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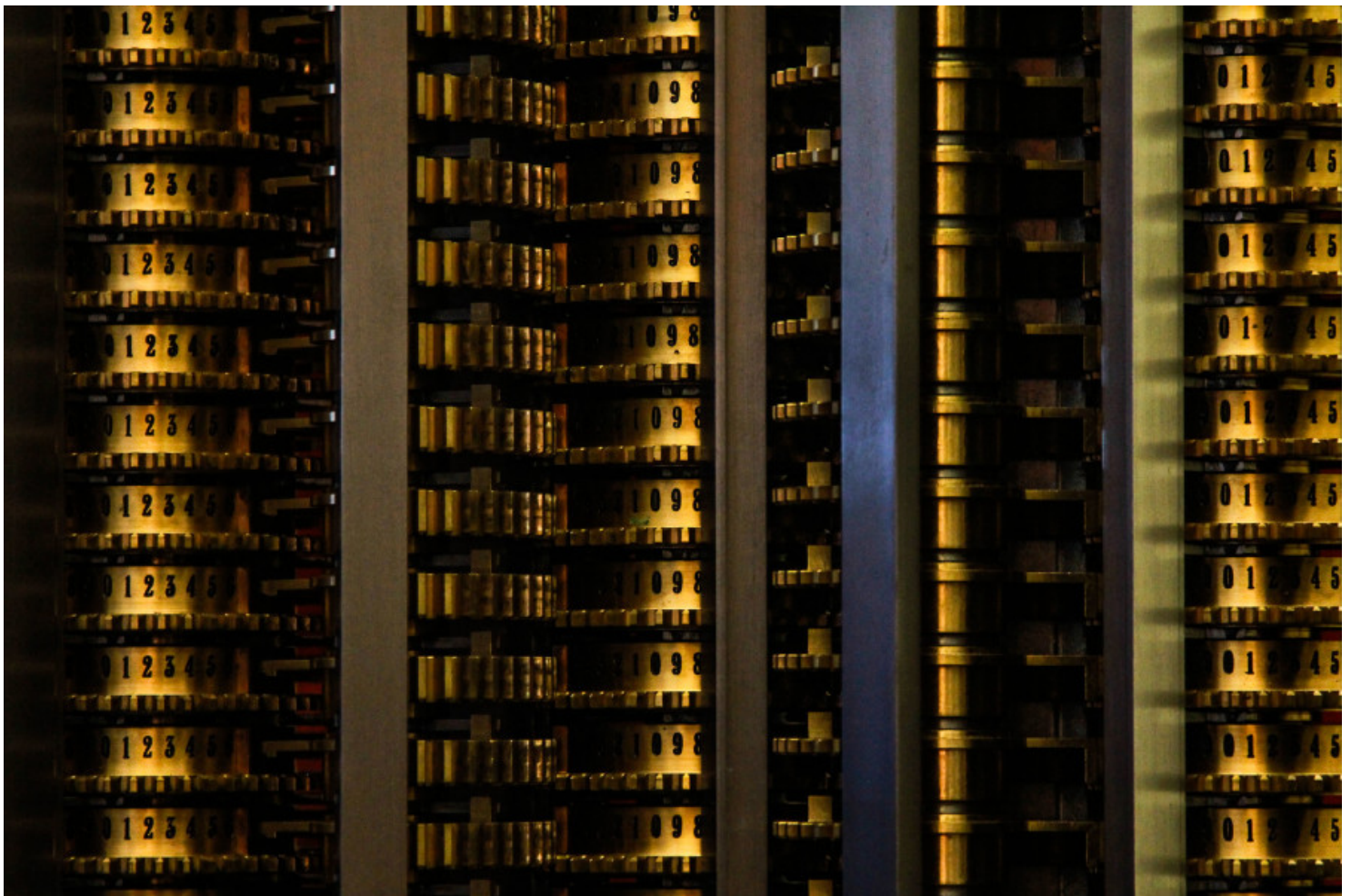**ISSUE 19 / SUPA DUPA SKIES (MOVE SLOW AND HEAL THINGS)**

Image by Chris Ballance.

Origin Stories: Plantations,

Computers, and Industrial Control

Meredith Whittaker

The blueprint for modern digital computing was codesigned by Charles Babbage, a vocal champion for the concerns of the emerging industrial capitalist class who condemned organized workers and viewed democracy and capitalism as incompatible. Histories of Babbage diverge sharply in their emphasis. His influential theories on how "enterprising capitalists" could best subjugate workers are well documented in conventional labor scholarship. However, these are oddly absent from many mainstream accounts of his foundational contributions to digital computing, which he made with mathematician Ada Lovelace in the nineteenth century.[1] Reading these histories together, we find that Babbage's proto-Taylorist ideas on how to discipline workers are inextricably connected to the calculating engines he spent his life attempting to build.

