Cyborg Maintenance:

The Invisible Work of the Technological Bodymind

Abstract

In this article, I describe the concept of Cyborg Maintenance: the being and doing of upkeeping a bodymind that relies on technologies. I focus on the “common” or “everyday” cyborg: the disabled person who relies on prosthetics, wheelchairs, medications, or other technologies to function in day-to-day life. I describe the historical and economic forces that push cyborg maintenance into hiding, what it is like to live and maintain a cyborg bodymind, and what it might mean to foreground the sorts of work necessary to maintain the cyborg bodymind. I argue that Cyborg Maintenance is a maintenance of relationships first, and that it reveals the multiple ways we are all dependent upon the wide care networks of our communities.

Keywords: Disability, Cyborg, Maintenance, Care, Agential Realism

Introduction[1]

My PhD advisor squeaks.[2] Well, squeaked. As of this writing, the issue is long resolved (and other issues have come and gone). However, fixing the squeak was a months-long saga that disrupted her academic and personal life, requiring several trips to multiple prosthetists in multiple States, missing an academic conference, and costing, most likely, quite a lot of money. If it weren't for my advisor's relatively well-off position in the academy, such an odyssey may have been impossible. And even though this particular squeak is gone, the upkeep and labor that is necessary to maintain a working and comfortable prosthetic is ongoing. This sort of work isn't advertised. It is hidden in the background, only known to those for whom it is a daily engagement.

Transhumanists and technologists alike dream of becoming cyborg. Their visions are full of shiny, well-functioning, sleek, human-like bodies partially made from metal and plastic, of enhanced minds with massive computing power and bodies infinitely repairable and upgradeable. They imagine that cyborg enhancements will create a utopia: end social strife, political conflict, racism, and sexism. The realities of life as a cyborg are much different, much messier, much more human. Cyborgs are expected to look, feel, function, and act the same way as non-cyborgs, and the performance of their cyborg-ness is policed and surveilled. If they don't match societal or medical expectations, vital resources can be taken away. The reality of the cyborg experience sits in stark contrast to the shiny imaginings about what it is to be a cyborg, and only through teasing out these conflicts can we value cyborgs at their full human worth.

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[1] This work was made possible by the NSF Career Grant #1750260

[2] Stories shared with permission.

The term “cyborg” —a portmanteau of “cybernetic organism” —was coined by Manfred Clynes and Nathan S. Kline in their 1960 *Astronautics* article “Cyborgs and Space,” which argued that cybernetic augmentation would be necessary for any extended space travel due to the hostility of microgravity and radiation. Nathan Kline is also considered the father of modern antidepressants and believed that we should be able to alter our neurochemistry at will to best suit the task at hand. Thus, cyborgs have always been about disability, imagination, and maintenance (D. P. Williams, 2019). Some, such as transhumanists, see cyborgs as a future utopic way of being, one that can solve any bodymind problem and turn us into immortal godlike creatures (Kaku, 2015; Kurzweil, 2005, 2013). Others imagine that humans have always been cyborgs, and that the tech is just getting “better” (Clark, 2004, 2010). And, of course, Donna Haraway used the figure of the cyborg as a feminist political image that disrupts neat boundaries between dualisms (1991).[3]

While I have some affinity for Clark’s notion that we’ve always been cyborg, and certainly for Haraway’s judoing the masculinist power-fantasy that the cyborg often represents into a feminist tool of resistance, for this piece I hew closest to Jillian Weise’s notion of the “common” cyborg (2016, 2018),[4] or the “everyday cyborg” described by Muireann Quigley and Semande Ayihongbe (2018), expanded on by Mallory Kay Nelson and coauthors (2019), and myself (Earle, 2021b). The common cyborg is the

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[3] Several Disability scholars have critiqued Haraway’s lack of inclusion of disabled people’s lived experience of being cyborg. They contend that the cyborg is not, in fact, an ironic political fiction, but rather a lived reality that aligns with Haraway’s model in some ways, but also does not in many others, and illustrates the particular stigmas and difficulties that a cyborg bodymind might bring to the project of feminist resistance to patriarchal structures. (Hamraie & Fritsch, 2019; Kafer, 2013; Weise, 2018)

[4] Wiese, in her collaborative definitional event Borg.Diem (The Borg Collective, 2024) defined the term cyborg as “a disabled person who claims disabled identity openly and wishes to further specify as cyborg. One cannot be a cyborg without first being disabled. See Hephaestus.”

bodymind which relies on technology to function in everyday life; a pacemaker, a wheelchair, a prosthetic. The bodymind who relies on Ritalin or beta blockers, whose cancer treatments include a port-a-cath, and whose livelihoods are reliant on technologies in a way that nondisabled people are not.

The difference here,[5] separating disabled people reliant upon technologies from nondisabled people who also need technologies (or disabled people for whom an intimate connection with specific technologies is not central to their disabled experience)—clothes, housing, and transportation, among others—is important. In some instances, there might seem to be a significant similarity between a nondisabled person whose glasses have broken and a wheelchair user whose front wheel is loose. How much each person's life is affected might be similar (minor to medium annoyance in the day-to-day), and in the amount of work it takes to fix (fairly minor). However, in many more cases, the difference in experience is not just one of scale, but one of kind. As Weise (2018) opens the essay where Cy coined the term "common cyborg," she is afraid at night when she takes off her leg. What if someone breaks in, how could she run? This same affective relationship cannot be claimed by nondisabled people. Most of us do not fear for our safety when we remove our glasses at night, or swap our clothing for pajamas, or setting aside our car or bike for the evening. Many cyborgs do not get to set aside their technological complement at all. Pacemakers, insulin pumps, artificial hips, rods and pins, and cochlear implants can't be removed. Medications, like

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[5] There will obviously be overlap here between the experiences of cyborgs, disabled non-cyborgs, the chronically ill, and even the temporarily abled. Nearly everyone deals with insurance premiums, copays, and prior authorizations, for example. In this piece, it is the intersectionality of all of the items discussed here (and all of the ones not discussed, including individual nuances in experience) that produce the cyborg, and thus the thing I am calling cyborg maintenance.

prosthetics and wheelchairs, may have life-threatening repercussions if they are. This difference puts the disabled person in the category of “cyborg.”

Central to this distinction is my theoretical grounding of this piece in agential realism (Barad, 2007). Agential realism is a relational metaphysics that puts as equal ontology (a thing’s material existence), epistemology (the ability to experience and know a thing), and ethic (one’s responsibility—i.e. ability to respond—to said thing) in creating the agential cut—what we might call the category or boundary—that describes a thing. These features intra-act diffractively with the world (and all other agents) to sympoietically[6] produce all agents. Thus, the cyborg isn’t only the product of a biological bodymind and technologies, but also the affective relationship to social and physical structures and systems. The cyborg requires the pressures (and oppressions) of ableism, capital exclusion, and the care webs they build and maintain to exist for the same reason that someone’s race is produced in part by the racism of society (Coates, 2015), or epidermalization from others (Fanon, 1986).

