

The Human in Bits



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the HUMAN in BITS

Graphical Computers, Black Abstractions

Kris Cohen



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Introduction: The Human in Bits

Point, line, diagram; bit, field; grid, raster: this is the idiom of Howardena Pindell's work in the 1970s. Maybe one finds this austere as a description or a modality of artistic practice, but then, in relation or opposition to what? That will become a key question in what is to follow—which forms of personhood, particularly racialized personhood, rely on, and even need certain cordons to be drawn around technical vocabularies, technologies, and technologized forms of being? The visual forms that correspond to the idiom I've given them span Pindell's punched paper work and her video drawings, otherwise separated by the biographical fact that the latter began as her relief from the bodily tedium and strain of the former. The television she purchased and then photographed to make the video drawings was at first intended simply to vary the focal length of her eyes in relation to the strenuous work she had been doing with dots, points, thousands of bits that were no larger than one-eighth of an inch and that she often marshaled to populate massive canvases—in the case of *Untitled* (1973, plate 1), 17½ inches tall and 90¾ inches long. A paper collage, Untitled is a vast field of hole-punched dots, each dot inscribed with a handwritten numeral. The numerals span one to twenty thousand, but are not arranged in any discernible order.² So the numerals and their medium evoke an order without being themselves ordered beyond their existence in a particular and consistent numbering system and their in-

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scription on the strictly gridded dots. As with anything that exists at two such extremes of scale, the dot field appears highly ordered from a distance, and far more chaotic up close.

The video drawings, such as *Video Drawings: Swimming* (1975, plate 2), are more modest in size. *Swimming* is 14 × 16 in. Here, too, we find system without order or systematicity, implied but not given. Arrows and numerals diagram the field of an image photographed from the TV screen, a process that makes the screen's own scan lines palpable as so much interference, or so much medium. In *Swimming*, the top fourth of the field is obscured or blotted out by something that obstructed the camera lens. Just below that, as though the figure had just fallen out of this obscure top fourth, a diver unfolds out of a pike, just starting to direct their own fall. The lane lines of the pool sit askance the scan lines of the screen—two systems, uncollated, except by their copresence here in this image. There is no sense in which the body with perfectly pointed toes exists free of any of the systems invoked here. The body is multiply embedded, multiply mediated, multiply transcoded.

Both sets of works give a formal delimitation to a social problem that requires a technical vocabulary: what could it mean to be a bit in a field? The question applies as much to the act of making these works as to the scene of dwelling with them. What could it mean to exist for all those hours with, if not as, points in a grid, at least insofar as one is willing to conform one's labor to those constraints? Were they constraints? If so, on what? What form of collectivity is a field stratified as bits? What are its histories, and how black or blackened were they? How were those histories related to the history of whiteness and its need for more flexible genres of control in the seventies?³

Of course, to watch television in the seventies on a bulbous cathoderay tube (CRT), itself a raster field composed of bits called pixels, or even to trace from that field at a distance, is not automatically to become a bit in that field. That was a fear from previous eras of white power, when heterogeneity—forms of difference as light as the shade of khaki and as heavy as an identity—might feel like shelter from an imposed homogeneity. The move from *viewing* to *being* in the video drawings was Howardena Pindell's play, effected in her willingness, maybe desire, to let her labor take form through the raster of a gridded field, to meticulously, minutely occupy the life of bits, to scan bodily from bit to bit across that field, to accede to those currents, to alter (even damage) her body in the exacting movements this required, all of it forcing Pindell to seek relief from one set

of screens in another. How are Pindell's diagrammed televisions and dot matrices, the forms of collectivity they offer and enforce, part of a black desire for freedom—not just freedom from the violence of whiteness, but freedom from the entire surround of whiteness seen together with its tawdry offers of inclusion? What was the collectivity of bit and field in relation to the long American history of, on the one hand, racist collectivisms (delimited by biology or skin and, later, in diversity), and, on the other, the collectivities of the black radical tradition that wanted nothing to do with either those racist enclaves or that which they would exclude?⁴

Pindell was not the only one sitting with such questions. Why did so many black artists in and after the sixties start to work with the grid and gridded structures? Alma Thomas's organicist plots, Adrian Piper's early permutational algorithms, William T. Williams's shattered screens, Peter Halley's circuit boards, Tom Lloyd's eight-bit pixel maps, Jack Whitten's "digital abstraction," Lorna Simpson's photo-textual systems, Charles Gaines's transpositional rasters, Lisa Corinne Davis's elastic grid land-scapes, Julie Mehretu's massive networked paintings, American Artist's *Black Gooey Universe*.⁵

As with Pindell's work, it is the willingness, the consent to dwell inside the problem of the gridded field, that should caution us against assuming we know who the enemies are here—technology, on one side, and life, on the other. But that is how the lines have been drawn . . . when, that is, the question of race is left unspecified. In Rosalind Krauss's defining, if ambivalent, take on the grid, that structure sits at the fulcrum of an epochal antagonism between aesthetic expressivity and the rationalizing technologies that have, for critics who share Krauss's commitments, overscripted modernity. There, two distinct possibilities hang in the balance: that modernism would find a way to defeat deadening rationalism on rationalism's own turf, or, that modernist rationality would claim art for its own, too.

The grid has always had other and longer histories, of course. But by the sixties in the United States, and certainly by the late seventies when Krauss published her essay, the technology of the grid had already quietly slipped out of Krauss's defining antagonism to take up its place in another scene altogether. This escape was facilitated by military funding that aimed to transform the computer from a simple and brute tool of computation, at best a sophisticated servant for crunching numbers, to something that would come to take up a position in proximity to, even inside of, the human: a personal computer, a computer of the person-form. There,

it would redefine the terms by which that human form can be known and lived while reimagining the kinds of labor and work that the computer user could be incentivized to produce. And it is this proximity, this intimacy fused to this "extimacy," that eventually makes race itself come to be legible as a technology.⁸

The history of the personal computer *is* a history of the desire to transform what a human was by way of a transformation of how and in what environments humans were to exist—whether working, playing, or idling. To accomplish this, the personal computer collapsed screen and computation in multiple ways, across multiple registers of meaning (from the visual to the logical). The enabling technology of this powerful collapse was the grid or raster of the screen made graphical. It was the screen's grid, turned immanently computational, that made it an infrastructure for information and, in what would become a near synonym, for life. The aims of this platform, the rastered screen or graphical field, were expressly to be the reorganization of personhood, now to be seen as augmented by or made symbiotic with information, and thereby with the computer.