From inception, the engines—"the principles on which all modern computing machines are based"[2]—were envisioned as tools for automating and disciplining labor. Their architectures directly encoded economist Adam Smith's theories of labor division and borrowed core functionality from technologies of labor control already in use. The engines were themselves tools for labor control, automating and disciplining not manual but mental labor.[3] Babbage didn't invent the theories that shaped his engines, nor did Smith. They were prefigured on the plantation, developed first as technologies to control enslaved people. Issues alive in the present—like worker surveillance, workplace automation, and the computationally mediated restructuring of traditional employment as "gig work"—echo the way that computational thinking historically emerges as a mode of control during the "age of abolition," in the early nineteenth century. Britain officially abolished West Indian slavery in 1833, and Babbage was very aware of the debate on abolition. He was also aware of the questions that were roiling

the British elite as they sought alternatives to enslaved Black labor—particularly the question of how to control white industrial workers who persistently rebelled against industrialization, such that they could produce at the pace required to maintain the British empire. Both Babbage's influential labor theories and his engines can be read as attempts to answer these questions—ones that, knowingly or not, rearticulated technologies of control developed on the plantation.

Finding Industrial Labor Discipline on the Plantation

In legislation and labor policy, the concept of freedom is largely rooted in the contract: the textually stipulated (in)ability for people to come and go, to agree to terms and walk away from them, backed by law and ultimately state violence.[4] In this formulation, workers and employers are understood to approach the contract as equals, each exercising their freedom to accept or deny a contract's terms. However, this assumed freedom is curtailed in practice by structural power asymmetries that are enforced by technologies of worker control designed to achieve employers' goals of extracting as much productive energy as possible. These technologies discipline workers' bodies, motions, and mental habits. And their application enables labor regimes that can be termed "free" while simultaneously limiting workers' agency and expression in the workplace, leaning on the contract as proof that workers freely chose such conditions.

Industrial methods of worker control were prefigured on plantations, which sought to maximize the labor of enslaved Black people otherwise unmotivated to produce value for those who kept them captive. While the relationship between industrial and plantation worker control is foundational, it is essential to recognize that there is no easy equivalence between the terror-enforced racialized labor regimes of plantation slavery, and industrial labor processes that drew on technologies developed on plantations.[5] Plantation management—and the relations of domination that structured the plantation—was anchored in a view of Black people as commodities, as something-not-quite-human. And

the conditions of bondage on the plantation defined the category of "unfreedom" against which white workers could be classified as "free."

The transfer of methods developed in slavery onto contractually governed "free" white labor regimes was aided by the structural similarities of plantation slavery and industrial factories. British plantations in the West Indies at the turn of the nineteenth century were not sites of 'raw' labor contrasted with modern and efficient factories. On the contrary, plantations were "modern industrial undertakings"[6] whose owners and overseers developed many 'modern' industrial forms of management and labor discipline well before they were implemented at the same scale and rigor in factories.[7] Historian Thomas C. Holt observes that "so much of the paraphernalia of the new industrial discipline bore ... a striking resemblance to that of the slave plantation. Centralized surveillance, regimentation, division of labor, strictly controlled work pace, written rules and regulations were all standards pursued by every planter."[8] And British industrialists borrowed knowingly from slavery. Plantation management guides routinely circulated among British capitalists, and an industry of preformatted accounting books, templates, and manuals was widely available in Britain during the eighteenth and nineteenth centuries, often commingling with literature on industrial management.[9]

Despite these clear links, the history of labor and workers as well as scholarship on management and business almost entirely erase the centrality of slavery in shaping modern forms of management and labor processes. This refusal to engage with the industrial factory's relationship to the plantation, in turn, produces a view of work and the history of industrialization that is delinked from practices of racial domination. These strategic gaps in the story are productive for the project of classifying some forms of waged labor as "free" while mobilizing plantation technologies to control it. The severance of labor histories and technologies of worker control from their emergence on plantations circumscribes our capacity to identify contemporary predicaments around the nature of work and its relationship to race. One common distortion that emerges from such revision paints the

eighteenth– and nineteenth–century development of industrial machinery as *the cause* of industrialization. While industrialization *was* powerfully aided by technological development (to which Babbage contributed considerably), such machinery was inevitably bound with plantation logics of labor discipline that predated the factory. By ignoring race and labor, these skewed histories paint the factory and its "free" labor regimes as a result of scientific progress that has no relationship to the plantation templates for discipline that they replicated and extended.[10]

Babbage and Plantation Management

Babbage's early nineteenth–century theories of worker control helped shape industrial factory management and predated methods later codified under the term "scientific management" by Frederick Winslow Taylor. Babbage documented his ideas on labor discipline in his famous volume *On the Economy of Machinery and Manufactures*, published a year before Britain moved to abolish West Indian slavery. His work built on that of Adam Smith, extolling methods for labor division, surveillance, and rationalization that have roots on the plantation.

