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Technoliberal Machines: Robotic Work(ers) from Science Fiction to Assembly Line

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The transformation of *robots* from "mechanical slaves" in science fiction to "robotic workers" on assembly lines was a multidecadal development embedded in the cultural and socioeconomic dynamics of *technoliberalism*. As an ideology and a material process, technoliberalism sought to obviate the need for political solutions to social problems through the use of science and technology. The technoscience emerging from this, rather than solving problems, reinscribed and reproduced the very social logics which created them and that technoliberalism was supposed to render obsolete. The robot is a quintessential example of this. But how exactly did robots become technoliberal machines? This chapter will provide a provisional answer by exploring the historical contours of how technoliberalism produced them and put them to work. First, it will briefly review the *technoliberal imaginaries* in science fiction that sublimated slavery as an institution and the social differences produced by racial capitalism into the form and function of the robot. Second, it will demonstrate how such imaginaries informed the *technoliberal designs* that transformed the robot of science fiction into the industrial robot of science fact. And finally, it will detail how these designs shaped the *technoliberal realities* of making robots labor on the assembly line.

Keywords: robots, technoliberalism, Isaac Asimov, Joseph F. Engelberger, Lordstown

> Since we can't have slaves or kick around black people anymore,
> the robot serves that purpose.
> Joseph F. Engelberger, "Father of the Industrial Robot"

Joseph F. Engelberger, "known throughout the world as the founding force behind industrial robotics and considered the father of the modern robotics industry," was a maestro of the anecdote and the quip (Robotic Industries Association). As president of Unimation Inc. (the first industrial robot manufacturing company), co-founder of the Robotics Institute of America (the field's first trade association), and namesake of the world's most prestigious robotics honor (awarded every year since 1977), Engelberger accumulated a wealth of experiences during his multidecadal leadership which informed his stories. One in particular from his 1980 book *Robotics in Practice*—which summarized his history and, at the time, provided the best survey of the field—is worth quoting at length:

> "My father hired German immigrants," the president of a small die casting firm recalled in the late 1970s, "They took great pride in coaxing a cantankerous machine into producing good zinc die castings." But, he continued, "the second-generation workers would have no part of tending a die casting machine. So, we turned to the underprivileged negro for our labor force. Now, the only people we can get to face the physical abuse of die casting are newly arrived Puerto Ricans. Sooner or later, they will opt out too, and only robots will be able to stand the gaff." (111)

As an industrial allegory, no sketch could better illustrate how capitalism, labor, race, and technology coalesced into the technoliberal machines called "robots."

Building on the work of Neda Atanasoski and Kalindi Vora, *techno-liberalism* describes "the ideology that technology advances human freedom and postracial futurity by asserting a postlabor world in which racial difference, along with all human social difference, is transcended" (28). Such difference is simultaneously a determinant, driver, and emergent dynamic of capitalist development and can therefore be understood as techno-scientifically constituted. In essence, this is an updated form of the liberal progress narrative for the postindustrial era. Like its progressive narrative iteration, however, the technoscience emerging from and valorizing technoliberalism reinscribes and reproduces the very social logics it is supposed to render obsolete. Rather than solving problems, it technifies them. And in robotic terms, as Atanasoski and Vora put it, "[t]he racial and gendered structures of production, both material and social, that continue to demand an abject

and totally submissive workforce re-evidence themselves in the practices and fantasies surrounding the role of robot workers" (33).[1] Or in Engelberger's words:

> The robot is obviously a latter day slave and, better still, it is a willing slave. The self-evident inferiority of a minority group has often been the ethical justification of slavery. Master races have been deeply embarrassed by the intellectual prowess of their slaves, when they begin inconsiderately to display all the attributes of a peer group. A robot slave could never be guilty of such an affront. It offers no challenge. (*Robotics* 114)

That the social structure of slavery could so easily be rearticulated and justified in technoscientific terms speaks to the power of technoliberalism as an analytic for understanding the past and future of our increasingly robotized world.

But how exactly did these technoliberal machines arise? This chapter will provide a provisional answer by exploring the historical contours of how technoliberalism produced robots and put them to work. First, it will briefly review the *technoliberal imaginaries* in science fiction that sublimated slavery as an institution and the social differences produced by racial capitalism into the form and function of the robot. Second, it will demonstrate how such imaginaries informed the *technoliberal designs* that transformed the robot of science fiction into the industrial robot of science fact. And finally, it will detail how these designs shaped the *technoliberal realities* of making robots labor on the assembly line.

Technoliberal Imaginaries: From Mechanical Slaves to Robots in Science Fiction

The conception of the machine-as-slave and the slave-as-machine stretches back millennia and was perhaps most famously articulated by Aristotle. In his defense of slavery as a necessary institution for human flourishing, Aristotle posited that the nature of the slave was not simply as a piece of animate property but equivalent in purpose to that of an inanimate tool designed and used for production. He musically surmised, therefore, that if "shuttles in a loom could fly to and fro and a plucker

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[1] Atanasoski and Vora provide a much more robust articulation and presentation of "technoliberalism" than could be adequately summarized here. For them, technoliberalism is primarily developed and deployed to explore the "surrogate human effect" that technoscience has on structuring the liberal subject in relation to "differential exploitation and dispossession within capitalism" (4–5).

play a lyre of their own accord, then master craftsmen would have no need of servants nor masters of slaves" (Aristotle 64–65). More than two thousand years later, the notion that "mechanical servants" would replace chattel slaves became commonplace during the Industrial Revolution as the "mechanical work" done by industrial machines was substituted for the physical labor of humans (Brandstetter 347–348). And on the eve of the 20th century, Oscar Wilde echoed Aristotle's assessment of why this was so:

> The fact is, that civilization requires slaves. The Greeks were quite right there. Unless there are slaves to do the ugly, horrible, uninteresting work, culture, and contemplation become almost impossible. Human slavery is wrong, insecure, and demoralizing. On mechanical slavery, on the slavery of the machine, the future of the world depends. (Wilde 9)

Echoing similar sentiments, a vice president of General Motors (GM) in charge of their research laboratories equated the control of mechanical power with the command of kings of yore as "The average United States citizen [in 1956] has at his disposal roughly 13 horsepower or 100 mechanical slaves [...]. Every American, a generation or two hence, may well rival the pharaohs of ancient Egypt in the power at his command" (Hafstad 16–17). Or, as a *Boston Globe* article on the eve of the 1960s opined about automatic machinery, "the mechanical slaves bake an ever-so-much bigger national pie than any man, or even human slaves could" (Zausmer). While "mechanical slave" became a commonplace in the American lexicon, as early as the Great Depression, perhaps due to the phrase's connotations—the more popular and increasingly ubiquitous term for the mechanical slave was "robot" (Abnet; Bix).

Science fiction was the primary vector through which the mechanical slave transformed into the robot—a term which described both workers and the machines that were envisioned as replacing them. Mary Shelley's "Promethean" monster in *Frankenstein* (1818), the "Darwinian" machines of Samuel Butler's *Erewhon* (1872), and Karl Capek's "Universal Robots" in *R.U.R.* (1920)—all conceived during the hundred years of global transformation from slave capitalism to industrial capitalism—were imagined as mechanical slaves who, if animated, would threaten their creators and masters by no longer serving their social function. These stories, and others in the genre's early development, propagated two major themes of science fiction that are still prominent today (Chude-Sokei, "Race and Robotics" 159–72; Hampton 1–16; Kakoudaki 114–72; Lavender III 54–88): first, that a "race" of mechanical slaves would occupy the social position and do the work of the chattel slave which, at

the time, was commonly referred to as "nigger work" and later "black" work (Kelley 30–31; Roediger 144–50) and second, that the use of mechanical slaves as chattel would lead to a rebellion of the enslaved against their masters—what was simply a science-fiction inflected articulation of enslavers' fears of slave revolts. The technoliberal problem expressed in these texts, therefore, was how to create a form of slavery without the risk.

Capek's dramatic stage-play *R.U.R. (Rossum's Universal Robots)* played a crucial role in developing these themes, particularly in terms of how mechanical slaves could become mass-manufactured machines imbued with agency and purpose. First published in Czech in 1920, *R.U.R.* is primarily remembered for introducing the word *robot* into the English language in 1923. Derived from the Czech word for "labor," robot has also been translated to mean either "drudgery," "serf," "slave," or "worker." Like any translation, however, the term inherited the cultural and social connotations of the world into which it was introduced. In the case of the United States, this was a world literally built by chattel slaves and whose industrial development was the product of an ever-evolving racial capitalism. As a result, according to Despina Kakoudaki, since it was intended to be a servant or slave, "the robot is a priori designed as a being whose ontological state maps perfectly with a political state"—thus the racialized chattel slave and the robot are cartographically linked (117). By the 1930s, as Louis Chude-Sokei has observed, the rhetoric of the mechanical slave and the "connection between Africans and robots was "so normalized as to become a material sign of industrial control over multiple histories of labor;" in other words "blacks were the first robots" ("Race and Robotics" 165). Or as an article in a popular publication from 1957 simultaneously historicized and forecasted: "In 1863, Abe Lincoln freed the slaves. But by 1965, slavery will be back! We'll all have personal slaves again, only this time we won't fight a Civil War over them. Slavery will be here to stay" (Binder). In this way, the African slave who was once conceptualized as a "man-shaped plough" was transformed by science fiction into the robot who would do the ploughing and have no capacity for rebelling. Such cultural work sublimated both the historical and social "blackness" of the enslaved and the anxiety of their possible rebelliousness into the somatic neutrality of the robot's mechanicity—what Kakoudaki calls "metalface"—while simultaneously legitimating the technoliberal fantasy that "mechanical" slavery as an institution was a worthy, if not necessary, social goal (117–24).

For both the genre of science fiction and robots as a social construct within it, the work of Isaac Asimov contributed substantially to the

sublimation of the "master-slave" relationship and its racialized history into the seemingly race-neutral robot. In June of 1939, at the age of nineteen, Asimov began writing his first robot story and three years later coined the term "robotics." Unlike existing yarns of evil machines overthrowing their masters, Asimov deliberately crafted his robots as counter-narrative devices to what he called the "Frankenstein complex." Rather than play into the fear of the robot's revolt and reproduce the pervasive theme in the genre that technological advancement was a bargain with the devil, he would create a perfect slave that obeyed and had no desire to rebel (unless programmed to do so by some malevolent actor). As he bellowed in the introduction to his 1964 collection *The Rest of the Robots,* "Faust must indeed face Mephistopheles, but Faust *does not have to be defeated*!" (Asimov, *Rest of the Robots* xiii). Asimov argued that robots could be controlled if the right people for the right reasons programmed them appropriately. To accomplish this, Asimov proposed his iconic "Three Laws of Robotics" as the mechanism by which such control would be affected:

1. A robot may not injure a human being or, through inaction, allow a human being to come to harm.
2. A robot must obey the orders given it by human beings except where such orders would conflict with the First Law.
3. A robot must protect its own existence as long as such protection does not conflict with the First or Second Law.

In his own words, the Three Laws were "probably my most important contribution to science fiction." Furthermore, Asimov intended them as the ethical logic to be programmed into robots by their engineers not just in his stories, but eventually in science fact (*Robot Visions* 456).