The densest concentration of this *graphical* history has been in the field of the graphic user interface, or GUI—that ensemble of icons and windowed space, extended within pull-down menus, enveloped within an encompassing desktop metaphor, navigable by the prothesis of mouse and pointer, and all arranged in space meant to feel open, even free, not despite the raster but because of it. The GUI is most often associated with Apple Computers, although Apple is not where it was born, nor does Apple's interface design, however iconic, mark the limits of its influence. This particular graphically organized space will be intimately, muscularly, even painfully familiar to anyone who has ever used a personal computer.⁹ That space has become the very site for the elaboration of personhood in computational and networked contexts. Contestatory, ameliorative, complicit . . . the mode or spirit of that elaboration barely matters (input alone was what mattered), even though it is tempting to want will, choice, decision (those technologies of liberal personhood) to matter, even to matter anew in that space. And the designers of the graphical interface of the personal computer were certainly driven to make those technologies matter anew, which is one of the reasons that their efforts were an investment in and reimagination of whiteness as well as an updated disavowal of that very fact.

Computer history knows this story as the invention of the personal computer, computer graphics, and eventually the GUI, and it has told

this story in some detail.¹⁰ Art history hasn't cared much about this history, although it has cared intermittently about certain abstractions it calls "screens" or "windows" and about a certain visual culture of computing and new media. 11 Media studies has returned to this history again and again, but, when loyal to a set of supercharged materialisms, it has sometimes dismissed it all as part of a fetishistic focus on the screen and visuality at the expense of other, supposedly more materialist aspects of computation. I'll refer to it as a history of the graphical. That phrase, describing not an invention so much as a slow process, gestures at the centripetal, but also centrifugal, expansion of the logics of the graphical interface out toward cultural and political spaces and the politics of the human. 12 Where the centrifugal and centripetal forces of the graphical intersect, there we find experimentation on the boundaries and capacities of the human itself. And so this is the place where a history of the graphical comes to intersect with a history of aesthetic experimentation in and around black abstraction and black abstractionists. 13

For black artists working in parallel with these developments, the grid could never have comfortably fit Krauss's antagonism. Their history within the surround of whiteness, however they chose to live and reconceive it, had always wanted to violently situate them on the side of the deadening techno-rationalism that the human—the hero for Krauss and others of an embattled modernist art practice—was tasked with resisting. 14 Katherine McKittrick teaches us how to see this defining antagonism as itself a technology of racialization: "This is where we begin, this is where historical blackness comes from: the list, the breathless numbers, the absolutely economic, the mathematics of the unliving."15 McKittrick considers the long entanglement of black life with numbers, with numeracy, with what she calls data—the ledgers of slave ships, police records, sociological data about "bad neighborhoods," digital videos of police violence coded with the metadata of hashtags, the foundational technologies of the digital computer. These are the various technologies for recording black life in order to extinguish that life. 16 As such, data, or mathematics, the quantification of life itself, has been one of the particular constraints on and scenes of possibility for blackness.

This means, of course, that mathematics, seen as the encoding of life in numbers such that life can be managed unto or in proximity to death, has also been one of the specters of blackness that haunts a white imagination (whiteness has always been haunted by the products of its own violence): that is, one of the various conflations through which black-

ness has been apprehended, misrecognized, violated.¹⁷ But to return to, by way of one last move away from, the antimonies that structure Krauss's grid, this threat of becoming data is importantly distinct from one of the more iconic threats that has organized various discourses of postwar modernity: the threat of anonymity, becoming a mere cog, the erosion of self-possession and individuality in becoming part of a vast machinery. 18 The defenses arrayed against anonymity, facelessness, or getting lost in the nonindividualized address of television or of any mass address assertions of autonomy, exhortations to individuality, an entire technical and psychological apparatus dedicated to shoring up the boundaries of individualistic self-possession—do nothing to protect against the threat of becoming data, which thrives precisely on quiddity, on heterogeneity, and especially on public attestations to the uniqueness of one's life. ¹⁹ This might not have been obvious to people who committed themselves to an American discourse of individuality in the immediate postwar period; or maybe it was, under the spell of a rush to the postracial. Now, it is obvious enough that social media has monetized individuality itself. No one who ever once entertained the fantasy of exhibiting their individuality online now knows how to escape that vaunted individuality.

McKittrick's account of modernity's other threat—the threat of mathematics, of data—helps us see how the history of the personal computer, and of the graphical field as a space for a labor of self-elaboration, needs to be seen as a technology for the recuperation of whiteness. Here, a driving anxiety of modernity is the fear of becoming numerical: not just a number among others, but a number in itself, a bit in a field. This is a story, in other words, about the fear of fungibility, not anonymity, of being interchangeable as well as endemically available to be read, to be understood from the outside, given as so much information.²⁰ I will address fungibility most directly in chapter 4 because Charles Gaines's work with systems aesthetics has long contended with the problem of freedom seen not in relation to the faceless mass but to fungibility, that other American "origin story." From the perspective of an embattled whiteness, seeking new footing after the world wars, in an American state that was itself seeking new footings for democracy and liberalism in the wake of World War II, those are fears not just about the computer and computation, but about blackness and its long historical enmeshment with data, with math, with encodings of life that make it both immanently available and extensibly interchangeable.21



The graphical field of the personal computer is a space in retreat from that threat, and so it is shaped by it. This story matters now precisely because of the proliferation of fantasies of autonomy, individuality, and liberal freedom that are fostered in and in proximity to the graphical field. Think here of Apple's famous 1984 advertisement. In airing its Cold War allegory during Super Bowl XVIII, Apple set the stage for the personal computer to go to war with the authoritarianism of television, of mass spectatorship: the personal (computer) against the mass (television). The athlete's body—its femininity indelible, but butched up to signal its autonomy from such social norms—wages a war where creative expression is the only weapon that mattered. This is what Apple offered to host in its newly graphical screens: life itself, so long as that life embraced difference as its platform. The graphical field doesn't cause these fantasies; there are myriad mechanisms for that. The entirety of America's nationalistic machinery often seems committed to sustaining the fantasy of individuality, rehabbing it whenever the fantasy grows tired (as we've seen so virulently during the COVID-19 pandemic, which has sent those machineries of individualism into hypertrophic death drive). But the graphical field was a crucible. It is now a host, the literal site where the labor of those fantasies gets elaborated, substantiated, recuperated, renewed \dots lived \dots for the benefit of some, still requiring the slow death of others. 22 But we will also have to note the ways that graphicalization changes the valences of that otherness.