In *Dark Matters: On the Surveillance of Blackness*, Simone Browne demonstrates that power over enslaved people was executed through bureaucratic technologies that divided enslaved workers, prescribed their routines and motions, and calibrated their movements with the goal of managing and controlling "every moment of enslaved life."[11] Her work clarifies the interplay between the strict division and quantification of life and labor on plantations, and how such segmentation served to make enslaved people observable to overseers and managers.[12] The fragmentation of production, whether in the field or the factory, shifts power away from those doing the work to owners who benefit from defining and overseeing a coherent view of workers and the labor process. Such a view doesn't emerge on its own. Rather, it is produced through records, metrics, and standardized assessments—and we must understand the term "record keeping" to be a synonym for "surveillance." Monitoring

and quantification of work and workers was the first, and arguably most important, step in populating plantation records. And these records' demands for data and information in turn shaped how labor was divided and managed, in service of making work and workers as visible and quantifiable as possible.

Worker surveillance and control was also a central feature of Babbage's theories. A chapter in Babbage's treatise advises readers on what "data" those wishing to understand and manage factory operations should gather. There are clear parallels between Babbage's data desires and the data and metrics that plantation owners, managers, and overseers shaped plantation labor practices to collect. Both advise creating records on the number of workers needed to complete a task and tracking their speed, individual outputs per day and per task, the tools and implements required to complete work, and the capacities required to accomplish a given effort.[13] For both Babbage and plantation managers and overseers, such surveillance fed into the design and redesign of labor arrangements, alongside distinct regimes of violence and discipline calibrated to increase profits and productivity.

Beyond Babbage's direct calls for data collection (aka surveillance), his work recognizes that dividing workers and segmenting the labor process itself enables further surveillance. Labor division requires employers and overseers to first map and specify each piece of a given job, creating a standardized and measurable system that tasks workers primarily with compliance.[14] This renders the work process (and the people doing it) more easily observable, quantifiable, and controllable. Each task and the expectations that attend it can be prespecified, and thus measurable against a preordained benchmark or set of expectations. Division and stipulation of the labor process also serves to enable "fine tuning" based on the aggregate of such surveillance, creating a feedback loop of managerial oversight and discipline that has at its core plantation logics that view workers as quantifiable, fungible, and amenable to being arranged and rearranged from above. How such "arranging" functioned in practice was, of course, mediated by the category of race, which justified and naturalized the application of violence and bondage it in the case of enslaved Black people,

while tempering such brutality for "free" white workers.

These practices of recordkeeping and surveillance also enable "management at a distance" (or, "control from above"), whether at a space of a few hundred feet or thousands of miles. By representing people and their activities as quantifiable commodities, those wishing to exert control can do so while retaining plausible deniability about the collateral consequences of their decisions. In the case of plantation slavery, management at a distance gave owners some leeway to deny violence and horror, producing an abstracted vision of the plantation as a mechanical device under the control of its operator. Nicholas Fiori quotes a contemporaneous manual for the operation of sugar plantations, which speaks to these fantasies of abstract mechanical control: "'the success of the whole [plantation] consists chiefly in this, as in a well-constructed machine, upon the energy and right disposition of the main springs, or primary parts."

In both factories and plantations, surveillant measurements informed methods of valuation that shaped people's lives and structured the labor process. In the context of slavery, trafficked and enslaved Black people were ranked, rated, and priced for sale or loan based on classifications that had as their central criteria the value of a person's perceived productive capacity. Enslaved people were rated by traffickers, plantation managers, and others profiting from enslavement based on their estimated productivity, their physical appearance, their fertility, and other attributes, with "the primary criterion for assessment being the amount of labor they could perform."[15]

Babbage also proposed mechanisms of worker valuation. In what labor scholar Harry Braverman termed the "Babbage principle," Babbage detailed how dividing a complex task into simpler component parts, and designating these simpler parts "low skilled," could justify paying the people who perform each part less.[16] At the heart of the Babbage principle sits the implied right of an employer to define the value of work and the worker, and to do so by controlling the scope and method of the labor process. Valuation, for Babbage, was pegged

to classifications of "skill," which was assessed based on the scope of the task performed—a scope dictated by the employer via labor division.[17] In attempting to define skill, Babbage resorts to a revealing tautology: the "skill" of a worker is determined by the amount of wages the worker can demand for their work: skill "may be measured by those sums."[18] So, skill can be calculated by the amount of money a capitalist is willing to pay for it. With this circular definition, Babbage acknowledges that skill, like plantation valuation, is ultimately an index of how much profit a person is assumed to be able to produce. It is a reflection of the imperatives and judgment of capital, not the person who performs the work or the nature of the work they perform.