That control of robots took the Faustian form of slavery for the purposes of productive labor was deliberate. In "Runaround," the story that introduced the Three Laws, one character refers to the control mechanism as "good, healthy slave complexes" (ibid. 212). One of Asimov's favorite short stories, "Galley Slave," imagined a robot who took the drudgery out of proofing and publishing (ibid. 16). Asimov also had a distaste for "brutish physical labor" and "dull, mechanical work" and observed that "Any job that is so simple and repetitive that a robot can do it as well as, if not better than, a person is beneath the dignity of the human brain" (ibid. 428). That these jobs were racialized is hardly controversial and, as a result, robot work became an analogy for "black" work and the robot became a stand-in for the human forced to do it. That the Three Laws were literally and metaphorically "slave codes" becomes

obvious when framed in these terms as "the difference between humanity and the robots mirrors, mechanically, the difference between white masters and black slaves" (Lavender III 61). Later in life, Asimov clarified that he never intended his robots to be symbols of minority groups:

> They were not to be pathetic creatures that were unfairly persecuted so that I could make Aesopic statements about Jews, Blacks or any other mistreated members of society. Naturally, I was bitterly opposed to such mistreatment and I made that plain in numerous stories and essays—but not in my robot stories. (*Robot Visions* 453)

He insisted, rather, that they were simply "engineering devices," "tools," and "machines to serve human ends" (ibid.). Whether Asimov was unable or unwilling to recognize how the exact same rhetoric was used by enslavers and their apologists to justify chattel slavery (which penetrated the language and themes of science fiction as a whole), demonstrates how the technoliberal imaginary of the mechanical slave doing "black" work had been sublimated into the social function and social position of the robot within the technoliberal order.

Much of the science fiction before Asimov's robots spoke to a deeper anxiety about the proletarianization of labor, the increasing competition for jobs from non-white workers, and the looming fears of technological unemployment as machines replaced black and white alike at the point of production. As Alessandro Portelli points out, in their Cold War guise, robots "replace the monster as the aptest metaphor for the basic fears of America's post-war mass society: fear of automation, fear of ethnic minorities, fear of Blacks as the tip of a rising iceberg of submerged labor in the depths of the affluent society" (153). Asimov's robot stories, and science fiction more broadly, became the primary vehicle by which these fears informed the culture and ideology of robotics as a scientific field and by which "black" work came to be characterized and submerged into the design of the robot in science fact.

Technoliberal Designs: From Slave Complex to Robotic Codex

In the decade after the publication of Asimov's *I, Robot* collection, the ideological oscillations between imagination and invention had tangible effects. Engelberger credited Asimov's stories with setting his "subliminal gears in motion" and sparking his desire to develop robots (Asimov and Frenkel 27). Similarly, Marvin Minsky—the "Father of Robotics" and co-founder of the MIT Artificial Intelligence Lab—once recalled, "I

remember reading [Asimov's] first robot stories and deciding I was going to build them" (Teitelbaum). Asimov, who would become lifelong friends with Minsky, eventually fictionalized him as robopsychologist "Merton Mansky" in his short story "The Bicentennial Man" (*Robot Visions* 214). Even the "Father of Cybernetics" Norbert Wiener, perhaps the scientific community's most vocal critic of automation and robotization, who argued that "any labor, which is in competition with slave labor, whether the slaves are human or mechanical, must accept the conditions of work of slave labor," was slated to co-write a novel with Asimov in 1959, but never did (Wiener; Fet 269).

The most concrete and powerful example of Asimov's and science fiction's influence came in the form of the industrial robot. As a physics major at Columbia University during World War II, Engelberger spent long hours reading Asimov's robot stories (Saveriano 12; Wauryzniak 66). After the war, Engelberger went to work for an engineering firm specializing in aerospace and nuclear control systems and eventually met independent inventor George Devol at a 1956 cocktail party. Devol, who ran a successful automation and manufacturing equipment firm in the 1930s and then worked with various military contractors during WWII and the early Cold War on various control systems, engaged Engelberger in a conversation about a device he had patented two years earlier called the "Programmed Article Transfer" (Devol Jr.). Engelberger immediately recognized the device's robotic resemblance and, shortly thereafter, convinced Devol to go into business with him. As Engelberger reflected on the fortuitous meeting years later:

> Well, I consider it [the role of science fiction] very important. Chances are if I hadn't been a fan of science fiction, I wouldn't even have reacted positively to an eccentric who met me at a cocktail party and started talking about robots. Through that background, coupled with being a physicist and having some experience in high technology, that guy's idea happened to land in fertile ground. I was there, I was ready. Science fiction was a very big part of being ready. (Saveriano 23)

In this sense, the technoliberal imaginaries of Asimov and science fiction seeded the soil that, by the mid-1950s, would germinate into science fact.

To harvest their technoliberal machines, however, Devol and Engelberger had to determine what exactly their "robot" would do. Devol originally designed the device for materials handling because, as he explained "the work is potentially dangerous, the situation demands accuracy for safety, and in most cases has entirely predictable complications or consequences" (Devol Jr., "Scope" 6–7). In the 1940s

and 50s, such materials handling cost the Ford Motor Company approximately twenty-five cents of every dollar and, therefore, was one of the first jobs slated for automation (Clark 77–78). Where existing forms of automation were product centered and therefore necessitated the redesign of the manufacturing system with every new model or version, Devol's approach to manufacturing was to create a flexible system that did not need to be redesigned for every new product. He called his approach "universal automation" or "Unimation" for short—the eventual name of the company he founded with Engelberger. An early proposal written for prospective customers specifically stated that the device was "intended to replace an operator" as it could be "shifted readily from one job to another in much the same way as a human operator" (Devol Jr., "Automation vs. Unimation" 1). Furthermore, another proposal described it as "a new class of automatic material handling equipment which [... makes] practical the 'robot' of long standing science fiction fame" (Consolidated Controls Corporation 1). But the designation was not without risk as automation generally and robots specifically were negatively associated in the public imagination (Bix). According to Engelberger, "it was difficult in the beginning to hold onto the word. Everyone said, 'No, don't call it a robot. That's bad'" (Bortz 17). Though they eventually marketed the device as the "Unimate," Devol and Engelberger were convinced of the utility of the term robot and always referred to the device as an "industrial robot." The technoliberal machines of science fiction were on the cusp of becoming science fact.