A broader story here is the shift in the politics of race from a representational to a nonrepresentational matrix. This book generates a few idioms for the nonrepresentational logics that we find wherever humans and computers tend toward indistinction: operational, in the language of the first chapter, there adapted from art historian Leo Steinberg and computer historian Jacob Gaboury; but also, more simply and more overarchingly, graphical, itself a kind of synonym for, because an operationalization of, nonrepresentational logics. As we'll see more clearly in the pages to come, the graphical is nonrepresentational because of its commitment to fostering the self in its "ongoingness"; tethered not to what was but to what can be. 23 In this privileging of futurity over what has been, of what can be made over what can be re-presented, the graphical accommodates the representational as so much content. The work of Ramon Amaro, Louis Chude-Sokei, Grace Kyungwon Hong, Jodi Melamed, Christine Goding-Doty, Katherine McKittrick, W. E. B. Du Bois, and others lays the groundwork for thinking about race in a nonrepresentational matrix.²⁴ The graphical field

of the personal computer makes such a matrix a space for life, including of course representations of life viewed and lived in all of their complexity.

Part of this story is told by Jodi Melamed, Grace Kyungwon Hong, and the feminists of color on whose work they build. Together, they have allowed an understanding of the late twentieth and early twenty-first centuries that revolves around the new palatability, and even popularity in some liberal circles, of an official antiracist stance that recognizes, in order to monetize, difference—when and only when difference is understood through the corralled representational logics of diversity and inclusion.²⁵ Melamed calls the 1940s–60s, which inaugurates my own study, a time of "racial liberalism." That period is succeeded by the "liberal multiculturalism" of the 1980s–90s. Both are periods in which whiteness gets rehabilitated by its newfound capacity to include more than just white people in the category of the human—so long as those who are to be included agree, explicitly or tacitly, to accept the basic neoliberal premise that a world realized as a free market has once and for all leveled the playing field, opening a clear path to the good life for anyone willing to be hailed by that call. There are entire genres of Twitter feeds, often authored by white men working in the tech industries, that play out this logic in their allegiance to meritocracy, to color-blind hiring practices, to neutral algorithms, and to the guiding ethos of *On the internet no one knows you're a dog.*

The list of milestones that have been said to mark the end of any sort of racial deficit in America is long, beginning with slavery itself, often justified by those who benefited from the institution as a kind of humanitarian, "civilizing" mission. These alibis extend beyond the formal end of slavery where individuation was the price the newly freed had to pay for a freedom that would perpetuate the ongoing logics of the plantation. Individuality itself was the key technology here. And those plantation temporalities feed forward, into and through racial liberalism and the different promises of freedom that the personal computer, with its graphical screen, whispers to users and materializes as an empty space for self-elaboration.²⁶

In Sylvia Wynter's terms, this history is structured by the logics of "dysselection." The graphical screen of the personal computer—by which we might as well mean the personal itself, given the personal computer's ubiquity—helps to set the standards for what would come to be understood as success: are you creative, a self-starter, independent, good at networking, at finding and sifting data? The graphical field thereby defined the parameters within which unsuccessful groups could be identified in

terms that felt less biological, less epidermal, less cultural, and more about who is good at navigating the present tense and its labile scenes of value production.²⁷ Key to Wynter's formulation, though, is that the dysselected are those people who can be seen as neither successful nor unsuccessful. They are, rather, the people who are illegible precisely by those standards. Failure carries with it the potential for redemption, always given in terms defined by the successful. So while failure and success are starkly different subject positions in terms of the allotment of resources, they together form a single recursive system, a self-reproducing set of values.²⁸ This is how, like McKittrick's thinking about mathematics and black life, Wynter offers a full-scale reconceptualization of modernist melancholia, rendering the otherwise epochal tension between alienation and freedom, the grid and the human, as just so much intramural whiteness. As Clyde Ford's memoir about his father's time as an early computer engineer at IBM makes painfully clear, whiteness comes to understand itself in the period of the personal computer's development not as a racial formation so much as a disposition toward success and toward the present tense—that is, not racial at all from its own perspective. ²⁹ It is a disposition that defines what counts as success, which makes success come to seem equally accessible to all, given the right attitude. In the context of the world the graphical field helped make, whiteness shifted, slightly, from being an atmosphere encompassing the smooth operation of a massive system of domination and violence, to being an attitude toward the present divorced from historical violence precisely by the power of one's attitude, one's disposition toward a world understood to be a "free market," a space of unrestricted movement such as was visualized and made operational, at the level of the personal, by the graphical field of the computer. As such, whiteness made allowances for people who were nonwhite to join their ranks, but only if the standards for success were strictly adhered to. This was the work to which the graphical interface was yoked, the forms of self-elaboration it was designed to accommodate.

This line of thought is important for media studies and for art history precisely because it registers what has always been nonrepresentational in race and racialization, and what is specifically nonrepresentational about the graphical field and computational technologies more generally. Even while computational and networked technologies have rekindled hopes that representational politics have finally found their most empowering medium in the internet, those same technologies work beyond representational politics at a technical level, and at social, cultural, and political

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levels as well. This perspective turns out to be as crucial for reckoning with computational technologies such as the graphical interface as it is for reckoning with black abstract aesthetics. While an efficient view of the history of black abstraction posits that the enjoinment to represent black life, or what Darby English calls the strictures of "black representational space," started to loosen after the Black Arts Movement, recent work on the Black Arts Movement has given us reason to think that nonrepresentational tactics teem, if quietly, in work made by black artists before and after the official discourses of abstraction. The chapters on Alma Thomas, Jack Whitten, Charles Gaines, and Julie Mehretu bear out this thought. The graphical form or modality of personhood this book tracks from its coalescence in the fifties (not emergence, nor origin—those are far older and more dispersed, as I'll hope to at least suggest) to its exhaustion and ubiquity in the aughts, is importantly nonrepresentational both in its technicity and in its operation as a mode of subject formation.

I call this form of mediated personhood "graphical" after the graphic user interface, or GUI. But the GUI isn't my only or even primary case, even if it is an instigating one. While the history of the GUI plays a key role, to see the graphical in the full flight of its ambitions, we need to range across a number of cases where that mode of personhood was encoded, elaborated, and insistently racialized—where, in other words, personhood was adapted or seen to be adapted for a graphical field that was to be both its training ground and its field of elaboration. These include: the gendered and racializing politics of early twentieth-century experiments in the scientific management of labor; postwar exhibition design and its attempts to recuperate racial whiteness for new democratic modalities of citizenship; and early computer research groups working out the forms of the computer's interface.