To fully understand how "skill" is deployed by Babbage, we need to return to the understanding of "freedom" at the heart of the emerging industrial labor regime Babbage worked to shape, and to read "skill" alongside the freedom purportedly guaranteed by the contract. In her examination of the politics of skill and migrant work in Qatar, Natasha Iskander shows that the concept of skill is tightly linked to the concept of "freedom"— undergirding labor regimes in which "unfreedom is recast as a reflection or even function of the basic character of the unskilled."[19] Iskander illuminates how designations of skill—and the power that capital claims to define what is and is not "skilled"—work to produce and naturalize conditions of bondage, creating a hierarchy of "deservedness" that justifies conditions of precarity and domination for the "unskilled."[20] The concept of skill is also racialized. In a "free" labor context, "skill" is narrated as something (white) workers possess and serves as an index of the wages a worker can deduct from the profits desired by capitalists—a sum they can, in theory, negotiate or refuse. On the plantation, enslaved Black people were not ascribed the capacity for skill. They were narrated as incapable of possessing skill, and any prowess they displayed was attributed to biological differences that nonetheless marked them as inferior—animal capacity, not human ingenuity. Racial categories structure who is deemed able to possess skill to begin with, while marking a lack of skill as a condition of unfreedom and thus a condition of Blackness.[21]

Babbage's deployment of skill works alongside the contract in the project of creating a category of "free" labor nonetheless disciplined by plantation technologies. Just as the contract and its notions of freedom undergird the conception of "free" labor, so too does the concept of skill. In Babbage's framework, (white) industrial workers are assumed to possess (some) skill, and thus to exist outside of the category of unfreedom ascribed to Black enslaved people. His application of labor division in the project of "deskilling" workers can be read as an effort to *reduce*, but not eliminate, workers' freedom (skill). Babbage accomplished this by claiming for employers the right to define "skill," alongside the right to structure the labor processes in order to strip as much "skill" as possible from "free" workers. Such practices of "deskilling," theorized by Babbage, serve to accomplish and naturalize significant feats of control and degradation while maintaining the presumption of freedom. The setting of wages and working conditions based on "skill" creates a framework (much like meritocracy) in which a worker's pay, labor conditions, and (lack of) agency can be narrated as deserved (they earned this), while the contract vouches for the voluntary nature of workers' labor and their agency in performing it (they chose this). Mediating both is the specter of Black unfreedom, which acts as the object of comparison against which industrial white labor is contrasted and, always, deemed to be "free."

Slavery, Empire, and the Labor Question

For Babbage, the disciplinary function of labor division and surveillance he laid out in *On the Economy of Machinery and Manufactures* was not a regrettable one. The goals his work sets out to achieve assume profits for emerging capitalists are an unalloyed good, while anything that would interrupt these is an obstacle to be eliminated. In this, he was aligned with many of his fellow British elites: during the early nineteenth century, the question of how to discipline labor in the context of worker unrest at home and impending abolition of British slavery in the West Indies was a pressing one. The future of the British empire relied on an answer that maintained the productive capacity required to sustain its economic position.

Here, it helps to remember that championing industry and capitalism was not a commonsense position during the early to mid-nineteenth century, when Babbage was working. In 1830, precisely when Babbage was completing *On the Economy of Machinery and Manufactures*, a new and fierce wave of protest under the banner of the Swing Rebellion ripped through the country. White British workers burned agricultural equipment, destroyed industrial machinery, and distributed radical critiques of industrialization, resisting the encroachment of industry into traditional modes of labor.[22] Nor was it a remote prospect that such rebellion would succeed: the French Revolution's overthrow of the aristocracy was fresh, and it both inspired rebels and provoked alarm among British elites, who feared a repeat.

British industry wasn't the only site of rebellion. The British slave trade was outlawed in 1807, and the years between 1807 and 1833—when British West Indian slavery was officially abolished—were a period of distressed debate in Britain, accompanied by regular uprisings across British plantations. These were also years that Babbage was actively developing his engines and his theories of worker control. Successive "waves of rebellions and resistance" had raised the cost of plantation slavery and helped "shift the capital calculation to the side of 'free labor.'" The scales tipped around December 1831.[23] In what has been dubbed the Christmas Rebellion, enslaved Black people in Jamaica, assisted by Baptist missionaries, rose up in an armed general strike. Their goal was to excise the white managers and overseers and to seize the plantations. Thomas C. Holt emphasizes the parallels between the Swing and Jamaican uprisings: "[b]urned haystacks in England's southern counties mirrored the burned-out sugar works of Jamaica's western parishes," a resonance that was not lost on British policymakers and industrialists.[24] Moreover, in the same way that the goals of rebels in Britain had a precedent in the French Revolution, the aims of enslaved workers in Jamaica were not far fetched: the Haitian Revolution that resulted in the excise and overthrow of French enslavers was living memory for many.