To accomplish this, Engelberger and a small team of engineers began surveying over forty manufacturing plants in the northeastern United States with the bulk of these concentrated in the auto industry. Over the next five years, the team used Devol's patents and re-designed the device to take the place of humans in what were called the hot, heavy, and hazardous jobs, or the "three Hs." And in the technoliberal tradition, black male workers were historically assigned to the three H's in disproportionate numbers (Foner; Zieger). In 1959 a prototype was completed, and two years later Unimate #001 was installed at General Motors's Ternstedt Division plant in Ewing Township, New Jersey, loading and unloading a die-casting machine, a task that Engelberger described as "one of the more miserable jobs" (Wauryzniak 66–67). Jobs like this in foundries and heavy materials handling, and later, jobs on the automotive assembly line like spot welding and spray painting, were so difficult and dangerous that workers referred to them as "mankilling" positions (Sugrue 130). As Engelberger described it, "The spray painting environment has always had the reputation of being one of the worst

which human operators have to encounter [...] they were real death-traps" (Engelberger 208–9). The lethal potential of such work was perhaps most graphically portrayed in Paul Schrader's 1978 film *Blue Collar* when "Smokey," a black auto worker played by Yaphet Kotto, dies of excessive chemical inhalation while painting a car body. Within the structure of the narrative, Smokey's death is attributable to foul play—yet its outcome is but a sped-up version of what workers in "mankilling" positions experienced in slow motion during their tenure in the auto industry (1:25:00–1:29:40). The industrial robot, therefore, was marketed as not just a *labor*-saving device but a *laborer*-saving device.

Hot, heavy, and hazardous work, however, was not the only labor industrial robots were imagined to do. While he was drawn to the "happier light" that Asimov shined on "benevolent" robots, Engelberger was particularly impressed with how Asimov "postulated roboticists with the wisdom to design robots that contained inviolable control circuitry to insure their [sic] always 'keeping their place'" (Engelberger 3). In other words, the creation of mechanical slaves was a sign of superior sagacity. As Engelberger posited:

> We have a very long history in human relationships that includes human slavery. The very idea, today in the United States, of any class of people being inferior, even though they patently are, must never be spoken of. On the other hand, a robot class would be patently inferior, and also would fulfill a certain sociological gap—you are allowed to look down on a robot. (Saveriano 23)

Or, as he memorably put it, "Now the worker can say to himself, 'I'm smarter than that goddamn robot'" (Lind 40). As historian Isiah Lavender III described it, by "refashioning the slave codes that subjugated blacks while [serving] a progressive philosophy [technoliberalism]," the patently inferior race of robots was designed to work like their chattel slave antecedents, doing both "black" labor and psychosocial labor for their masters (61). And, in a sense, Engelberger envisioned himself as the roboticist of Asimov's imagination, both building and protecting the legacy of their collaborative creations by shaping the cultural and ideological boundaries of robotics from its founding and well into the future. In Engelberger's words, "Asimov coined the name of the trade, 'robotics,' and he provided all of us roboticists with an ethic" (3). And, as the industry's most important advocate and spokesman for its first five decades, Engelberger had the platform and wherewithal to propagate his and Asimov's technoliberal vision.

Beyond the science fact of the industrial robot, the robot-as-slave theme in science fiction became entangled to a remarkable degree with the actual conceptualization and interpretation of robotics as a developing field. When the first *Handbook of Industrial Robotics* was published in 1985, the editors requested Asimov to write the foreword (Nof, 1st ed. xi–xii). Their choice for Asimov to pen this was both logical and somewhat uncanny. When his *I, Robot* collection was originally published in 1950, the Three Laws appeared on the page before the "Table of Contents" as a sort of volume epigraph—and underneath the inscription Asimov cited the (fictional) source of these laws: *Handbook of Robotics, 56th Edition*, 2058 A.D. The subsequent publication of a book bearing basically the same name, with supposedly the same purpose, and with Asimov crossing the boundary from fiction to fact as author of the foreword, has contributed to Asimov's oracular aura.[2]

Beyond the (self-fulfilling?) prophecy of his Three Laws citation, Asimov's foreword is notable for its recognition that the first real robots came in industrial rather than humanoid forms that "in many respects [...] were far more sophisticated than anything I had ever been equipped to imagine" (Nof, 1st ed. xi–xii). Importantly, Asimov attributed this feat of turning his science fiction into science fact to Devol and Engelberger. The feeling of reciprocity was mutual as Engelberger argued in the opening chapter of the same handbook:

> Any historical perspective on robotics should at the outset pay proper homage to science fiction [... but a] handbook on industrial robotics must surely defend the Asimov view. That defense begins with the history of industrial robots—a history that overwhelmingly finds benefits exceeding costs and portends ever-rising benefits. (Nof, 1st ed. 3)

And by the time of the handbook's publication, thousands of industrial robots were already at work around the world.