The remainder of this chapter will be spent dwelling in those three scenes, elaborating the role each plays in the larger gathering of the graphical as a system for producing personhood. In the following chapter, as a bridge to the rest of the book's focus on art practice, I look closely at art historian Leo Steinberg's thinking about "operational processes" in relation to midcentury painting, postindustrial labor, and cybernetics. Here I draw the conceptual and technical work of the current chapter into an explicitly artistic register, showing how the graphical was always an aesthetic proposition. The following chapter, in other words, addresses the question of why artistic practices are part of this story at all.



The diffraction patterns created when the latter history of artistic practice is laid over the former history of the technological gathering of the graphical is where this book lives. The GUI is, in other words, just one of a cluster of historical cases that I think register the impacts of this mode of graphical personhood. If the GUI assumes some priority here, it's not because it was first or most important; it's because it and its technological afterlives so explicitly worked to recondition whiteness for a period where information would come to subsume so many regimes of personhood, both imposed and chosen. But if the conditions for the elaboration of whiteness have changed, one thing about whiteness remains consistent here: it is not a subjectivity or an ethnicity or even a culture. It is a vast latticed structure of violence masquerading as an attitude that both requires and generates differentiation and individuation, or what scholars in media studies sometimes refer to (usually with no reference to racialization) as discretization.³¹

The graphical doesn't name a medium or mode of representation so much as a scene of concatenation, accommodation, and adaptation: human to computer, human capacity to computer capacity. This involved an explicit project of changing the very nature of the human. So it couldn't not be a racializing project, insofar as the human itself has been a lively site of race work.³² The graphical computer screen becomes the primary space where the human would be adapted to the imperatives of communicating with and through information. It was and is not the only such space. And while a kind of technological imperative motivates each of the scenes that I sketch in what follows, each scene's interest in the fate of the human after World War II also makes it a site for the rehabilitation and reform of whiteness itself, but now traveling under the new universalism of the diverse, the multicultural, and, eventually, the postracial. All of this, of course, took time to achieve, and no one site instigates, completes, or stands in for the story as a whole. The GUI, a center of gravity for my own project because of its ubiquity today, isn't the first or most important engine of graphicalization, nor the only site where its terms were elaborated and contested. It is simply, now, omnipresent, ineluctable, unavoidable. But it is also true that the GUI does encode within itself—inside all those managed windows and folders, those scenes for managing the self—the various ambitions articulated in the disparate cases that round out this chapter.

In what follows, I track the formation and logics of the graphical through three disparate scenes, scattered throughout the twentieth cen-



tury, each of which gathers together some of the ways of thinking that would be necessary to entangle computers, labor, and humans in the field of the graphical: first, the work of the Gilbreths (Lillian and Kenneth) and the labor and management systems they initiate in parallel to Frederick Taylor's own systematizations of labor; second, the exhibition strategy that Fred Turner calls "surround media" and its role in the *Harlem on My Mind* exhibition at the Metropolitan Museum of Art in 1968; and third, the work of Douglas Engelbart to transform computing by conceptualizing an early graphical computer interface. This third case acts, in the geometry of history, like something of a knot, where historical threads enter into the field of Engelbart's work, get tangled, and exit in different configurations.

All these scenes mark the shifting relationship between labor and personhood that was endemic to the era that witnessed the birth, spread, and eventual dominance of the graphical computer screen. Not all mark race as part of their explicit and self-conscious discourse, but all move in and through the racial politics of the postwar period in the United States and the renewal of whiteness that was so central to the various projects of the burgeoning tech industry.

The Managed "I"

Alan Liu has, more than most, helped us pay attention to the formal significance of the graphic user interface. His book *The Laws of Cool* (2004) is worth quoting at length. Here is how he introduces the graphic user interface, or what he calls the "user-friendly interface of knowledge work," by which he means the interface to an entire socioeconomic and cultural period of history:

Turn on a networked personal computer today, and the face of information looks quite different. Instead of a character-based monochrome screen, we see the descendant of the bitmap approach first devised in primitive form in the 1960s by researchers at The Stanford Research Institute's Human Factors Research Center and the University of Utah's Computer Science Laboratory. The approach was further developed in the 1970s by the Xerox PARC group, before being adopted in 1984 by Apple for its groundbreaking Macintosh and finally brought into the corporate mainstream in the late 1980s and 1990s in the successive revisions of Microsoft's Windows

operating system.³³

Liu continues:

We see a graphically bitmapped main "window" whose menu bars and office-themed visual icons (file folders, trash cans, calendars, phones) construct a metaphorical "desktop," the great landscape of the cubicle. Above all, the function of such a desktop is to coordinate (and also subordinate) operations and modes. Clicking on desktop icons, for example, initiates sequences of actions or opens up individual windows that, as [Steven] Johnson points out, are what we now have instead of "modes." Or, rather, such windows obviate the awareness of modes by making mode switching as much as possible a matter of "direct manipulation." . . .

Nor does the modeless coordination of computing stop there, for with the advent of tightly integrated application "suites," individual word-processing, spreadsheet, database, or e-mail programs display what amounts to whole interior desktops complete with cross-application menu bars, templates, embedded program "objects," and "wizards" designed to stitch all the suite into a single, virtual work surface.³⁴

Liu's attention to the design of the GUI then turns symptomatic: "In reality, as both Johnson and the cyberpunk novelist Neal Stephenson (in his nonfiction *In the Beginning... Was the Command Line*) have argued, the user-friendly interface is symptomatic of a whole way of relating to culture." 35 Liu brings this line of thought to a head when he implies that there are essentially no boundaries to the graphical field as it exists in and as the very substance of today's world: "And since the desktop is now networked, there is in principle no outer horizon to that single work surface." 36

What Liu describes, across this whole symptomatic chain, are various modes of systematization, including those that traveled under what might seem to be the ideologically opposed concepts of "decentralization" and "distributed centralization." Liu links all these forms of systematization, by way of genealogy, to Frederick Taylor. Where Taylor systematized physical labor, the personal computer and its graphical interface systematized knowledge work—the labor that, in Liu's history, best defines the contemporary period his book describes. It is through the dispersive logics of decentralization that those technologies could issue their ultimate promise: democratization. Decentralization, in Liu's account, all but requires what he calls connectedness and consistency, something achieved by the

internet protocols that made personal computers as well as their graphical environments systemic and pervasive—in fact, impossible to escape.³⁷ So while the promises Liu historicizes are all voiced in a democratic mood, the specter Liu identifies, again and again, is of a minimally updated threat of homogenization—of everything becoming the same under the impress of systematization. And what rushes sharply into relief, in any account of homogenization, is the individual, that bastion of resistance to the forces of sameness, that fragile form of selfhood forever threatened by modernity's forces of homogenization. Who is this resistant individual? What sustains a faith in their coherence and political importance? And what if the individual isn't that which is threatened by the graphical field and its modes of systematization, but is itself the danger?