Of course, I am not the first to introduce Barad into disability studies. Perhaps the most relevant entry here comes from Kelly Fritsch’s piece for *Foucault Studies*, “Desiring Disability Differently” (2015).[7] In this piece, Fritsch blends Barad’s concepts of intra-action and of bodies being *of* the world (not *in* the world, constituted through relations to already-existing bodies), Foucault’s ideas of heterotopia and milieu (via Thomas Lemke), and various complications of corporeality put forth by Stacy Alaimo

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[6] Sympoiesis—aka “becoming with”—describes how complex relational systems are “collectively-producing systems that do not have self-defined spatial or temporal boundaries. Information and control are distributed among components. The systems are evolutionary and have the potential for surprising change.” (Haraway, 2016, pg. 33 via M. Beth Dempser).

[7] Hat tip to my reviewer who introduced me to this incredibly useful piece!

(2010) and Gail Weiss (2013) to describe *intra*-corporeality. Fritsch argues that Barad's step away from the anthropocentrism of Foucault (and Butler's performativity) allows back in the materiality of nonhuman *actant*, such as stairs or gravel that produce the disabled bodymind. I follow this trend by including technologies on and within the bodymind (which Fritsch does not explicitly include (or exclude, to be fair)) as agential intra-active and *intra*-corporeal pieces of the disabled material-discursive cyborg existence.

One problem with using Agential Realism is that the ethic part of ethico-onto-epistemology is both essential to my project here and undertheorized by Barad herself (and left out by Fritsch and other theorists in this space which use Barad, understandably due to the undertheorization). I developed a more robust ethic in my dissertation and associated book chapters through the introduction of Care Ethics, which functions in a similar way to agential realism: relation-first (Earle, 2021a, 2021b, 2022). I expand on this idea in my co-authored work with Ashley Shew in which we argue that cyborg-technology relations require care as a constitutive part of cyborg existence, and resist universalization, fungibility, and neoliberal capitalism as a value framework (Shew & Earle, 2024). Care is used widely in Disability Studies and has already been woven into much of the scholarship around disability. It was introduced by Carol Gilligan (1982) and Nel Noddings (1984), expanded on as a set of logics by AnneMarie Mol (2008), has been extended into the areas of rhetoric (Pender, 2018), cybersecurity and privacy (Wittkower, 2016, 2020), and used most extensively in disability studies (de La Bellacasa, 2017; Piepzna-Samarasinha, 2018). Care moves us away from a customer/consumer model to a model of intra-dependence[8] and engagement over time. Care rejects medicine and disability as things associated with neoliberal capitalism and instead frames them as natural ways of being that are necessary to the general thriving of humans in all their diversity.

Maintenance is a relatively new subfield in science and technology studies (STS) whose advocates believe that society (and academia) focuses too much on the shiny, new, "disruptive," and "innovative" technologies, while missing the everyday work that goes into maintaining what we already have (Edgerton, 2011; Russell & Vinsel, 2018). Maintenance studies seeks to demystify and de-stigmatize the work (and those who do it) which makes up "most of human life with things" (Vinsel & Russell, 2020). Scholars have already brought care and maintenance together. In the very first Maintainers conference in 2016, Daniel Kreiss argued that

> we need an explicitly normative and relational ethics of care and capabilities underlying our efforts at repair to provide a framework for determining which infrastructures should be the objects of our collective efforts to maintain them, and how to prioritize among them. (2021, pg. 1)

The pairing of maintenance and disability is also not new. Hanna Herdegen has written on bodily maintenance for disabled people and the connection to dirty work (2019b, 2019a). I jump off from these shoulders to more thoroughly theorize how disability, maintenance, and care interact and impact the lives of disabled people, and how these

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[8] Intra-dependence is my own construction (first developed in my dissertation) built upon how Barad uses intra-action in Agential Realism. Intra-dependence focuses on how dependence is not a linear, transactional relationship, but rather diffracts through agents to the large care networks on all sides (Earle, 2021b).

relationships ought to shape how we build and maintain our systems of care, community, and human value.

This model is deliberately hyperlocal and does not take well to scaling or generalization. By this, I mean that while there is only one world that intra-acts to sympoietically produce itself, and all agents are entangled in some way, considering anything beyond the immediately local (in space and time) or broadly powerful (such as large-scale social forces like capitalism, ableism, etc.) becomes almost impossibly difficult. Attempting to figure out how an infinite number of agents intra-act is impossible, which is why we have the kinds of simplifying models[9] popular in academia (be that biopolitics, actor-network theory, or agential realism). Similarly, as Margaret Price observes when she introduces Michelle Wright's *epiphenomena,* "different agents' experiences may constitute entirely different realities" (Price, 2024, pg. 10). Since the world is entirely different for each agent, generalizing between agents, even similar ones, is fraught at best and harmful at worst (this is the problem of ableism[10] as a whole, imagining that the abled bodymind is the unmarked default against which all others are measured, when almost no one can actually claim pure abled "normality"). Because we can also contend that "agent" in agential realism may not consist of a singular entity (a corporation can act as a single agent, so can a community), scaling from an individual to a collective when reality is different between agents also fails. As such, agential realism may feel like a less-useful model, especially to those in academia who might prefer a universalizing framework. Though this piece does speak in some generalizations, I hope it is more useful as a set of tools to describe and help specific

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[9] All models are wrong, but some are useful, and agential realism is no different.

[10] And patriarchy, and white supremacy, and…

individuals to whom it might be applied. Since we cannot generalize between agents, nor scale between them, when applying agential realism, we must be very intentional about who and what we include in our analysis and attend to what their reality is.

In this paper I investigate the historical and economic forces that push cyborg maintenance into hiding,[11] what it is like to live and maintain a cyborg bodymind,[12] and what it might mean to foreground the sorts of work necessary to maintain the cyborg bodymind. I argue that Cyborg Maintenance is a maintenance of relationships first, and that it reveals the multiple ways we are all intra-dependent and rely on the care of our communities. I continue in four parts. In Part 1, I discuss the labor that cyborgs must do on and for themselves. This labor is often hidden, unknown until someone becomes disabled. It is also unpaid, and often assumed to be done by care workers, though the disabled cyborg is most often the one who must do it. In Part 2, I discuss the costs of cyborg maintenance. These costs are both monetary and social and can be exacerbated or alleviated depending on the technological complement of the cyborg. In Part 3, I discuss how care reframes responsibility (in the colloquial and agential realist sense) and expand on my argument about how relationships are the basis of cyborg maintenance, and how we are all subject to a similar set of organizations, forces, and values. I end by tying together these threads into a new formulation, the diffractive cyborg, which can become a model for revealing the ways we are dependent through each other in ways that produce possibility.

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[11] This piece is focused on the United States, particularly as it relates to cost, insurance, and the medical industries involved. Even with that narrowed context, within the US there will be local community nuances in relations, access, and culture that alter and shape the topics I talk about here.

[12] I use the term “bodymind” in the tradition of disability studies (Price, 2015) and Black feminist scholarship (Schalk, 2018), as a rejection of the western philosophical split between the mind and body; a philosophy that has been used to marginalize women and people of color for centuries.