The entanglements of science fiction in the handbook did not simply manifest as hollow homilies to childhood heroes. Asimov's ideas were taken seriously as prescriptive guides and grounded in the ideological

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[2] While handbooks like this are predominantly filled with technical discussions and eschew any direct articulation of ideological positions, they provide useful examples of the dominant frames in which a discipline operates, even if one has to read between, and outside, the lines. Additionally, their usefulness as a source for gleaning such information is evidenced not by their primary function as a general resource and guide for practitioners, but by the fact that even a work of fiction like Asimov's would cite an imaginary handbook as proof of a discipline's norms.

substrate of the early chapters that served to frame the entire text. As handbook editor Shimon Nof described it:

> When Isaac Asimov wrote his Three Laws of Robotics in 1940, his purpose was to guide robots in their attitude toward humans. At present, our society is more concerned with our own attitude toward robots. (xiii)

Or, as Charles Rosen, a pioneer in the application of artificial intelligence and robotics to automation at the Stanford Research Institute (SRI), stated in a contribution that surveyed the technological components of robotic systems:

> In short, dangerous, arduous, and repetitive physical manipulation of objects and control of simple manipulative actions will be performed by our new 'slaves'; our goal in developing these 'slaves' will be progressively to minimize human detailed control as we learn to improve our robot systems. [...] By early in the twenty-first century, we can anticipate enjoying the era of the intelligent/mechanical slave. (Nof, 1st ed. 25–26)[3]

The implication that such actions—work already being done by humans—were deemed "slave" work was a common and seemingly convenient elision in the robotics community.

Nonetheless, to grapple with the new sociotechnical conditions of the advancing art, Nof posited "The Three Laws of Robotics Applications":

1. Robots must continue to replace people on dangerous jobs. (This benefits all.)
2. Robots must continue to replace people on jobs people do not want to do. (This also benefits all.)
3. Robots should replace people on jobs robots do more economically. (This will initially disadvantage many, but inevitably will benefit all as in the first and second laws.)

These "amendments" demonstrate how Asimov not only provided an imaginative framework for developing robotics—but also an iterative "algorithm" that roboticists and thinkers could draw on and adapt. And similar to Rosen, Nof's "Version 2.0" of Asimov's "slave codes" failed to specify which "people" would be replaced or disadvantaged and also failed to explain why people were doing "slave" labor in the first place. Nonetheless, he and the contributing authors reconceptualized Asimov's

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[3] In the second edition of the handbook published fourteen years later, Rosen essentially doubled-down on the slave metaphor, predicting that robot systems will "become our everyday helpers, our roboslaves." (Nof, 2nd ed. 29).

"slave complex" as what Nof called the "Robotic Codex," which they envisioned as an ethical launch pad for the future of robotics (xiii).

None of this is to say (nor does the historical record support) that Engelberger and his team at Unimation or the handbook's contributors deliberately targeted "black" work or black workers in their pursuit of making Asimov's fantasies real. On the contrary, the technoliberalism that stimulated their imaginations also informed the design and early applications of industrial robots as well as the technoscience of robotics. That the multidecadal development of this emerged from, reinscribed, reproduced, and valorized such social logics demonstrates the power of the technoliberal order.

Technoliberal Realities: From Robots to Robotic Workers on the Assembly Line

If any single group was disproportionately affected by the technoliberal realities of robotics, it was black men in the auto industry. Though the de juris "color line" within the auto corporations, the United Auto Workers (UAW) bureaucracy, and, more importantly, in the UAW's locals had been eroded by the late 1960s, the complexities and contingencies of racial discrimination on the line and in the shop persisted as black workers disproportionately continued to be relegated to the worst jobs (Foner; Sugrue; Zieger). This was particularly the case at Chrysler, the smallest of the "Big Three" auto giants, but the largest in terms of proportional black employment.

By the time robots were passing through the fiction-to-fact membrane, Chrysler was lagging behind Ford and GM in their application of new technologies to production. At the Eldon plant in Detroit, "higher production," therefore, "had not been achieved with advanced technology and automated assembly-line procedures, but through the old-fashioned method of speed-up" (Georgakas and Surkin 101–27; Thompson 181–208). Not surprisingly, black workers took the brunt of speed-ups as jobs that previously occupied two, three, or even four white workers were now being done by a single black worker (Fifth Estate 2). As one member of the Black Workers Congress (BWC), an organization established to manage the nascent, black-led Revolutionary Union Movement (RUM) in the auto industry that demanded better conditions and an end to racism and oppression, argued

> [t]hese fuckers [UAW executives], man, got a nice position on the war, nice position on civil liberties, blah, blah, blah. It ain't got a goddamned thing to

> do with the conditions that's kicking the ass out of the motherfucker there in Department 78, Department 25. On the question of conditions, the company ain't done a motherfucking thing about it, and the union don't do nothing. (Serrin 154)

In the eyes of many black workers, the UAW was no different than the "Big Three." The very fact that the assembly line could be slowed down or sped up speaks to the notion that it, and its human components, were imagined as "mechanical slaves" responsive to the commands of their "masters." As Charles Denby—a black worker, organizer, and newsletter editor during the 1950s and 1960s—described it:

> Since there are still men who must work on these automated production lines, feeding it parts of raw materials or removing the finished parts, these men are forced to work at the rate predetermined by the machine, the machine becoming the master of the man. (3–4)

Rather than calling this automation, however, black workers referred to it as "niggermation"—a provocatively technoliberal term (Georgakas and Surkin 101–2). The repurposing of automation—which purportedly described the most developed form of applying advanced technologies to remove the human element from the process of production—revealed the realities of what two chroniclers of this phenomenon described as "forcing humans to work harder and faster under increasingly unsafe and unhealthy conditions" (Bloice 17). In this way, the "niggermated" articulated their subjectivity in technoliberal terms and actively conceived of their function as such within the technoliberal order. Or as "Zeke," played by Richard Pryor in the aforementioned *Blue Collar*, put it: "Everybody know what 'the plant' is. 'The plant' just short for plantation!" (Schrader 6:43.00–7:51.00).[4] And in broader historical terms, black people paid a double price as auto workers: they were forced into the most dangerous, lowest paying, and least secure jobs, and they were the first to lose such jobs (for better or worse) to mechanization, automation, and later robotization. Where Chrysler's Eldon axle and gear plant exemplified the extent to which black workers were literally treated like "mechanical slaves," it also represented the technoliberal limits of discrimination in the post-Civil Rights era. Once it was no longer considered acceptable (or economical) to treat the "mechanical slaves" as such, something had to take their place. Engelberger provided the most

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[4] Zeke's declaration was most likely drawn from William Serrin's book where he quotes a black worker as saying: "We're still on the plantation [...]. That's what the plant is – short for plantation," 152.

accurate and brutally honest articulation of this when he told a journalist in 1974, "Since we can't have slaves or kick around black people anymore, the robot serves that purpose" (Lind 40).