Liu is led to this account in part because of his genealogical approach, his looking back to Taylorization for the ideological roots of knowledge work and the technical forms, such as the GUI, that propagated it. The story of Taylorization is always one where individuals are lost to a system: overridden, erased, violated precisely in their individuality and autonomy. It is always a melancholic story, where the lost object is individuality. And so, histories of Taylorization have protected, even aggrandized the individual. Melissa Gregg's Counterproductive: Time Management in the Knowledge Economy allows us to begin to imagine a different genealogy, one with a more capacious imagination for the space between the human and the individualized subject. 38 For my purposes, Gregg's book gives a prehistory of the graphical field in relation to a far longer history of explicitly gendered and implicitly racialized work management. By shifting the history of knowledge work from Frederick Taylor and Taylorization to the husband-and-wife team of Lillian and Kenneth Gilbreth, and eventually to Lillian Gilbreth's work on her own after her husband's early death, Gregg teaches that the model for time-management studies, that which it seeks to install in the human, isn't so much the generalized system as it is, specifically, the white middle-class woman managing the home. In other words, the prototype and engine of the managed human is the augmented individual, now gendered and tacitly racialized—not, crucially, just the worker organized as a systematized mass.³⁹ This recognizes the key role that Lillian Gilbreth played in this history, while at the same time uncovering the way that domesticity was the scene for not just early time-management studies, but for later twentieth-century books aimed at improving time management in relation to labor, addressed now to individuals rather than to corporations. While Taylor was an obvious, if uncited influence on Engelbart's thinking about the trainable human and the analysis of tasks, the Gilbreths' work more closely models the tacit gender and racial politics of the research that generated the graphical field.

As Gregg describes, the white middle-class woman running a home performed the manual labor of housework. But under the influence of Gilbreth's efficiency studies, or what Gregg sometimes more pointedly calls her "fatigue studies," they were also to understand themselves as the managers of the home, supported either by servants or by a suite of technical and managerial resources that would stand in for the work of servants. In other words, the I who does the work also, and more importantly, experiences herself as the I who manages the work. In this individual, there is a splitting so that one can take up a certain attitude toward oneself and one's labors. All of the labor usually resides in one body, but with or without actual servants, that body, in her own self-conception, now occupies the more valued category of manager. 40 For Gilbreth, this wasn't about gender emancipation so much as it was about efficiency—but the narrative of gender emancipation would come in the wake of her work, in the later self-help literature aimed at contemporary office workers.⁴¹ So while the role is expressly gendered (female) and more quietly racialized (white), that role's aspirational managerialism can seem to supersede those kinds of classifications, those zonings of the human and its populations. The soi-disant manager might—if only in her own self-conception, here aided by the products of Gilbreth's work studies such as the management desk that she wanted to install in every kitchen—feel as though she has overcome any collective identities that might have determined her life before. Gilbreth's management consulting and the tools that emerged from her research fostered an attitude toward gendered and racialized work that might seem to lift one out of those categorizations. So if the interfaces of Gilbreth's managerial tools weren't yet graphical, they fostered an attitude toward self and work that would become central to the graphical interface that Engelbart would famously demonstrate in 1968 (Gilbreth died in 1972).

Fast-forward to the end of the twentieth century, the historical center of Gregg's book, and this history helps explain the wild explosion of a market for time-management books and apps aimed at individuals. On the one hand, such resources emphasize what Gregg calls the strenuous "athleticism" of time management. On the other hand, they reveal the prevalence of technologies that act as servants in an age when far fewer white-collar workers had access to secretaries but still desired the cachet

associated with being able to offload "nonessential" tasks to an other. An other whose very presence would then play the invaluable role of setting off the work of a delegating authority as special, essential, core, and perhaps above all—as Lillian Gilbreth asserted in contrast to the rote systematicity of Taylorism—as creative. 42

The new ethos of knowledge work that Fred Turner would link to 1960s counterculture and the hippie movement (with all of its own well-documented gender and race problems), Gregg links to a long-standing ideology that tightens the aperture of time-management efforts ever more concertedly around the individualized worker, where what the individual was to become feels open-ended. That is, Gregg's work offers us a history of the individual not just as the liberal avatar of freedom, decision, and will but as the manager of one's self. The individual who, in internalizing a certain managerial function, also incorporates structural elements of white masculine paternalism.

But most importantly, the individual who incorporates those elements into an encompassing attitude toward the self was incentivized to become indifferent to their own historical conditions as the platform for successful individuation. In this fantasy, the individual was never autonomous; they were always augmented by an imaginary scene of servitude. The creative self who would find a home, eventually, in the graphical fields of the personal computer thus arrogates a historical prerogative of whiteness—the power and right to be served by another—as an element of their own self-possession, even while getting to embrace inclusion and diversity, life beyond identity, as part of their self-conception. Here, the individual, modeled on the white middle-class woman, is a driving force of modernity just as much as the masses who have been more often feared, and whose threat of homogeneity lingers like an eerie fog around Liu's own Taylorist account of the GUI.

In Gregg's account, twentieth-century industrialization begins with a scene of the white woman in the home, efficiently managing a household of real or internalized servants who were racialized less as any particular identity and more as what Sylvia Wynter calls the dysselected. This periodization culminates sometime near the present, with the lure of a wide-spread personal regimen that might appeal to any gender willing to take on the increasingly strenuous work of managing one's own time ever more productively (what Leo Steinberg, in the next chapter, will call a "he-man" attitude toward the self and one's life). ⁴³ Gregg's research, in other words, narrows the spotlight for the American history of knowledge work, locat-

ing its center not with information itself, cybernetics, information theory, or computers, but with the historical construction of the individual and an expansive infrastructure of individuation. This was an individual supplemented by time-management technologies (a renewal of a past relationship to servants, secretaries, and further back, slaves, now instantiated as an attitude toward self); by a new bifurcation of labor, where the management function externalized in Taylor becomes internalized, possessed as the engine of self-possession, generating a self-directed and ever more fulfilling form of work where one is one's own boss. This would be true, or feel true, as much in a large corporation as in a peripatetic freelance setting. Such an individual thereby retained their privileged relationship to a far longer history of white patriarchy, by way of a white matriarchy, by way of its relationship to proxy-servants. This figure was compelled to stand out by inventing new modes and models of productivity through ever more athletic feats of self-composure, self-possession, and self-discipline. All these new modes and models would find a home in the graphical field of the personal computer.