Part 1: More Work for Cyborgs

Our society's focus on new technologies and innovations ignores that new technologies do not necessarily lead to easier or better lives. Electric washing machines, for instance, might make individual loads of laundry easier, but then we expect laundry to be done more often (Cowan, 1983). The offloading of labor onto a new technology does not necessarily lessen the amount of labor we expect to be done; it may even increase it as laborers are "freed up" to do other things (Marx, 1999 [1867]). And there is the particular issue of maintaining the new technology, which often requires new training or outside contractors. Andy Clark writes that "technology becomes portable, pervasive, *reliable*, flexible, and increasingly personalized [over time]" (2004, emphasis mine), implying that newer technology needs less regular maintenance. Such a position has enough counterexamples to be at best an unreliable expectation, and at worst demonstrably false. Consider the lifespan of a current generation smartphone—perhaps two to five years of expected utility—and compare it to the famously robust Nokia 3310, or to the rotary phone, which was expected to last nearly as long as the house in which it was used.

Computerized systems show the same lack of reliability. While our home operating systems rarely give us the infamous Blue Screen of Death anymore, crashes, glitches, and exploits still regularly happen. On large-scale systems like the stock market, social media, or cloud computing, issues like this make the news on a terrifyingly regular basis. Consider the May 6, 2010 "Flash Crash," where the stock market lost a trillion dollars of value in a little over 30 minutes due to a bug in automatic trading algorithms (Treanor, 2015), or the regular reports of various social media sites storing passwords and user info in plain-text documents (Hendrickson, 2019). There is also the litany of crashes due to autonomous driving systems, including the death of a Tesla driver in 2016 (Yadron & Tynan, 2016), and the pedestrian killed by an Uber-operated autonomous car in March 2018 (Levin & Wong, 2018). Assuming that reliability improves as technological complexity increases is a recipe for disaster—quite literally.

Companies are reluctant to discuss what maintenance their products might require, or their reliability. Dean Kamen, who built an advanced prosthetic arm on behalf of the Military, never mentions what sort of upkeep his arm requires either in talks or on the website of its manufacturer. One assumes, due to the complex nature of the motors and computerization, that the arm would need to be shipped to a specialized repair place should it need upkeep, but there is no mention of what this procedure requires anywhere on the site. Even the FAQ about possible maintenance is vague and incomplete (Mobius Bionics). Similarly, Hugh Herr, who makes computerized ankles and knees for prosthetic legs, says nothing of the cost of their repair, and also talks about updating the software once a month, which sounds like something between a nuisance and an impossibility, depending on one's access to internet or patience for waiting for one's electronics to update (my advisor said it "sounded like a special kind of hell"). Both systems are incredibly advanced, complex, and expensive. Their upkeep would likely be the same.

Any person who uses a prosthetic (even a relatively simple one without computerized joints or motors) will regale you with stories about trips to their prosthetist to adjust sockets, replace worn bolts and rivets, quiet squeaks—along with the myriad improvisations to make the technology usable day-to-day (“there are so many socks involved!” exclaims my advisor). Yet, rarely on informational websites or in brochures is it made clear what sorts of maintenance one might need, how much it might cost, the procedure one would go through, how long one might be without one’s technology, among others. One only learns about the upkeep once one is within the system—going to prosthetists, talking with fellow amputees, or hanging out on community message boards where participants share life hacks, suggestions, and experiences.

It makes sense that maintenance might not be at the forefront of designers’ minds—it's hard enough to invent a novel widget. Ensuring that the widget is also easy to service is even more difficult. Especially in a time where planned obsolescence is growing and the right to repair is waning with companies working to establish and maintain both control of their technologies, and growth within their industries. Repair becomes a task that is often, though not always, left to future designers or to users. In other cases, repair is a tool kept by companies themselves, unavailable to the end user or technicians. They use the opacity of their systems, and intellectual property concerns, to make repair difficult, legally inadmissible, or impossible. This can turn repair into a radical and transgressive act (to the point of voiding warranties, losing access to a system, and getting sued or fined). This dynamic has been discussed around things like farm equipment (Shah, 2018), cellular phones (Velazco, 2023), but also cyborg technologies like smart hearing aids (Kennedy et al., 2021).

What life with these things actually entails should drive planning and design decisions (Jackson, 2018; Shew, 2020). Designing one’s technologies to be easily maintained is one way to help manage costs and attract more customers; it is also a way to manage the device's obsolescence lifecycle. Of course, this may go against the financial desires of the company producing the tech (as with Apple's recent financial disclosure that people repairing phones "cost" the company an estimated $9 billion (Liao, 2019)). The open source movement is a model, here (Cangiano & Romano, 2019), and while there are concerns about the true egalitarianism of the movement (Nafus, 2012), its approach to repair is commendable, and one I argue should be employed in the assistive technology space.

Maintenance intersects at many junctures with the cyborg bodymind, requiring the disabled cyborg to take on extensive labors, technological skills, and knowledges. In this section I discuss three such areas (this is not an exhaustive list of the labors and knowledges required of disabled cyborgs). The first is preventative maintenance/ medicine/care. Americans[13] tend to avoid or put off preventative maintenance (on themselves and on our technology… how many of us let our oil change light sit there redly judging us for a few extra thousand miles?[14]) (Borsky et al., 2018). Second, the technology-body interface produces new maintenance needs—needs that open up new avenues/requirements for relationships, care, knowledges, and skills. Finally, I discuss the kinds of technical, medical, and organizational knowledges that a disabled cyborg is required to learn to maintain their cyborg bodymind.

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[13] This is likely a trend that extends beyond the US, but I hesitate to generalize too far. I focus on the US context for this piece, and the intersection of the US medical establishment, insurance, legal landscape, and more make for a particularly difficult system in which to establish good preventative care practices.

[14] Definitely not me *cough* >_>

1.1: Preventative Maintenance/Medicine

Preventative maintenance/medicine is a broad suite of actions which try to head off illness, injury, or breakdown before they happen: dental cleanings; regular physicals and checkups; screenings and tests; exercise, nutrition, and wellness programs; vaccination regimens; regular counseling sessions; social engagement; sufficient sick, family, and general leave; and childcare programs. For a more robust concept of cyborg maintenance, we must broaden our concept of preventative maintenance. Many of these maintaining actions, tools, anxieties, knowledges, and more are experienced by cyborgs and non-cyborgs alike. Only the disabled cyborg, I argue, experiences them all, and through that experience, part of the cyborg identity is produced.