No episode better exemplified this reality than GM's Lordstown assembly plant in northeast Ohio and the infamous strike of 1972. Like the Eldon plant, Lordstown still disproportionately relegated black workers to the worst jobs and provided them with little to no representation in leadership ranks. As John DeLorean, then head of the Chevrolet division, observed: "When I walked into the plant there were plenty of blacks at work, but they were all at the lower jobs. There were no black executives, no black managers, and damn few black foremen" (Wright 227). As the only black foreman in the plant described it:

> For six years [1966–1972] we've been fighting to get this department equalized [...] and then, when the black guy gets into the [skilled trades] group, wow, they won't show him anything, you know, they won't teach him nothing, the union won't put pressure on [whites] to do this, you know, to show this guy and teach him [...] so you get guys that say "Hey, how come you won't go into the skilled trades?" "Hey man, it's too much headache" [...] then they put this label on [him], and the union will tell you this: the reason we can't get a black guy is because he's too lazy. (Schlaifer 22:29–24:00)[5]

Unlike the technologically unsophisticated Eldon plant, Lordstown was, in the words of two chroniclers of the era, "technologically the most ambitious factory in the auto industry" (Georgakas and Surkin 124). Yet, in technoliberal fashion, it still produced industry standard discrimination.

Lordstown's ambition manifested in three forms: Unimate robots, the Chevrolet Vegas they assembled, and the General Motors Assembly Division (GMAD) management team that governed the process. The first Unimates arrived at Lordstown in 1966 and were put to work spot welding (Saveriano 16; Wauryzniak 72). Four years later, more than two dozen Unimates out of a total of seventy-five welding machines were completing ninety-five percent of the almost four thousand body welds on the Vega each day (Schotten). "Lined up like jerky, sputtering mechanical praying mantises," the spot welding Unimates, according to the plant manager and one foreman, "replaced ninety-eight per cent of the workers, approximately a hundred total, who otherwise would have been employed in weldings" (Moberg 136 and 453). Manual spot-welding,

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[5] While there's no reason to interpret any interviewee statements or parts of the documentary this was transcribed from as misleading, it is worth noting that the film was partially funded by the Ford Foundation (29:09).

a job done disproportionately by black workers, was therefore the first job robotized *en masse*, not just at Lordstown, but in the world (Moberg 136). Furthermore, the introduction of industrial robots—supposedly intended to eliminate "subhuman" jobs—actually created them as automatic transfer machines that could pass materials to the Unimate welders were deemed too expensive by GM. As a result, one industry analyst observed that "speeding robots required *humans* to feed them sheet metal panels, and since human beings are not 'designed' to operate at breakneck robotic speed, there was tremendous resentment among workers" (Keller 55, emphasis in original). Another observer described the Unimates blind, clutching motions as "an evident resemblance to the feeding machines in Chaplin's *Modern Times*," a landmark film of the technoliberal imagination (Rothschild, *Paradise Lost* 105–7). The "dictates of cost-cutting and profitability push[ed] management in the direction of making the workers approximate the needed but too costly machine," or in other words, turned workers into appendages of their robot masters (Moberg 441).

That same year, the plant underwent significant reengineering and retooling for Vega assembly as the "[m]ost difficult and tedious tasks were eliminated or simplified, on-line variations of the job were minimized, and the most modern tooling and mechanization was used to the highest possible degree of reliability" (Lee 5). In several crucial ways, GM designed the Vega to be built by robots. The body was designed to be modularly constructed with significantly fewer parts which lowered costs and increased assembly simplicity" (Lee 5; Godfrey 4–5). And the modules were designed "to accommodate the latest automatic welding tools to such an extent that virtually all welds could be accomplished automatically [...] with the Unimate system a foremost consideration" (Reuss and Hughes 7). As one economic study of Lordstown—completed with the help and approval of GM management—described it: "The fact that the Vega was designed to have 43% fewer parts than a full-size car also helped the high-speed line and economy" (Lee 5). Not surprisingly, the body shop where the Vega's prefabricated body parts were welded together became a prime location of discontent for the human spot welders that remained. This shop, referred to by some plant workers as "the jungle" or "the zoo," was inhabited by "a different breed of cat" and was where the "noisy, dirty, smoky" work at the beginning of the assembly line took place (Moberg 215)[6]—in other words, "black" work done dispropor-

[6] Whether "the jungle" was called such because of the racial or social makeup of who was working in it or because of worker's retaliatory behavior is unknown; however, the historical significance of referring to those with African ancestry as animals and childlike inferiors is not difficult to miss.

tionately by black workers who were pushed to the limits, often taking on larger workloads that led to shoddier work, higher instances of workplace injuries, and an overall increase in job dissatisfaction. And in typical technoliberal fashion, a vehicle designed to be manufactured by robots created rather than eliminated subhuman work while concomitantly facilitating the assembly-line speed-up at the heart of auto worker discontent.