While the worker rebellions in Britain and among enslaved people in the West Indies were

not identical, nor joined by anything like a common cause, together they did exert a common pressure on British elites. This produced a particular set of questions and anxieties. For the British political class, the issue of slavery and abolition abroad and growing industrialization at home was "at its root, a labor problem."[25] The viability of "free" industrial labor was not settled at that time, even as it became increasingly central to British interests. And British policymakers looked for effective models of labor discipline to pacify and control working populations, in hopes of producing workers capable of laboring at the scale and standards necessary for Britain to maintain its place.

Babbage was no stranger to these questions and debates. And while his views on British worker rebellions are clear and well documented (he was vehemently opposed, singling out the Luddites for special opprobrium), his engagement with slavery and race is much thinner. Attending to it helps us connect his work to contemporaneous questions of labor that were roiling Britain. Babbage explicitly mentions race and slavery in his writings, at least once stating his abolitionist position.[26] This is not incongruent: abolitionism was a mainstream view at the time and connotes, in his case, less a commitment to liberation than an optimistic view of industrial capitalism that believed "free" labor regimes were capable of delivering for the British empire.[27] We will focus here on a second instance, following a note Babbage includes in the second edition of his *Ninth Bridgewater Treatise: A Fragment* (where he endeavors to mathematically prove the existence of miracles). The note references a section discussing the cruelty of slavery, taken from 1832 testimony to the British Admiralty on the question of abolition by a Captain Hayes.[28] The testimony itself is excerpted in a long article titled The Foreign Slave-Trade published in the Dec 1835 edition of the London Quarterly Review.

This article includes more than Hayes' testimony. Notably, it also contains a strong argument that because Britain had abolished its own slave trade in 1807, it was morally—and economically—imperative that the nation work to abolish slavery worldwide. Chief among the anxieties that drive this position is the prospect that Britain would be hampered in its

pursuit of international dominance if it were alone in abstaining from the benefits of enslaved labor, leading to "a diminution of British production."[29] Babbage's citation of this article makes clear that he understood the centrality of the "labor question" to discussions of abolition—particularly the question of how, in the absence of brutal enslavement, workers could be disciplined such that they could continue producing for capital without threatening profits. Nicholas Fiori articulates this friction clearly: "in the whitened factory, a different kind of apparatus was needed to refine production and discipline labor, one that attenuated the violence of the plantation while retaining the relation it had established between human and machine—a relation that treated the body as (merely) another part in the production machine."

The Plantation in the Computer

Babbage's work developing theories of factory labor control and his lifelong pursuit of his *calculating engines* can be read together as two approaches to answering the same question: how to standardize and discipline work in service of capitalism and the British empire. It was in endeavoring to build his complex engines, which created the template for modern computation,[30] that Babbage spent the early decades of the nineteenth century visiting factories and workshops in the UK and Europe. And the observations made during these tours formed the basis for *On the Economy of Machinery and Manufactures.*[31] Babbage envisioned his engines as tools of empire, justifying his requests for extensive government funding based on their prospective use in building navigational tables for the British navy. At the time, flawed navigational tables led to many shipwrecks, which imperiled trade and the empire such naval prowess defended.

To understand the link between Babbage's engines and his theories of labor control, we can first look to his view on automation itself. During Babbage's time, the term "engine" was a synonym for "machine" and was applied to the swell of industrial machinery that was used to transform traditional labor practices. His engines take their place alongside other

mechanical tools for labor automation, distinguished by their purposive automation of mental (rather than manual) labor. Babbage understood automation generally—including his engines—as dependent on the division of labor.[32] He observed that "[t]he division of labour suggests the contrivance of tools and machinery to execute its processes," reasoning that "[w]hen each process has been reduced to the use of some simple tool, the union of all these tools, actuated by one moving power, constitutes a machine."[33] Division and rationalization of labor—specification of each piece of a given job in order to render the work process (and the people doing it) observable, quantifiable, and controllable "from above"— was, for Babbage, the enabling condition for automation. Thus, in order to design engines to automate mental labor, Babbage first needed to borrow (or develop) systems of labor division and control.