Health, and the maintenance of health, nearly always carries a moral valence. The diet and hygiene rules of the Torah (keeping kosher), the Bible, and the Quran (keeping halal) are about both demonstrating piety or fealty to religious traditions and also about avoiding food-borne illnesses and creating a healthy, fit populace to carry on religious traditions. Public health programs, which focus on social, moral, and mental hygiene were central to the early 20th century eugenics programs. Immigration and public health laws trace back to military hygiene programs, which grew out of the view of the nation as a body that must be protected from the infection of outside invaders through the fitness of its defenders (Cohen, 2009; Dolmage, 2011).[15]

But since the turn of the 20th century, preventative medicine has become less emphasized by the medical establishment, especially as a public good. Instead, they

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[15] Dolmage argues that disability became a racializing category for immigration during the early 20th century, around the times of eugenic anti-immigration laws. I have qualms about associating disability with race, generally, but it's an argument for another paper.

have become the responsibility of individuals.[16] Before the rise of Progressive-Era eugenics programs, public health was about communities engaging in healthy practices that then led to positive individual health outcomes (Cohen, 2009; Foucault, 1975). But as eugenics and a more explicitly neoliberal capitalist ethos began to take hold in the United States in the early 20th century, the responsibilities flipped: it became the individual's duty to maintain their own health to promote the health of the community or population (Cohen, 2009). Social welfare, public health, and community education programs fell by the wayside as it became each individual's duty to educate themselves, manage their insurance, and maintain their own (and their family's) hygiene and health. People relied less and less on preventative measures, many of which are based in community engagement and shared responsibility (like vaccines) and more on dealing reactively with symptoms as they appeared. Medical General Practitioners became devalued, and urgent care clinics, specialists, and emergency rooms became the main avenues of health care (Stevens, 1996).

I do not intend to lionize or romanticize prevention here, for it too is used for ableist ends under neoliberal capitalism. Not all medical tests and disease screenings are risk-free. Mammograms and X-rays use ionizing radiation and can actually cause the sorts of cancers they look for (though the risk is low) (Ron, 2003). MRIs, which do not use ionizing radiation, can overcome some limitations of mammography, but are also less specific leading to an increase in false-positive diagnoses (Pender, 2018). False positives in screenings are more common than false negatives due to humans'

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[16] There is valence here with respect to the COVID-19 pandemic, vaccines, and masks—which has come up in the space between the original writing of this piece and its eventual publication—but it must remain beyond the scope of this paper.

desire to find patterns (Hatch, 2016), which can lead to more tests (some risky) or to potentially unnecessary treatments with all their attendant side effects.

And even when screening does accurately find a problem, there's often not a lot anyone can do about it. For example, genetic testing for the BRCA1 and BRCA2 mutations, which are correlated with breast and ovarian cancer risk, leads only to increased surveillance or to prophylactic surgery; there is no way to intervene and fix those mutations. Surveillance means regular mammograms, biopsies and other potentially invasive tests (and for ovarian cancer, for example, there is currently no good test) and a lifetime of anxiety about what the next screening might show (Pender, 2018). Prophylactic surgeries (like all surgeries) carry risks, such as infection, and it is impossible to remove all the necessary tissue, so it can only reduce, not eliminate the risk of developing cancer. For oophorectomies or hysterectomies to prevent cervical, uterine, and ovarian cancers, the risks are even greater and add the new problem of medically-induced menopause, which carries its own side effects. The treatment for the side effects is a regimen of hormone replacement, which again carries its own risks and side effects, some of which are other cancers. Even doing nothing after a positive genetic test has risks, for it carries with it a great deal of judgment and stigma. As Rua Williams (2019) argues, our metaeugenic culture requires intervention, and not intervening is seen as doing harm.

Preventative maintenance is psychologically difficult for people (disabled or not) to do. There is no visible result of proper preventative maintenance… the best possible outcome is that nothing happens. If one fails, the ramifications can happen months, years, or decades later. If one fails to brush their teeth one night, one does not immediately get a toothache or need to visit a dentist. However, a long stretch of not brushing one’s teeth regularly can. And often once the intervention is needed, preventative maintenance (now reaffirmed as important) becomes less effective. The result of an extended lack of preventative care can move people from the nondisabled category to the disabled category. For disabled people, the ramifications can be significantly more dire.

The cyborg must maintain much more than just their bodymind through tests, medications, a good diet, exercise, and regular interaction with the medical establishment. They must also maintain their technological complement in ways that nondisabled people do not. They must clean ports and stomas, oil squeaky wheels and gears, learn to upholster and stitch torn and worn cushions and clothing, and tinker with assistive devices which may be expensive to replace or inefficient to send out for repairs. Cyborgs are required to learn new skills in repair and maintenance that non-cyborgs are not. And when they cannot do those repairs themselves, or have a difficult time getting them done by others, tragic consequences can follow, such as William Peace’s untimely death due to failed wound care after a poorly-repaired wheelchair caused pressure sores that became infected (Peace, 2019).

Thus, I argue that Cyborg Maintenance is not just a call for a robust system of preventative maintenance and medicine, but is also a set of skills, hacked together and distributed among cyborgs themselves. Cyborg maintenance describes the care networks that have already been established, which makes possible accessing those repairs that one cannot do alone (or are protected by anti-repair IP laws). Cyborg maintenance should be community-driven; leaving it to individuals, especially with the kinds of moral valence that preventable illnesses and injuries have, is a failure of social and community care. ADHD and other executive and memory dysfunctions like “chemobrain,” long Covid’s notorious “brain fog,” Alzheimer’s, dementia, traumatic brain injuries, and more can make preventative maintenance difficult. Stress and anxiety can also negatively affect people’s ability to do maintenance. Thus, a vibrant care community is necessary for Cyborg Maintenance. Also, establishing a good public health and education system not only helps everyone, it especially helps disabled people, whose engagement with preventative maintenance is a set of labors that they are both more inclined to need and least likely to have the energy, time, or money to do.

1.2: Interface Breakdown

Cyborgs have very intimate relationships with their technology, and that technology often sits in direct contact with the biological parts of their bodyminds. These interfaces are seldom benign. They are contested, and corrosive to each other. Wear and tear of the technology side of the interface is exacerbated by the presence of biological material: the moisture and acidity of sweat, the introduction of bacteria and fungi, uneven pressures from body parts that change shape over the course of the day, shifting and uneven temperatures from being either a heat source (bodymind) or a heat conductor (metal & plastic). The biological side of the interface is also worn down by technology: developing sores and bruises where technologies rub unevenly; becoming infected if the technology holds bacteria or fungi close to the skin; producing immune responses to implants and tech that are against or underneath the skin; and producing scar tissue surrounding implant sites in attempts to protect themselves.

Nondisabled people rarely find themselves in contact with a technology for long enough during the day for one to begin breaking down the other. That said, we experience clothes wearing out, uncomfortable chairs that can lead to back pain and injuries, rashes and abrasions from ill-fitting clothing, soreness from shoes built more for fashion than for comfort, and more. For disabled people, these interfaces are often an all-day thing. One cannot take off one's pacemaker or port-a-cath. If one's wheelchair is uncomfortable or poorly made, a user cannot choose to sit somewhere else. Even one's bed can be a site of breakdown, injury, and danger. If one is not readily mobile, pressure sores can be a life-threatening event. William Peace, who blogged regularly under the pseudonym "Bad Cripple," wrote about this on his blog in April of 2019:

> Even the most minor wound can send me into a tailspin of depression and fear because I know a minor wound can blossom into a life-threatening wound in days. Sepsis can set in and one can die very quickly. I learned all about sepsis in 2010 when a wound almost ended my life. (Peace, 2019)

Peace died of sepsis from poorly treated pressure wounds less than four months after this post.