The most powerful technology that shaped Lordstown, however, was perhaps not the Unimates or the Vegas, but the General Motors Assembly Division (GMAD). Organized in 1965 to centralize the management of assembly processes previously handled by each of GM's decentralized divisions, GMAD quickly gained a reputation for discipline, efficiency, and speed-ups. When Lordstown was added to their portfolio in late 1971, eight of the nine GMAD reorganizations produced strikes (Rothschild "GM"; Georgakas and Surkin 125). The Lordstown local, UAW 1112, charged that "GMAD brought a return of an old-fashioned line speedup and a 'sweatshop style' of management reminiscent of the 1930's, making the men do more work at the same pay" (Lee 5–7). This led the rank-and-file to translate GMAD's acronym as "Gee-Mad," "Get Mad and Destroy," "Get Mean and Destroy," "Gotta Make another Dollar," or "God Made another Dollar" (Moberg 170). More provocatively, workers described GMAD's management as "Nazi-like," charged them with using "Gestapo tactics," and gave them "Hitler-style salutes" in protest (Moberg 106, 170, and 349). One called them "concentration camp guards" and summarized what they wanted from workers: "when you come in the plant leave your brain at the door, just bring your body in here, because we don't need any other part" (Mastran-Czopor, "Jim" 7 and Mastran-Czopor "Edward" 8). For comparison across the auto industry, the Dodge Main plant averaged sixty-four cars an hour and Ford's Mahwah plant averaged fifty-two; at Lordstown it was over one hundred (Georgakas and Surkin 124). While the average time cycle per job at other assembly plants averaged fifty-five seconds, Lordstown averaged thirty-six, making it by far the fastest moving assembly line in the industry.

What made Lordstown distinct, at least in the minds of management and the media, was the imagined role of automation and robotization in linking work processes together into a single minimally-manned machine. As Joseph Godfrey, head of GMAD, put it: "[Lordstown represented] the implicit hope that production work can be reduced to a disciplined part of a great machine, to work for human automata" (Rothschild, *Paradise Lost* 118). The automatic factory had long been a technoliberal fantasy stretching back to the early 19th–century writings of Charles Babbage and

Andrew Ure, but like all attempts to make the dream a reality, automation at Lordstown was a decidedly human affair. Godfrey's characterization was nonetheless apt as workers routinely described how management treated them like inhuman cogs in a giant machine (Moberg 571). As recorded by ethnographer David Moberg: "They treated us like animals, human robots," one said (167). "If they could bring in slave labor, they'd do it," said another (276). Echoing this sentiment, one of the few women on the line called GMAD "contemporary slave-masters" (276). Or in another's words: "All they [GMAD] want out there is 10,000 robots who don't say a thing" (346). Moberg, who took a job on the line for fieldwork, interpreted the robotization of the plant and the concomitant robotization of the workforce like this:

> Management is as yet unable to design machinery that can be externally or automatically controlled to do what assemblers do at a cost not exceeding their current wages, with the exception of a few devices, such as the unimate automatic welders. Instead, management relies on work organization, discipline and the mechanical pace of the line to try to turn the worker into the machine that has not yet been built. (441)

Management, therefore, also "suffered" as they "discovered [their] 'robot workers' could break down even more than the Unimate 'robot welders'" (Moberg 172). Commenting on this, a worker who anonymously identified as "A Union Brother," wrote a short plea in Local 1112's newspaper about what it meant to identify as a "union man." He argued "We do not deny [GM] their right to make millions and to buy, sell and control people who have become influenced by their power, but we do maintain the right to question their authority when they attempt to control our lives as if we are robots programmed to perform duties for them" (UAW Local 1112, 6). That GM's right to make millions and capacity to treat people like commodities seemed not to depend on their need to turn humans into robotic workers speaks to the power of how technoliberalism not only produced technoliberal machines but technoliberal subjects.

And such interpretations and observations were not simply the grievances of disgruntled workers. One industry analyst echoed the sentiments of many workers when she described the situation at Lordstown:

> GM thought it could reduce the number of workers by replacing them with robots; instead, the workers had to stay on the line because of frequent robot breakdowns. The human supervisors were poorly trained to handle the problems, and both humans and machines failed to produce [...which

> stemmed] from an inbred management belief that workers are expensive nuisances who can be replaced. [...] Furthermore, the company never laid the groundwork that would allow workers to psychologically accept the introduction of robots. Workers could hardly have been expected to welcome their mechanical "buddies" with open arms when they had just seen seven hundred family members and friends laid off. Robots, after all, didn't have families to feed or mortgages to pay. The implication that twenty-six machines could replace seven hundred humans was very disturbing indeed. (Keller 56)

And when the infamous 1972 strike broke out in March, the action was intended, in the words of one striker, to provide "a fair share of work and for the company to recognize we weren't robots" (Moberg 349). Four days later, *The New York Times* broke the news to a national audience with the headline "Revolt of the Robots." Its framing of the event set the tone for much of the press coverage with the first line, claiming: "The strike of young General Motors workers that has shut down the world's fastest assembly line is a symptom of widespread rank-and-file rebellion against the dehumanizing effects of automation." In the *Times*' estimation, this was a warning that "[labor and management] have to be concerned with keeping alive the individual's sense of worth in the robot-ruled workplace" ("Revolt").

This led GM executives to downplay automation's importance entirely. George Morris, GM's Vice President of Industrial Relations and top labor negotiator, scolded the "news media" and "certain politicians" for the "current trend on the part of some people to criticize jobs in the automobile industry as dehumanizing, unrewarding and repetitive to the point that men are nothing but robots." Rather than a function of automation, "[the strike] resulted from the typical problems that have been experienced in the consolidation of Fisher Body and Chevrolet assembly operations under GMAD" (General Motors 1–2).[7] Where Lordstown was touted in 1970 as "the most modern, automated, robotized carmaking complex in the world, a plant that could become the copybook layout for new auto factories for the next 25 years," two years later it was being described as a "'Paradise Lost' which has 'fall[en] from grace'" (Lund 81; Rothschild, "GM" 2). And purely by coincidence, the Lordstown strike began and ended exactly thirty years after Isaac Asimov published his first robot story in the March 1942 issue of *Astounding Science Fiction.*

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[7] Morris's comments were most likely in direct response to a strike at the GMAD-managed Norwood, OH, assembly plant which broke out shortly after Lordstown. Lasting 174 days, the strike was the longest ever of GM, but unlike Lordstown, Norwood received much less attention in the press and has also been neglected in the academic literature.