Babbage created two major "versions" of his engines, with multiple iterations of each: the "Difference Engine," followed by his and Ada Lovelace's "Analytical Engine."[34] To design his Difference Engine, Babbage drew on templates for labor division created by Gaspard de Prony, France's leading civil engineer. Babbage saw the engine as "the mechanical analogue of de Prony's system."[35] As part of a postrevolutionary effort by the French government to standardize measurements across the nation, de Prony endeavored to build a massive set of complex logarithmic and trigonometric tables for the French Cadastre. When he accepted the task, de Prony wasn't sure how he'd do it—there simply weren't enough mathematicians to carry it out. But, the story goes, de Prony encountered a copy of Adam Smith's *Wealth of Nations* and, inspired by the text, he applied labor division to the task of calculation. He segmented human "calculators" into three hierarchical levels, with the largest and "least skilled" level comprising sixty to eighty clerks (many of them former hairdressers to the aristocracy who were out of work following the French Revolution).[36] A scant handful of "most skilled" mathematicians worked to develop the instructions that those in the middle and bottom levels were tasked to follow. Babbage's Difference Engines were explicitly designed to automate the work of the "least skilled" mathematicians—the sixty to eighty former hairdressers—encoding templates of labor division and control.[37]

Babbage's second engine, the Analytical Engine, was designed with Ada Lovelace. Directly prefiguring modern computation, it owed a particular debt to another industrial-era labor-automation device that also relied on rigid structures of labor division: the Jacquard Loom. An evolution of older mechanical-loom designs, the apparatus used punch cards to standardize and enforce complex weaving patterns, while regimenting and disciplining the workers tasked with attending them. (Jacquard, the eponymous inventor, was once thrown into the river by workers furious at being displaced by his loom.)[38] It was the punch cards, inspired by the loom, that constituted the "program" that the programmable Analytical Engine was designed to operationalize.[39] The advantages of the Analytical Engine compared to the earlier Difference Engine are also described in terms of their capacity to do (or automate) more labor than their predecessor, while at the same time regimenting the work of their human operators. Reflecting on these advantages, Luigi Federico Menabrea, an Italian scientist whose description of the Analytical Engine offers us one of the most complete contemporaneous accounts, suggests that it could be capable of replacing not only the third but also the second level of de Prony's mathematical laborers.[40] He also clarifies that "once the engine shall have been constructed ... it will, by means of some simple notation, be easy to consign the execution of them to a workman." This points to the engine's role in facilitating "management from a distance." The engine encodes instructions from overseers ("the first layer"), and workmen are tasked not simply with obeying instructions but with tending a machine programmed to enforce obedience. Implied here is also the engine's role in "deskilling": with the work of specification and programming done by "skilled" workers "from above," the engine itself can be "consigned" to a workman, who can easily oversee the devices without specialized knowledge or "skill."

Both of Babbage's engines were also designed to surveil the workmen who would be tasked with attending them. Their design complexity was vastly increased, and their feasibility decreased, by Babbage's insistence that they print out the results of their calculation throughout the process.[41] Such reflexive documentation is helpful for debugging errors. But it is also, unequivocally, a mechanism for worker surveillance, recording the progress and

potential missteps of whoever would be employed to operate the engines. Babbage's impulse not only to surveil, as we've already seen, but to automate surveillance is evident elsewhere. Among his many mechanical contributions is an early time clock, the "tell-tale," which worked to record a worker's presence or absence and "informed the owner whether the man has missed any."[42]

While the bulk of Babbage's writing sings the praises of automation and mechanization, the benefits he names always accrue to capitalists—including the disciplinary check that automation provides "against the inattention, the idleness, or the dishonesty of human agents."[43] Only briefly does he acknowledge automation's downsides for workers, in a chapter of *On the Economy of Machinery and Manufactures* where he also excoriates worker organizing. He argues that when workers strike, capitalists get desperate, and that this desperation provides increased incentive to replace the striking workers' labor. In such circumstances, new mechanical innovations arise that serve to replace workers, allowing employers to break a strike via automation. For Babbage, this proves that organizing and withdrawal of labor does not benefit workers, even as it can impel innovation.[44] Revealed here is Babbage's awareness of the disciplinary function of automation itself, as a tool of control that builds on and extends the disciplinary features of labor division.

The architectures of Babbage's engines are bound with his theories of labor control, and his engines served as one of the multiple mechanisms by which he sought to discipline workers. And at the root of his larger project of industrial labor discipline lie plantation logics and technologies.