Cyborg bodyminds remind us that we cannot separate the care of our technology from the care of our biology or from the care of our relationships and networks. A cyborg interface—where biology meets technology—is a site of relationship. Cyborg maintenance is about maintaining that relationship, even when it is contentious, adversarial, or corrosive. As cyborgs proliferate, the separation of those who do maintenance on the bodymind and those who work on the technology will(/should) break down. Pacemakers and insulin pumps already require both medical and technical knowledge. Osseointegrated prosthetics—prosthetics that are attached to the user through implants set directly into bone—need to be carefully monitored, both technologically (as the body tries to break down the invading material) and medically (as the integration of such an implant makes infection and microfractures of the bone more likely). These interfaces are the material sites of relationship that must be maintained. Technicians are often trained in maintaining one or the other—the technology or the biology—with some specialists doing both. For example, the prosthetist who fixes the fit of a prosthetic rarely has the certifications necessary to prescribe antibiotics for an infected pressure sore. Similarly, a general practitioner from whom such a prescription is easy and expected will usually have little expertise in how to adjust a prosthetic to fit better. Cyborgs often must collect many different expertises, combining and diffracting the knowledges of the medical and technical experts with whom they interface (as well as the wider disabled community's knowledge and life/tech hacking knowledge base) to maintain their own bodyminds. Foregrounding this kind of knowledge as valuable for a wider variety of professionals could help alleviate the kinds of epistemological and social work that cyborgs must do.

1.3: Medical and Technical Knowledges

Disabled and chronically ill people rely on networks that nondisabled people do not or rely on the same networks—particularly the medical and insurance establishments—in very different ways that require specific sets of knowledges and labors. In this section I describe three different sets of knowledges that are additional or significantly different for disabled people than for nondisabled people (this is far from an exhaustive list). First is the medical-industrial complex that diagnoses and treats the disabled bodymind; second is the technical knowledges that one gains from creating, using, and repairing one's own technologies on a day-to-day basis; and third is the internet as a vector of care, community, mutual aid, and technical knowledge transfer. These sets of knowledges require work to find, understand, and integrate into one's everyday practices; work that is not required of nondisabled people, work that takes energy that disabled people are often in short supply of.

To gain access to the systems that they might need (like government assistance, access to prosthetics, etc.), a disabled person must first get a diagnosis from a licensed medical professional. This makes one legible by, and subject to, the medical model of disability and the medical-industrial complex. Because disability policy is based on the medical model, specific diagnoses are required to obtain medication and assistive technologies, and access to the economic support systems our government has established.

Proper diagnoses can take months to years, depending on the condition (Fay, 2022). Some conditions can be quickly diagnosed, but other conditions like Postural Orthostatic Tachycardia Syndrome (POTS), celiac disease, or lupus can be episodic and can present symptoms that look like other conditions (one colleague of mine had a diagnosis of Multiple Sclerosis before their eventual celiac diagnosis). Symptoms like chronic pain, symptoms that change in kind or magnitude, and symptoms that are difficult to test for are often disbelieved by medical professionals or dismissed as psychological, especially for women and people of color (Washington & Randall, 2023). Disabled people are often not believed about their symptoms, thought to be either drug-seeking or unreliable narrators of their own experience (Iezzoni et al., 2021a).

Disabled cyborgs—distrusted about their symptoms and severity by medical professionals and laypeople alike—must often search out information on their own to self-diagnose, find scripts and languages that are more likely to move doctors to believe them (Epstein, 1995), find reliable treatments, life hacks, and community from other cyborgs online. Doctors and nurses often resist and resent this disability knowledge practice, leading to further distrust and poor care. There is a popular meme online in medical professional circles that goes something like “do not equate your Google search with my X years of professional experience.” This is meant to combat the kinds of surface-level peeks at WebMD, where every symptom is one of cancer, and it is easy for a layperson to assume the worst of their symptoms. It is also often used against disabled people who have researched their own symptoms as a way of dismissing their lived expertise.

Disability communities on social media like BlueSky, TikTok, and YouTube have myriad discussions about, and support, for newly or not yet diagnosed people (Eagle & Ringland, 2023). Many people have self-diagnosed their own ADHD, POTS, Ehler-Danlos Syndrome (EDS), celiac, autism, or other conditions through these networks. Those networks have also produced strategies to get doctors to believe them, or at the very least to run the tests that would confirm the diagnosis. These communities often counter the “google search” meme with their own, which goes something like “don’t equate your 20 minutes of training on my condition with my X years of lived experience.”

The second set of knowledges that disabled people must learn is the day-to-day production, use, tinkering, and maintenance of their cyborg technologies. Liz Jackson (2018) calls disabled people the “original life hackers.” And Kelly Fritsch and Aimi

Hamraie “[call] attention to the powerful, messy, noninnocent, contradictory, and nevertheless crucial work of crip technoscience: practices of critique, alteration, and reinvention of our material-discursive world… Disabled people are experts and designers of everyday life” (2019, pg. 2). Some of this technical knowledge is simply about which tools are correct for the job. When is proper to use a wheelchair, vs. a prosthetic, vs. crutches (and which kind of crutches), vs. a walker or rollator? Mallory K. Nelson et al. (2019) call this transmobility. This set of knowledges also includes things like which accoutrement one uses to do things like open doors, type, or pick up things. Mouth sticks are incredibly useful for quadriplegics (Williamson, 2012), tongs and other grabbing tools (like more functional versions of the dinosaur-headed toy many of us remember from our childhoods) help people retrieve dropped items, or other out-of-reach objects.

This set of knowledges is not just about how to fix a thing that has broken or failed, but knowing how to anticipate how and when something will fail, and how to tell when one tool is better than another for the job even though they may appear the same to a nondisabled person. A wheelchair user will know, in a much more embodied and visceral way, why a hospital-style chair is bad for everyday use. They will also be able to feel when their chair is ready to fail, likely before a technician could see something going wrong.

Disabled people are often the ones creating the technologies in the first place, too. Much like the mouth sticks that quadriplegics used to type in the 50’s (and use tablets and smartphones today) were developed by (or in direct consultation with) the disabled people who wanted to type (Williamson, 2012), many disability-aimed products were first developed by disabled people. The OXO brand of kitchen utensil, for instance, is usually covered by the media as developed by a man for his arthritic wife. Except Betsy Farber, said wife, was actually the designer of the tools… her husband just got them constructed (Jackson, 2018). Disabled people often must design their own life hacks, adjustments, and assistive technologies. And nowadays, an internet-savvy disabled person can search on YouTube, BlueSky, Instagram, or TikTok for how to make, design, and maintain tools to make life a bit more accessible.

