1900.[40]

Furthermore, critical disability studies offer an expansive notion of "access" that can inform both the production and dissemination of historical knowledge. The computer interface, as Petrick puts it, is "a place of access."[41] Access from a disability perspective is fundamentally political. Disabled people constantly find themselves agitating for access to information, technologies, places, and services that presume their needs as not the norm but an exception.[42] Access can cause pain and injuries.[43] It can also force disabled people to make tradeoffs with their privacy.[44] The computer interface, therefore, can be revisited as a site not only of ideologies of augmentation and user-friendliness, but also of politics of restriction, disablement, and surveillance. Additionally, as disability historian Susan Burch reminds us, access is itself a historical artifact, embodying shifting ideas about users, citizenship, labor, and knowledge—key concerns of the social histories of computing. A critical understanding of access also reveals the inaccessibility of particular forms of knowledge (e.g., print texts), allowing recalibrations for sources in alternative formats, as well as the exclusionary practices of historical knowledge.[45]

Finally, historians may find it generative to engage with the notion of "interdependence," advocated by many disability activists and scholars as a key analytic between human-technology relationship, in which bodies, environment, and tools are intricately connected.[46] It aligns with Eden Medina's proposal for "decentering" computing, that is, placing the computer in broader historical processes without overstating its significance or displacing other histories.[47] All humans depend on other humans and technological systems. Through this lens, computing histories can problematize notions such as "autonomy" and "self." Rather than the center of analysis, computers can be situated as one actor within complex networks of multidirectional interactions, and their broader power hierarchies.

CONCLUSION: TOWARD ANTI-ABLEIST HISTORIES

What this Think Piece proposes is for histories of computing to incorporate disability as an empirical subject, a critical method, and finally, a political practice. Historically, while disability was rendered as a problem to fix, a resource to extract, and an afterthought to excuse, disabled people's technoscientific labor and expertise is underacknowledged. Historians of computing have the expertise to shape practitioners' understanding of their own past, and by extension, our collective imagination of the future. Without challenging the long-standing ableism encoded in and through computing, we may continue to see the lack of support for disabled students in STEM,[48] and examples of algorithms that involuntarily disclose, filter out, or harm disabled people,[49] all the while "disability salvation" tropes proliferate in grant proposals and advertisements of cutting-edge computational systems. Histories hold the key to denaturalizing these patterns.

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