The Whiteness Surround

Fred Turner argues, in his book *The Democratic Surround*, that after World War II, in the American context at least, this figure of the individual was more an open question than a definite statement, still in formation.⁴⁴ The question, as Turner articulates it, was this: what form of the human would be most resistant to fascist modes of address? This question was pursued across a range of fields, from military-funded computer research to exhibition design. The specter of fascism is the crucible for Turner. More to the point, and in line with Liu's account and Taylor's ambitions, the specter is of the lone, vulnerable, racially unmarked member of a mass, made susceptible to fascism's comforts by the blanketing address of mass media. Exhibition design, and museums broadly, addressed this vulnerable member of the mass and in doing so felt that they could inoculate them. What Turner describes as an exhibition ethos, Engelbart, at around the same time, implemented as the new approachable face of the computer. Both were engines of subjectivization, and so both were addressed to the human, to a stripped-down American subject, now divested of their postwar subjectivities, and set free within a renewed American ideal of liberal democracy where the discursive claims of content delivered as information might serve to inoculate its users from strong forms of authoritarian address. A question driving all this research was: What environments could be constructed to form this new human, who would be shaped into a subject inside a political context looking to distance itself from the genocidal whiteness of fascism in Germany? Here, whiteness was to be not an identity or national formation but a kind of managerial ethos or attitude (which in part explains both how and why the subsequent communist threat in the United States would so often be racialized as black⁴⁵). "The democratic surround" is Turner's name for what would become the answer to this question, and he looks to exhibitions like the *Family of Man* to describe the formal features of the surround. The democratic surround amplifies and augments the project started by Lillian Gilbreth and taken up later by Douglas Engelbart.

The Metropolitan Museum of Art's infamous Harlem on My Mind was an exhibition built explicitly in this mold, as Susan Cahan insinuates when she links the curator, Allon Schoener, to Charles and Ray Eames and their midcentury multimedia displays. 46 The lineage Turner draws is longer: from El Lissitzky through László Moholy-Nagy and the Bauhaus to Herbert Bayer at the Museum of Modern Art in New York City. The quiet race work of the idealism that drove postwar ideas about exhibition design becomes unavoidable in 1968 with Harlem on My Mind. In prior exhibitions, the universalizing logics—of the subject inoculated against all forms of monolithic address by being encouraged to think for themselves—could issue inside an echo chamber of whiteness and count on the fact of the museum's propriety and mostly white audience for this to never cause much friction. But with Harlem on my Mind, the subject matter of the exhibition would not submit to this renewed liberal address. Susan Cahan details the ensuing controversy in forensic detail.⁴⁷ In her account, the Met management comes off looking tin-eared and inept, unwilling to respond to advice, which was abundantly available, bringing on themselves the disaster that the exhibition would become. But the reason for Schoener's arrogance wasn't just that this attitude toward criticism is a timeless prerogative of whiteness, although it was that too. The reason Schoener could feel self-righteous, even when faced with multiple warnings by the Harlem community, was that the liberal ethos of the exhibition tradition in which he was working felt itself to be regenerating personhood as precisely postracial, beyond any and all homogenizing categories. Black criticism, in the eyes of that ambition, would have been seen as a backslide into a crude racialism. The specific exhibition design choices described by



Turner, in fact, operationalized that attitude, making it available to anyone who would accept it or who was willing to be trained by it.

As Turner describes, the exhibition design relied on clusters of photographs, none attributed to any author, combined with sound, the whole paradoxically both overwhelming the viewer and aiming to set them free inside the bounds of "the whole personality" that it was the exhibition's ambition to reanimate. This required producing an environment or surround that was not determined in its meanings or outcomes so much as managed in its design. In Herbert Bayer's famous exhibitions as well as Schoener's, rooms were filled with photographs, mostly black and white, addressing viewers in a kind of scatter logic. The photos did not conform to the architectural environment, as when images are hung neatly on walls; they formed environments. One navigated photographs as much as one navigated rooms. Movement through more photographs than any one person could process or assimilate, now understood as so much information, was designed to be tolerably overwhelming. As such, it was a distant reflection of a prior stage in the amassing and selection of the images. That stage, for the Family of Man exhibition, involved Edward Steichen and Wayne Miller reviewing, as Turner documents, two million images. These they winnowed down to ten thousand. And from there to the final 503. A heroic effort to be sure, and one that was quite explicitly meant to be replicated, in miniature, by visitors to the exhibition. In this, the managerial ethos of curatorial work could itself be understood less as guiding others than as modeling a behavior. This process of information sorting and retrieval was a key element of all the exhibitions designed in this democratic mold. With Harlem on My Mind, it was, in a sense, blackness itself that was transcoded from biography, history, and experience into information. The individual encouraged to move through information—to inhabit an informational environment, to make their own categories of relevance and noise—was, in this logic, thought to be crucially different from the individual who was subject to the authoritarian address of mass media or fascism or, for that matter, the Black Power movement and its various threatening forms of collective life. However managed the final selection of photographs, and it was of course highly managed, the exhibited scatter of images, their profusion and assembly, was to be a kind of inoculation against losing one's individuality to such strong forms of address.

But it was more than that too. Here's Turner: "[*The Family of Man*] grew as much if not more from the promotion of diversity as the basis of



national unity in the early 1940s and from the museum's wartime efforts to train its visitors in the ways of the democratic personality." Turner continues: "With images literally all around them, visitors to *The Family of Man* had to make choices about where to look and how to integrate what they saw into their own worldviews. This process, in turn, exercised the psychological muscles on which democracy and perhaps even the future of the world depended." Inside this democratic purview, importantly, the management of information was understood as the management of diversity, of difference itself. Information processing was the core activity of this Cold War strategy for rebuilding the individualized American subject. The citizen who could process information was the citizen who could exercise a kind of energy, both creative and social, where self-enhancement becomes synonymous with democratization, and eventually, with incorporating difference in order to facilitate an attitude that race no long mattered.