To that end, disabled cyborgs must also be tech- and internet-savvy in ways that are growing in importance. Many assistive devices are now computerized, from power wheelchairs to powered prosthetics, to implants like pacemakers and insulin pumps, to apps and assistive software. They must also be able to deal with information and applications online that are not built to accommodate their bodyminds in some way, requiring hacks, alternative programs, or a system of support from other disabled people to use them. Many of these require regular firmware and software updates, and are thus able to connect to the internet either via a plug, bluetooth, wi-fi, or other similar system. The security of these technologies thus becomes vitally important to disabled cyborgs, and their ability to manage as much of that security as possible requires yet another set of knowledges from them.

Beyond these technical knowledges, the internet is the source or location of a wide range of disability community, support, and care. Mutual Aid networks are coordinated via Twitter, BlueSky, Facebook, Signal, Discord and other social media (O’Toole et al., 2015; Piepzna-Samarasinha, 2018). Collaborative differential diagnoses are done in group texts and chat rooms. Life hacks such as building tools, maintaining assistive technologies, cleaning and maintaining cyborg tech, and what to carry with oneself if one has certain technological accoutrement abound on Youtube and TikTok (Herdegen, 2019b, 2019a).

Part 2: The Cost of Being Cyborg

Disabled personhood carries both monetary and non-monetary costs. Social networks can be strained when one party is too sick, too out of spoons,[17] or unable to afford a phone or regular transportation. The pity and moocher narratives that surround the common cyborg mean that any monetary price of personhood comes with an additional emotional labor price as well—an exhausting price that sometimes cannot be paid. Only by re-figuring our relationships, our communities, and our inter- and intra-dependencies so that supporting people who need it is seen as normal, not exceptional, will we start to see our community members as part of our own networks of care and ourselves as part of others' networks. We should seek to assist others as we would like assistance. Dependence is not failure, moral or otherwise; it is a basic, ontological, definitional feature of what it is to be (Bennett et al., 2018).

2.1 Social Costs

Disability is widely stigmatized in the United States. During the early 20th century, disabled people were the prime target of State eugenics programs that sought their removal from the public eye through Ugly Laws (Schweik, 2009) and institutionalization, but also removal from life and the gene pool via forced sterilization,

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[17] "Spoon Theory" is an explanatory tool created by Christine Miserandino to describe the extra energy it takes to be disabled. Original article can be found here: https://butyoudontlooksick.com/articles/written-by-christine/the-spoon-theory/

selective abortion, and sometimes actual murder. And, while the last Ugly Law was repealed in the 1970s, institutionalization, forced sterilization, and selective abortion still happen regularly.

In the US pregnancies with a Down Syndrome diagnosis are terminated between 60 and 90% of the time depending on the regional mores and laws (race and age groups also play a role) (Natoli et al., 2012).[18] Other countries such as Denmark (Lindeman, 2017) and Iceland (Quinones & Lajka, 2017) have all but eliminated Down Syndrome from their populations through systemic testing and stigma campaigns.[19]

For cyborgs, their technological complement often is the first and most visible marker of disability. One might never know a blind person's status until they bring out their cane, or someone with cerebral palsy, until you see their forearm crutches. In many instances, hiding one's technological complement is seen as a necessary part of reintegration into society. Prosthetic users are encouraged to walk without a visible limp. A "normal" gait being seen as a marker of true rehabilitation or being "fixed" via technology (Shew, 2023). These technological markers of disability can also signal a level of agency low enough that people feel comfortable violating that agency. Stories abound of blind people being "helped" across the street by a well-meaning and clueless bystander, or of people in wheelchairs being moved against their will by (less well-meaning, usually) people. This is so prevalent that spiked covers for wheelchair handles are a very popular accessory.

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[18] Data for this study ends in 2011, and it is unclear how the Dobbs decision overturning Roe v. Wade will affect the numbers.

[19] Both the Danish and Icelandic governments deny that their goals are the eradication of Down Syndrome, but both have also taken great lengths to remove stories where government officials have given statements about the elimination being a sign of progress and better for each nation. The Wayback Machine remembers, however.

The stigma of disability does not only affect disabled people, there is also a stigma that affixes to families of disabled people, especially disabled children (and especially those with intellectual and developmental disabilities) (Mitter, 2019). This understandably leads parents who have received an in-utero disability diagnosis to consider abortion; to save both their potential child from the pain of a world that hates them, but also themselves from the stigma for having brought such “suffering” into the world. Ashley Shew has written about the kinds of stigmatizing tropes that disabled people face, one of which is that of the sinner, where the disability is the punishment for some sin (Shew, 2022). This includes the debunked “refrigerator mother” theory of autism which argues that a child becomes autistic because their mother is insufficiently warm towards them (R. M. Williams, 2021). This sinner trope combines with the media trope of “ugly is evil” where visible disabilities, especially facial scars, are visual depictions of the moral disfigurement of a villain (think: James Bond villains).

Stigma has a wide set of negative social effects on disabled people and their families/communities. These stigmas lead to disabled people being passed over for jobs, left out of social events, being avoided, having people talk to the person next to them as if they are a caretaker, and many more infuriating, humiliating, and exhausting social confrontations. Even seemingly benign events like being told while picking out corn for one’s family dinner that they were “so brave” to be out… doing the most mundane thing possible (Shew, 2023). Similarly, the labor of simply educating people on one’s condition, access needs, or that “no, they’re fine, you don’t need to help them across the street,” can constitute a burden on disabled people’s social activity. Annika Conrad calls this “Access Fatigue.” Konrad points out, pulling from Sara Ahmed

(Ahmed, 2016), that “the work of seeking access [is] mentally and emotionally taxing” (Konrad, 2021, pg. 184).

Dependency might be one of the most stigmatized situations in the bootstrappy, frontiersperson, ruggedly individualistic, hustle-culture-obsessed US. This is perhaps best embodied in one of the primary tropes of disabled people: the moocher. The moocher is the disabled person who is draining resources from the rest of us, possibly faking their symptoms to do so (Shew, 2022). Sarah Rose detailed how labor and being a “productive citizen, was (and is still) part of the national construction of the “good” disabled person (Rose, 2017). When work and labor becomes the marker of social value, dependency becomes the lack of that value. Technologies, and well-kept technologies especially, then often stand in for a disabled person’s ability to produce or to labor. A wheelchair becomes an obvious marker of kinds of labor that are no longer available to the person using it, whereas a prosthetic might be more highly valued because it eliminates the “problem” of a missing limb or a wheelchair, even if the reason for the wheelchair and the prosthetic might be the same. The more function a technological complement produces for the disabled person, the lower social value the person using it is often seen as having.

The irony here, of course, is that the perceived cost of cyborg technology will also signal social value, sometimes increasing a disabled persons social valuation. A prosthetic with computerized joints will be more highly valued than a Jaipur Foot, even if both restore function equally. A well-maintained power wheelchair is more valuable socially than a rusty hospital wheelchair. Visible cyborg maintenance (or rather the lack of visible wear and breakdown) becomes a signifier of social worth, and one’s ability to do the labor of cyborg maintenance then becomes visibilized and legible to nondisabled people, signifying a person’s worth. A visible lack of maintenance may be enough to keep a cyborg out of public view in perhaps a similar way a lack of clean clothes might keep a nondisabled person from going out with friends.