Redefining Freedom

Connecting Babbage's theories of worker control and his architectures for computation is a unified objective: the discipline of purportedly "free" labor such that it could continue to produce for the British empire. The templates for worker control that shaped Babbage's contributions to computing draw on technologies created on the plantation, which were

already actively applied to control rebellious workers in industrial factories. The links between computation, plantation technology, and industrial labor control raise questions well beyond who gets to control systems of automation and computation in the present, assuming that systems controlled by those with benevolent intentions will produce positive outcomes.They request that we engage in more fundamental inquiries, examining the technologies of control that structure the core logics of computation and attending to the enabling conditions in which computational technologies are designed to work—the imaginative landscape that we structure our relations and practices to accommodate. As we see with Babbage's engines, this landscape presumes the presence of plantation technologies of labor division, surveillance, and control "from above": Babbage's engines "work" only within these contexts. The specter of the plantation that hangs over computation and industrial labor regimes also speaks to the need to revisit the terms of "free" industrial labor, and to recognize the contested process through which this particular category of "freedom" was created and guaranteed. To do so, we must directly confront the unmarked presence of Black unfreedom that haunts "free" labor and reweave links that have been strategically severed between race, labor, and computational technologies. My hope is that such analysis can help identify leverage points for change, and shift attention from tinkering at the edges of technologies of control to articulating futures that claim the right to redefine categories of freedom.

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1. Welcome exceptions to this pattern, which do foreground and theorize this connection, include: Dan Mcquillan, *Resisting AI: An Anti-fascist Approach to Artificial Intelligence* (Bristol, UK, Bristol University Press, 2022), 25; Nathan Rosenberg, *Exploring the Black Box: Technology, Economics, and History*, (Cambridge, UK, Cambridge University Press, 1994), 24-46; Sun-ha Hong. "Prediction as extraction of discretion." Big Data & Society, 10, no. 1 (2023); Matteo Pasquinelli. "On the origins of Marx's general intellect." Radical Philosophy 206 (2019). 43−56; Stein, Dorothy K. "Lady Lovelace's Notes: Technical Text and Cultural Context." Victorian Studies 28, no. 1 (1984). 33−67; Schivelbusch, Wolfgang. "World

Machines: The Steam Engine, The Railway, and The Computer." Log, no. 33 (2015). 54–61

2. Charles Babbage, *On the Principles and Development of the Calculator and Other Seminal Writings*, ed. Phillip Morrison and Emily Morrison (Mineola, NY: Dover Publications, 1989), xi.

3. Of course, this division itself is fraught and often applied more to connote the status of labor than the capacities required to perform it.

4. Thank you to Veena Dubal for this insight and framing.

5. I am grateful to Stefan Ouma and Saumya Premchander for emphasizing the importance of maintaining the particularity of these distinct regimes. See Stefan Ouma and Saumya Premchander, "Labour, Efficiency, Critique: Writing the Plantation Into the Technological Present-Future," *Environment and Planning A: Economy and Space* 54, no. 2 (2021): 413–21.

6. Ouma and Premchander, "Labour, Efficiency, Critique."

7. Caitlin Rosenthal, *Accounting for Slavery: Masters and Management* (Cambridge, MA: Harvard University Press, 2018), 14. As scholar Simone Browne also makes clear, these forms of punitive worker management rooted in the surveillance and classification of Black people and were totalizing, applied throughout all of life in ways that highlight the insufficiency of the category of "worker" to capture the full implications of such regimes.

8. Thomas C. Holt, *The Problem of Freedom: Race, Labor, and Politics in Jamaica and Britain, 1832–1938* (Baltimore: Johns Hopkins University Press, 1992), 38.

9. Rosenthal, *Accounting for Slavery*, 100, 112, 119.

10. This is similar to the narrative relied on by gig-economy companies like Uber and Lyft. The marketing of these companies painted their business model as reliant primarily on innovative technology that, they promised, would lead to a new kind of economy. As Veena

Dubal notes, this technophilic narrative masked the reality that these companies primarily relied on regulatory arbitrage and labor law noncompliance to fuel their business. See Veena Dubal, "A Brief History of the Gig," *Logic*, May 4, 2020.

11. Simone Browne, *Dark Matters: On the Surveillance of Blackness* (Durham, NC: Duke University Press, 2015), 51.

12. Rosenthal, *Accounting for Slavery*, 111.

13. Charles Babbage, *On the Economy of Machinery and Manufactures* (1832; repr., New York: Augustus M. Kelley, 1963), 65; Rosenthal, *Accounting for Slavery*, 88.

14. Ursula M. Franklin, *The Real World of Technology* (Toronto: House of Anansi Press, 1999), 8.

15. Daina Ramey Berry, *The Price for Their Pound of Flesh* (Boston: Beacon Press, 2017), 41.

16. Babbage, *Machinery and Manufactures*, 101.

17. "That the master manufacturer, by dividing the work to be executed into different processes, each requiring different degrees of skill or of force, can purchase exactly that precise quantity of both which is necessary for each process; whereas, if the whole work were executed by one workman, that person must possess sufficient skill to perform the most difficult, and sufficient strength to execute the most laborious, of the operations into which the art is divided." Babbage, *Machinery and Manufactures*, 100; Harry Braverman, *Labor and Monopoly Capital: The Degradation of Work in the 20th Century* (New York: Monthly Review Press, 1998), 55.