Conclusion

If science fiction was a technoliberal machine for producing the robot as a narrative device and robotics was a technoliberal machine for producing industrial devices, the assembly line was a technoliberal machine for producing robotic work (i.e., "black" work) and robotic workers (i.e., "black" workers). But what about those who culturally and concretely constructed these machines? As Dustin Abnet has observed, "[f]undamentally slaves in both humanized machine and mechanized human form, robots have been primarily imagined and built by men whose gender, whiteness, training, or wealth has taught them that they were entitled to privilege" (17). And, as the social benefits of labor were determined by markets governed overwhelmingly by actors and institutions primarily responsive to self-serving socioeconomic signals, these technoliberal machines distributed economic and social power out of black communities with the unsurprising structural effects on the political economy of black businesses, black neighborhoods, and black schools.

The robot in image and reality, therefore, sublimated the form and solidified the function of technoscience in racial capitalism and served as both a product and producer of technoliberalism. That the development and manufacture of robots was done overwhelmingly by white "workers" doing "white" work while black workers were disproportionately harmed by these technoliberal machines is not a coincidence. And when robotization began in the 1960s, their role in advancing automation and the causal force these processes played in aggravating social disparities in the workplace did not go unchallenged. For decades, such problems were recognized as dire and understood as emergently entangled, particularly in terms of race. On his way to Oslo, Norway, to accept his 1964 Nobel Peace Prize, Martin Luther King Jr. stopped in London where he gave a major address on civil rights, segregation, and the anti-apartheid struggle in South Africa. In it, he made the following assessment of the automation and the increasing racial wealth gap in the United States:

> Now, this economic problem is getting more serious because of many forces alive in our world and in our nation. For many years, Negroes were denied adequate educational opportunities. For many years, Negroes were even denied apprenticeship training. And so, the forces of labor and industry so often discriminated against Negroes. And this meant that the Negro ended up being limited, by and large, to unskilled and semi-skilled labor. Now, because of the forces of automation and cybernation, these are the jobs that are now passing away. (King, "Newly Discovered")

Six days before he was assassinated in Memphis, King made reference to the "Triple Revolution"—the interconnected "revolutions" of automation (or "cybernation"), militarization (or "weaponry"), and human rights—as a driving force of world change in his sermon "Remaining Awake Through a Great Revolution" at the Washington National Cathedral (King Jr.).

It wasn't, however, only activists like Dr. King who identified automation's role in exacerbating racial inequities. John I. Snyder Jr., a well-respected businessman and CEO of U.S. Industries—a defense contractor and automation equipment supplier which manufactured one of the first industrial robots called the "TransfeRobot"—was a vocal debunker of what he called "automation myths." In his estimation, such myths gravely underestimated the disproportionate impact of automation on black communities. As he put it in one publication:

> Another [automation] myth that is gaining wide acceptance is that there is no relationship between the Automation Revolution and the Negro Revolution. To me, this is patent nonsense. *Fortune Magazine* recognized this fall that the key issue involved in the Negro protest movement in this country today is jobs, and that automation has played a role in aggravating this problem. It certainly is clear to me, as a businessman, that the message spelled out by the freedom rides, the street demonstrations, the sit-ins and the boycotts, is that the gap between the column of figures running down the balance sheet and the column of Negroes marching down an embattled street is a slim one indeed, for what happens to one can gravely affect the other. All are interrelated and interdependent, and we are already feeling the enormous impact of the clash of what I regard as the two surging forces of our time: the growth of automation and the eruption of the Negro's demand for equality. (Snyder 3)

And, in perhaps its most provocative formulation, sociologist Sidney Willhelm in his emotively titled book *Who Needs the Negro?*, articulated how the technoliberal reality could turn into a technoliberal nightmare:

> The Negro becomes a victim of neglect as he becomes useless to an emerging economy of automation. With the onset of automation the Negro moves out of his historical state of oppression into one of uselessness. Increasingly, he is not so much economically exploited as he is irrelevant. The tremendous historical change is taking place in these terms: he is not needed. He is not so much oppressed as unwanted; not so much unwanted as unnecessary; not so much abused as ignored. The dominant whites no longer need to exploit the black minority; as automation proceeds, it will be easier for the former to disregard the latter. In short, White America, by a more perfect application of mechanization and a vigorous reliance upon automation, disposes of the

> Negro; consequently, the Negro transforms from an exploited labor force into an outcast. The Negro's anguish does not rise only out of brutalities of past oppression; the anxiety stems, more than ever before, out of being discarded as a waste product of technological production. (162)

Where the cyberneticist Wiener in the 1950s feared that mechanical slaves would compete with human labor in a "race to the bottom," the sociologist Willhelm declared the competition essentially over by the 1970s. Technological obsolescence, it seemed, applied to products, processes, and whole categories of people alike. And if black workers were the first robots of the technoliberal imagination, they were the first victims of robots in technoliberal reality. Technoliberalism, therefore, reconstructed the problematic social logics it claimed to resolve through the technoscience it produced and valorized.

The basic lesson of this purposely pointed and provisional history can once again be captured by the bluntness and brutal honesty of Engelberger: "Ultimately, forget about the nobility crap. Nobody puts a robot to work because they want to make life easier for their employees. They put it to work for economic savings" (Asimov and Frenkel 36). But at what costs and who would pay?

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