Disabled people being kept out of public view leads to a collapse of community engagement, a loss of a feeling of belonging, a feeling of separation from work colleagues, and the loss of valuable professional networking. As friends attend concerts, unmasked, or professional organizations hold their yearly meetings abroad (with the high likelihood of one’s wheelchair or other tech being damaged by flight staff) with no virtual option, disabled people are often left out of conversations, forgotten about, or left to their own devices to protect themselves, even in an instance where there is no such thing as individual risk (as in a highly contagious deadly pandemic). Cyborg maintenance is not the sole responsibility of individual disabled people. Nondisabled people are responsible as well, for the places they go, the technology they use (or don’t in the case of masks), and the labor they require of disabled people to participate.

2.2: The Costs of Things

It is also financially expensive to be disabled. For the disabled cyborg to participate in the world, they must have their technological complement. If their technologies work well enough, they may be able to have a job and produce capital such that they are valued by society. Sometimes, the assistance offered by the government is contingent on the disabled person NOT making money in a job, putting the disabled cyborg in multiple binds: unable to keep and maintain their technological complement without engaging in government insurance programs; unable to work a good enough job to gain better insurance benefits without losing necessary government benefits; unable to marry for fear that their combined income might be too high to qualify for benefits. Once we factor in the more intimate embroilment in the medical-industrial complex, the costs rise even further.

In the United States, a hospital-style wheelchair costs around $150 to $500 depending on where you purchase it.[20] Wheelchairs built to be used by the person *in* the chair rather than a nurse or attendant who pushes the chair from behind, start at $1,000, and powered chairs can get up to well over $30,000 (Smith, 2021). Prosthetic legs like the one my advisor wears run well north of $13,000 (Shew, 2023 pg.16), while prosthetics with powered ankles and knees can balloon to over $120,000 (Birnbaum, 2016). Prosthetic arms vary quite a lot as well, with cosmetic arms running around $3,000 and extremely advanced arms such as the DARPA-funded “Luke” arm made by Dean Kamen’s company DeKa running upwards of $150,000 (Biello, 2018; Turner, 2009). A cochlear implant runs $30,000 to $50,000 (not counting the years of therapies and training required to use it) (Nadège, 2011), and hearing aids can cost $1,000 to $4,000 per ear (Dybala, 2018), though new over-the-counter hearing aids are bringing that average price down for some. The insurance environment in the US means that many of these items may be fully covered… but others might not.[21]

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[20] As of this writing, Amazon has them priced around $130.00.

[21] And the way the amount of work, knowledge of bureaucratic systems, and fighting against a neoliberal capitalist system whose main goal of capital accrual runs counter to the desire of the disabled cyborg to… well, live… makes dealing with the system another barrier, another locus of access fatigue (Konrad, 2021).

Maintenance is also very costly in time and dollars. To fix the foot shell (not the structural support at the end of the prosthetic, just the foot-shaped shell that goes around it to make it look more like a “natural” foot and fit into shoes… this was a different cyborg maintenance quest than the squeak I mentioned earlier) of her prosthetic leg, my advisor was required to get a new prescription from her doctor, or her insurance would not pay for its replacement. This meant that she had to travel to her prosthetist to have an “official” person say “yep, that’s broken,” get a written prescription, send it through the pre-authorization process, and get it shipped to her home. This took a couple of weeks, during which time her prosthetic leg did not work as well as it should—even if the shell is mostly aesthetic—and possibly damaged shoes and floors. And this is a simple fix, for a mostly nonessential part. Even if the foot shell was covered by insurance (not guaranteed for all cyborg technologies), the copay was probably around $50 (which may seem minimal but can be hard for many disabled people who live on shoestring budgets), and the travel was all on my advisor. If she weren’t able to take a day or two off, or travel that kind of distance, or cover that cost immediately, getting the new shell may have taken longer, leading to further problems that might then cost more money.

Because wheelchairs are considered medical devices, one needs a prescription from a licensed doctor to get one (and get it covered by insurance) *and* to get it serviced, which often requires you to ship it to a servicer and wait for it to be shipped back, which can take weeks. If you don’t have a backup for this chair (and no insurance plan is going to pay another many thousands of dollars for a backup chair) then you are likely to be stuck at home without any way to go to work, go food shopping, or do anything else you might need to do (Iezzoni, 2022). The loss of wages, the cost of alternative devices, and the networks of support individuals one needs all add up to a price for existing—one that can be impossible to keep up.[22]

Part 3: Cyborg Care

Maintenance is care is maintenance. Care is at the heart of community, family, kin, and civilization. We cannot include within our communities those for whom we do not care (in every sense of the word). We cannot (perhaps "will not" or "do not" are more accurate) maintain those people and relationships about which we do not care. Care work, and its position in the current systems of medicine and of community, shows the (literally) fatal flaws of these systems; the ethics, logics, and acts of care lay bare the ways our (bodily, medical, community) maintenance systems fail us all, but especially disabled people.

None of this is to say that either care or maintenance are always a net positive. Every March 1st is the disability day of mourning, where we remember the disabled people who were killed by their families and care workers. We maintain relationships we ought not, we care for people who do not care back. As Maria Puig de la Bellacasa says in the opening paragraph of her book, "[t]o care can feel good; it can also feel awful. It can do good; it can oppress" (2017, pg. 1). People who are subject to care from others are often controlled by them in myriad ways that ought to be examined and resisted, and the generally positive light in which care is spoken of hides some of the viler acts of violence that exist between humans. And carers themselves are often underpaid,

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[22] A no-longer-recent hashtag on Twitter, #TheCostOfBeingDisabled, started by Imani Barbarin (@CrutchesAndSpice), illustrated in heartbreaking detail the multiple costs of being disabled.

underappreciated, and under-cared-for themselves in ways that exacerbate the harms possible via care relationships (Nishida, 2022).

In this section I discuss care in two ways: as an ethic and as an act. These ways are separated here but are entangled in practice. In the final section, I deal with that entanglement and how the cyborg is not just an ontological, material state (as Weise would urge us toward), nor just an epistemological standpoint (as Haraway would guide us), not just an ethical subject/object (as our pity and charity models would have us believe), but a diffractive being who produces and is produced by all three. For this turn I engage with Karen Barad's Agential Realism (Barad, 2007) to illustrate the cyborg as an ethico-onto-epistemological, intra-acting, intra-dependent, and sympoietic techno-organic-relational being.

3.1: The Ethic of Care

Most medical and social "care" in the US today is not actually done under a logic of care, but rather one of choice (Mol, 2008). The logic of choice frames care, especially medical care, as a list of options given to one by a medical professional from which the patient then chooses. Considerations, then, include the amount of time the option will take, what it will cost, how complicated it will be, and the risk-benefit analysis the patient can do with the information they have.