This same logic is hard at work in Vannevar Bush's famous 1945 essay "As We May Think"—an essay that Engelbert named as the direct precursor to his own work on the graphical interface. 50 The key conceptual leap of that essay was something Bush referred to as "associative indexing." This was a nascently graphical dynamic that Bush spoke of less as a technological feature or affordance and more as the unique feature of human creative labor that needed to be freed from the kinds of "repetitive" work that characterized the prewar period. Here we find an echo of Lillian Gilbreth's own work in this area, which she understood as management and modeled on the white housewife.⁵¹ Bush's interest in his hypothetical memex was to create a machine that worked with, and even facilitated, the human capacity for associative indexing. The memex arranged photographs in a kind of semivirtual spatiality that fostered what was to be understood as the user's own associative indexing. The memex, in other words, created an information surround in which the labor of information management could become a form of self-elaboration. Bush's enthusiasm for this project, like Engelbart's after him, and Gilbreth's before him, gathered around the reconstruction of the human on a new basis. As Bush ruminates, "Presumably man's spirit should be elevated if he can better review his shady past and analyze more completely and objectively his present problems."52

If the rooms of such information displays looked like a proto-windowed interface, we can begin to see why this is not an accident of visual likeness. *Harlem on My Mind* was informed by the same logics and involved in the



same long project of renovating the human as those pursued by Gilbreth and Bush, as well as Engelbart and the computer's later interface designers. Schoener's and Bayer's photographs constituted an information space. Movement through that space was understood as lightly managed but nonetheless personal research, the pursuit of individualized interests and insights. Creative labor was here reconceived not as the creative expression of exhibition design, which, as Turner says, could easily turn coercive, but as action within a field of "aesthetic indeterminacy." What Turner describes as the overriding intellectual project of Steichen's exhibition and what Cahan's book allows us to extend to Harlem on My Mind, might as well be a description of Engelbart's work on early computing interfaces. And it certainly describes Apple's later approach to both the implementation and the marketing of their GUI. This, one last time, is Turner: "In other words, while Steichen's show would have a message in the general sense, it would not seek to *impose* its views on the audience. Rather, it would attempt to build a framework of principles, draw visitors into that framework, and there allow them to see themselves as free individuals among a world of others."53

We learn something about whiteness in the swirl of these events: something about how whiteness would seek to renovate itself after midcentury, at least in its own bastions of culture like the Met. One lesson is spatial: the geometry of whiteness would now not be sequestration but the surround—a spatiality that Julie Mehretu's work will later take up in its infrastructural expanses (see chapter 5). In fact, as Cahan documents, so many of the ambitions of Harlem on My Mind were bound up with a desire to be seen as integrating themselves, and Harlem most prominently, into the wider surround of New York City. Even if Cahan reveals these overreaches of liberalism to be a bad-faith ploy to annex more land, they nevertheless reveal that the public strategy of that bad-faith effort was to be a pretense of integration, of breaking down geographic and urban barriers between the races. Meanwhile, inside the exhibition: blackness documented, blackness refracted, blackness displayed, blackness sequestered by the new apparatus of its democratic surround. A tactic is being added here to a repertoire that would still, of course, whenever needed, have recourse to sequestration, to barricade and raw violence. We find those old brutal tactics, in fact, used to quell protest just outside the doors of the Met, at the very moment this new tactic was being exhibited inside. But inside those barricades, far from those hardwood batons, a softer face



emerges: a documentary impulse, an impulse to include, a willingness to integrate, to surround, and to thereby set free inside the sharply delineated boundaries of the individuated self. The black faces postered on the facade of the museum were accompanied by an eagerness to relegate whiteness to what Turner, in an echo of Lillian Gilbreth's work, calls a "managerial" background. It's a nearly perfect figure for the relationship of whiteness to the new technocultures of its own creation: no longer the face of the proceedings, now they can seem to merely (and magnanimously) share the limelight—but only because whiteness retains a managerial relation to the technologies of that display and circulation. Schoener and the Met did what they could to advance this tactic with the resources at their disposal, inside the limits of the art world's idealism. The computer industry, with the invention of the personal computer, would massively expand and advance the tactic.

Engelbart and the Augmented Human

It is now possible to see how Engelbart's research, along with all the research strands that made the personalized, graphical computer interface possible, played an integral role in this longer history of the particular individual person-form that Gregg and Turner help establish. Engelbart's graphical interface was to be a training and testing ground for just such an individual, while also being quite literally where they were to be integrated with a computational environment designed as an information surround. Gregg's work also helps us track the ways that a longer history of whiteness pursued a subterranean channel into the so-called meritocratic, race-blind cultures of the twentieth century's newest privileged form of technologized labor: namely, personal computing. Here, exclusion and marginalization are still weapons, but like a mutation of Saidiya Hartman's "burdened individuality," this exclusion is encouraged not only to be almost entirely oblivious to its racial dimensions, but also to think that it sits in the service of getting beyond race. The engine here was the universalizing rhetoric of self-improvement performed in an open field (no obstacles in a graphical field save the self itself), galvanized by the ideal of a meritocracy in which such performances of self could be recognized for their inherent quality, without interference from history, from context, from the messiness of the social. All such interferences the graphical field very consciously bracketed in favor of a new infrastructure for life, a terrain that integrated work and play as communication. The graphical



I.1 Still image from Douglas Engelbart's demonstration of the oN-Line System (NLS) at the 1968 Fall Joint Computer Conference, San Francisco, December 9–11, 1968. Courtesy of the Department of Special Collections, Stanford University Libraries, and Christina Engelbart.

interface was an uncommonly dense infrastructure for the construction and eventual work of this individual: at once effective metaphor, training site, and theater of performance.

In the 1968 demonstration that would announce the graphical interface to technologists, and thereby to the world, and that has come to stand in too much for the announcement of the graphical project in its entirety, Douglas Engelbart and his team employed a trick right out of the long history of what Tom Gunning calls the "cinema of attraction." As a way to display the kind of space this computer interface promised, the team superimposed a live video of Engelbart's face over a live feed of the computer screen itself. The presenter thereby appears to be presenting from inside the mostly blank interface that he is there to present and whose content he himself becomes. This is, in fact, precisely the affordance that became most important to the subsequent history of the graphical field, even if it wasn't exactly on the agenda that afternoon. Engelbart inhabits the graphical field. That is, above all else, what makes that field graphical.

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It is a visual trick, in some ways merely a metaphor. But it more than suggests the larger ambitions of the project, where the graphical field was to become a kind of home or habitat.