18. Babbage, *Machinery and Manufactures*, 107.

19. Natasha Iskander, *Does Skill Make Us Human? Migrant Workers in 21st Century Qatar and Beyond* (Princeton, NJ: Princeton University Press, 2021), 13, 46.

20. Iskander, *Does Skill Make Us Human?*,14.

21. Iskander, *Does Skill Make Us Human?*, 38

22. Carl J. Griffin, *The Rural War: Captain Swing and the Politics of Protest* (Oxford: Oxford University Press, 2012), 5, 192–93.

23. Holt, *Problem of Freedom*, 14.

24. Holt, *Problem of Freedom*, 51.

25. Holt, *Problem of Freedom*, 33.

26. We see him express casually abolitionist views in a snapshot from the *Times*, which covered a campaign event for his ill-fated run for office in 1832. In response to a question as to whether Irish Catholics should be forced to pay taxes to the Church of England, "Mr. Babbage told them he held Negro slavery in abhorrence; pray was he prepared to emancipate the English labourer from the tyrannical control of parson justice?" Quoted in Anthony Hyman, *Charles Babbage: Pioneer of the Computer* (Princeton, NJ: Princeton University Press, 1985), 84.

27. Many capitalists in Britain were also in favor of abolition due to a desire to eliminate the tariffs placed on commodities produced by non-British colonies. These tariffs were seen to unfairly inflate prices on commodities required by industrialists and factory owners. See Archana Tewari, "The Reform Bill (1832) and the Abolition of Slavery (1833): A Caribbean Link," *Proceedings of the Indian History Congress* 73 (2012): 1140–47.

28. "The Foreign Slave-Trade," *London Quarterly Review* 55, no. 109 (December 1835): 136.

29. "The Foreign Slave-Trade," 145.

30. Joseph Henry of the Smithsonian emphasized the importance of this work to the British empire when he noted that "everything which constitutes the chief element of international

commerce in modern times, depends upon the fullness and accuracy of the tables." Quoted in Hyman, *Charles Babbage*, 49.

31. Babbage, *Machinery and Manufactures*, iv, 5.

32. Babbage, *Machinery and Manufactures*, 164, 173, 174; Adam Smith, *The Wealth of Nations* (1776; repr., n.p.: Neeland Media, 2004), 22. Smith also appreciated the deskilling and atomization that such divisions produced for workers. Dividing labor made each part of the work process into its own "peculiar trade," allowing workers to become skilled at a subpart of the work process, as opposed to the process as a whole.

33. Babbage, *Machinery and Manufactures*, 173.

34. The Difference Engine was envisioned as a complex automated calculator that would use the method of divided differences to compute polynomial functions, useful for producing complex mathematical tables much used in navigation. The Analytical Engine was designed to offer flexibility that the Difference Engine did not, allowing those operating it to "program" the engine via punched cards. Modern computing only moved away from the punch card in 1970s, and the Analytical Engine laying out the basic architecture for digital computation that persists today, introducing separate memory ("mill") and processing ("store") components, and an input/output system, all choreographed via the program encoded on the cards. Neither were completed during Babbage's lifetime.

35. Hyman, "Charles Babbage," 50; James Essinger, *Jacquard's Web: How a Hand-Loom Led to the Birth of the Information Age* (Oxford: Oxford University Press, 2007), 62, 73.

36. Essinger, *Jacquard's Web*, 60–62; Babbage, *Machinery and Manufactures*, 109–11.

37. Babbage, *Machinery and Manufactures*, 111.

38. Essinger, *Jacquard's Web*, 40.

39. Essinger, *Jacquard's Web*, 86–88.

40. I credit this insight to Ron Eglash, "Broken Metaphor: The Master-Slave Analogy in Technical Literature," *Technology and Culture* 48, no. 2 (2007): 360–69. See also Luigi Federico Menabrea, *Sketch of the Analytical Engine Invented by Charles Babbage*, trans. Ada Lovelace (1843; repr., n.p.: Quaternion, 2020), 3. In her detailed notes which accompanied her translation of Menabrea's article, Lovelace assures readers that while its powers (to automate and displace labor) are great, the Engine will remain under "our" control: "It can do whatever we know how to order it to perform." Here we see a perfect encapsulation of the tension between the will to automate and control others' and the fear that such automation could potentially expand to control "us" as well as "them."

41. Hyman, "Charles Babbage," 51.

42. Babbage, *Machinery and Manufactures*, 36.

43. Babbage, *Machinery and Manufactures*, 36.

44. Babbage, *Machinery and Manufactures*, 162–63.

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