When we extend this idea of care beyond a methodology of medical practice into an ethic—i.e. what we ought to do—our systems are suddenly, obviously, woefully inadequate. Our current medical system is driven mostly by an ethic of utilitarianism: do the most good for the most people. *Prima facie*, this seems like a good model to follow, but it relies on doctors and nurses prioritizing those they believe most likely to benefit from treatment, and those they believe will gain the most quality of life. This requires professionals to rely on not just their medical expertise, but their expectations and assumptions about what “quality” is and who has the most of it. Disabled people are believed to have a low quality of life, even though self-reports of life satisfaction are statistically identical to the nondisabled population (Iezzoni et al., 2021b). This is often called the “disability paradox,” (Albrecht & Devlieger, 1999). The “paradox” here is illusory, based in an ableist failure of imagination about what having a disability is actually like.

The disabled cyborg is often visibly different, triggering this paradox of people believing that disabled lives are fundamentally worse. They become the obvious targets of medical and social intervention in a utilitarian framework, because ableds imagine them to be suffering. This feeds into what Rua Williams calls “metaeugenics,” where intervention is seen as the norm, and non-intervention is seen as harm (2019). The cyborg, because their technological intervention is often quite visible, reinforces both ideas that intervention is good, and the technoableist notion that technologies are the proper mechanism for that intervention (Shew, 2023). The disabled cyborg thus becomes the poster child for the necessity of technological interventions, *and* the idea that those interventions are a utilitarian good.

If, instead of a utilitarian ethic, we worked through an ethic of *care*—foregrounding relationships and intra-actions that require time, attention, and the acknowledgement of the patient as a person, not just a problem to be fixed or cured—we can establish disabled people (and the elderly, and many others) as full people, valuable regardless of their productive capabilities, valuable intrinsically, and worthy of social inclusion and regard. By decentering the technological “fix” or cure, we also decenter the cyborg’s technological complement. It no longer becomes a semiotic signifier of both the need for techno-medical intervention, nor one of the limits of said technology to return the disabled person to some mythological “normal.” Care centers the person, whose relationship with their technology might be fraught or not, whose relationships with the people and things in their wider ecology might also be sympoietically produced by the technologies upon which they rely.

But care is not just an ethic, a way of ordering our values and commitments, it is also an act. Care is praxis, and the kinds of care that the cyborg must do, receive, and maintain go beyond that of the disabled noncyborg and certainly the nondisabled noncyborg. But even the nondisabled noncyborg requires care, so shifting our frame to one of care helps us all. It is an ethical curb cut effect (Blackwell, 2017).

3.2: The Act of Care

Both maintenance and care work tend to fall under the umbrella of “dirty” work—work that includes contact with dirt, grime, refuse, bodily fluids, and other things we consider unsightly or gross (Simpson et al., 2012). These contacts with physical contaminants often get translated into moral or social contamination (Douglas, 1966). This includes the sorts of self-maintenance and care that disabled people and those with chronic illnesses must undertake regularly (Herdegen, 2019a). Maintenance workers must crawl into tight, dirty spaces or pull apart greasy, sooty engines and other mechanical devices; care workers deal with bodily excreta such as blood, sweat, urine, and feces, as well as the general grime produced by living. And while maintenance tends to be coded male (though not exclusively, if we consider cleaning as part of maintenance; Atanasoski & Vora, 2019), care is coded as almost exclusively female, and both types of work tend to be coded for people of color and of low socio-economic class.

Maintenance and care work is also intentionally made invisible. In manor houses, servants had quarters, hallways, and even staircases that were separate from the main hallways and rooms to ensure that the cleaning and maintenance of the manor is not seen; laundry and maid services come and go while you aren't around. Similarly, the sorts of care work performed for disabled people are usually carried out in private settings such as one’s home, almost never in public. And digital assistants such as Alexa or Cortana (which are almost exclusively gendered female) make invisible even basic, non-bodily maintenance like scheduling, listmaking, or shopping (Atanasoski & Vora, 2019).

Part 4: Conclusion, or The Diffractive Cyborg

Media depictions of cyborgs are almost always three things, sometimes in sequence, often simultaneously: the apotheosis of human appearance and function, a grotesquerie illustrating the hubris of technoscience (Earle, 2024), and a hidden threat under control by outside forces. In academia, they are combinations of technology and organism, sometimes described in diagrams like “(human/technology) -> world” (Verbeek, 2008). To technologists, transhumanists, and tryborgs (Weise, 2016), the cyborg is a path out of the limitations of the flesh, into shiny new immortal bodies, forever upgradeable. And for much of the nondisabled world—via our ableism, our eugenic history, our fetish for the new and innovative—the cyborg evokes both pity and, ironically, expectations of the superhuman.

In lived experience, they are far more. A cyborg is an ethico-onto-epistemological agent sympoietically produced by their material-semiotic contexts. This is true of everyone, of course, not just cyborgs. We are all sympoietically produced by our relationships and environments—biology altered by pollutants, social mores shaped by friends and family, ways of knowing shaped by the language(s) we learn and institutions to which we have access. Cyborgs simply include technological objects within the boundary of their selves. Wheelchair users will tell you how their wheelchair is a part of them; an anxious, bi-polar, schizophrenic, or depressed person will often describe how medication makes them feel like their true selves (or, sometimes, the opposite) (Wang, 2019; Wurtzel, 2014). They are also produced by the kinds of labors, stigmas, and costs I have described above. Cyborgs are the result of the diffraction pattern produced from bodymind, technology, environment, labor, relationships, and more.

Thus, the cyborg is produced by cyborg maintenance, by the relationships between and through contested and corrosive interfaces of flesh and technology and contested and corrosive techno-social systems. Cyborg maintenance is generative, transformative, and definitional to the cyborg. Thus, Cyborg Maintenance is not just the upkeep of *things* (flesh or technological), though those are included, but primarily of *relationships* and thus of being and knowing. Relationship, ethic, and meaning are primary among the equals in Barad's ethico-onto-epistemology, and those matter as much, if not more, than matter and knowledge in the agential cut I call the Cyborg. Care, the mechanism by which we maintain and upkeep of relationships, is thus the very set of acts and ethics that produces thriving disabled people.

The cyborg may be the maximal version of this stack of diffracting relationships, into which technologies are most intimately involved, but we all find ourselves along the spectrum between nondisabled and disabled. In this way, we are all just a few additional technologies from becoming cyborg ourselves. Our general resistance, via ableism, technoableism, rugged individualism, and capitalism, is a part of what makes the figure of the cyborg one of fear and grotesquerie and what pushes those who do cyborg maintenance into the background, invisible and poorly paid. But our disabled and nondisabled material-semiotic worlds are close enough to reach out and touch. They diffract through each other, producing the non-cyborg as much as the cyborg is produced, poisoning both through the corrosive ideologies that permeate our world. The cyborg reveals just how dependent we all are, how the stigmatization of dependency is based in a fear of being subject to that same stigma, plus the ignorance of our host of intra-dependencies. Since we will all eventually become disabled should we live long enough—either through accident, disease, or age—acknowledging and supporting the kinds of dependencies that Cyborg Maintenance illuminates will help everyone. A new curb cut effect, but for a society where relationships between people, technologies, systems, and ideas are maintained with care to support everyone and help us all thrive.

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