In that demonstration, to an audience of approximately one thousand computer professionals assembled for the Fall Joint Computer Conference at the Convention Center in San Francisco, Engelbart and his team demonstrated what they called the "oN-Line System" (NLS). They did so through a closed-circuit televisual feed. The feed cut between close-up facial shots of Engelbart himself working the interface and feeds from the computer terminal thirty miles away in Menlo Park. Engelbart himself was on site in the convention center, as presenter. But his ghostly image, beamed through a high-powered TV projector onto a 22×18 ft. screen, was the presenter most present. The closed-circuit broadcast was simultaneously recorded on film and is now archived in full as part of the Engelbart Collection in the Special Collections archive of Stanford University. Six people, connected by headsets, some in San Francisco and others back in Menlo Park, orchestrated the event behind the scenes, controlling the video mix and sound. The total effect was of an expansive networked system at work, but all seemingly controlled by the person sitting at the terminal, facing the screen and inhabiting the screen, doing nothing more technical than manipulating that screen's graphics. This figure, the user, was not a node in that network because part of what Engelbart was demonstrating was how the user of the graphical interface could be heedless of the network of support that made his presentation and his presence there possible—free to make creative, associative leaps. Like Lillian Gilbreth's homemaker, they command the network while living inside of it. Engelbart is framed from the chest up, wearing a white shirt and dark tie. His banter is easy, relaxed. He's not particularly in a hurry to sell anything. He refers to his wife and to family dinners. He uses the capacities of the graphical screen to categorize a grocery list. In this, the graphical screen subsumes not just the face of its user but home life as well. Its uses were to be extensive — as extensive as life itself.

The graphic user interface so demonstrated, the GUI or "gooey," is a thing and not a thing. An infrastructure and a superstructure. A space through which other things are screened, transmitted, executed, done. A platform. If we know it—and I arrogate the "we" here to index the GUI's ubiquity—it's because the graphical interface is a thing that enrolls people. It was designed precisely for this. As a real estate proposition, or simply understood as an image, it is mostly empty space—space in which to

move. In his demonstration, Engelbart organizes and reorganizes lists, he draws lines between items in those lists, and he toggles between otherwise discrete tasks. In this, he establishes connections between those tasks. But always the blank screen is the default, the space of reset—just the screen and the image of the user superimposed onto and so into that space.

Today, that space is outfitted in metaphor and figuration: the desktop, files, trashcan, windows, mouse. It is a space navigated haptically—this being what opened the computer up initially to the human in a new way, almost literally inviting the hand of the user into the space of the computer via the proxemics of the mouse. This hand, and it is significant that it was the hand, was a dense site for the accumulation of skill and expressive potential. Engelbart had played with the knees as a source of input—like Taylor and Gilbreth, he was interested in the most efficient forms of input and action—but the mouse that he invented makes use of the hand's historical connection to expressivity, to interiority directed outward through gesture. Chapter 3 addresses the significance of the hand in this story through Jack Whitten's digital experiments in paint, which were also manual experiments in making the self appear without individuality or the vaunted expressivity of the hand. 55 For the human using a mouse, metonymized by the hand, the graphical was not a calculator. Nor was it something that foregrounded the experience of being rendered a service. It was a creative workspace, a work surface in which the human could be augmented by access to information and the tools to manipulate information. On this basis, and in line with the experiments in exhibition design that Turner calls the "democratic surround," the inhabitant of the graphical would be freed from the kinds of labor that characterized the prewar world. But that human would also be inoculated from the kinds of mass address so feared by a liberal modality of whiteness that had just witnessed the latest explosion of its own genocidal fantasies.⁵⁶ In the longer history, pre-Apple, pre-Xerox, when the graphical screen was merely part of an intense ideological debate in the computer world over what the computer could be, who it would serve and how it would serve them, the idea behind the graphical screen was that it made the computer more human. Engelbart understood it this way, although with the acknowledgment this his project was about transforming the human as well. In other words, this anthropomorphism was just Engelbart's way of beginning the longer process of occupying the human to transform it from the inside.⁵⁷

As perhaps this begins to hint, the graphical interface of the computer screen is not exactly a space, just as the work of the artists I discuss in

later chapters is less interested in inventing spaces than in reconceiving the coordinates through which the human can be understood. But the graphical does draw on spatial conventions when convenient, such as its use of Euclidean geometries and the proprioception needed to navigate those geometries with a mouse. Before the graphical field, one didn't inhabit a computer, didn't move within in. One issued "commands." The command-line interface flattered the sovereignty of the human issuing the commands, couldn't but make humans feel as though they controlled computers, even inside a frustrating debugging process that, precisely in taunting the sovereignty of the user, became an arena in which to exercise an esoteric, increasingly occult mastery.⁵⁸ With the graphical screen, as was Engelbart's and other's intent, one no longer had to know how to speak a computer's language. And so these sites for the exercise of mastery were lost and had to be replaced by new opportunities for self-possession and self-elaboration. In the graphical field, one could gesture, move, click, rearrange objects, toggle between screens and windows that were all conceived as tasks in a workflow—a flow that felt like one's own (one's own grocery list), not something prescribed by technical protocols. These gestural proxemics were modeled on familiar paradigms of movement: dragging, reaching, pulling, connecting, expanding, collapsing.

Engelbart, an engineer who was one of the key proselytizers of the graphical screen as a more human interface for the computer, was explicit about his ambition to have the graphical interface train his users. Apple, in their later popularization of the graphic interface, would eschew this idea in favor of "user friendliness"—a promise that no training would be required to achieve mastery. But even here, of course, a retraining was occurring, if only a retraining in how to imagine oneself folded into the fields of a computational interface that was so naturalized that it required no training.

Though first imagined in a variety of forms in the sixties and seventies at computer graphics labs around the United States, the graphical form of the computer screen—manifest in the raster of the cathode-ray tube (CRT) monitor, and now the encompassing environment for basically all facets of life accommodated and actively solicited by the computer—took shape in the years immediately following World War II. Nearly imagined by Vannevar Bush in 1948, importantly conceptualized by J. C. R. Licklider throughout his work in the military-funded development of computing after World War II, nascently realized by Douglas Engelbart and his team through the early and middle sixties, first demonstrated by En-

gelbart in 1968, taken up and then abandoned by Xerox PARC in the early seventies, streamlined and mass-marketed by Apple Computers in the eighties, ubiquitous and unavoidable by the early years of the twenty-first century—with Microsoft Windows and Apple dominating the market for personal computers—the graphic user interface has so realized its universalizing ambitions that its precise technical name, GUI, can only underdescribe its impacts, while setting the misleading expectation that the discussion to come will henceforth reside in the realm of appropriate specialists: computer historians and design historians and critics, the people to date who have cared to write about the GUI.

Today, the GUI ships with every personal computer and is arguably native to every smartphone. At its simplest (and it has been designed to appear simple so its user can appear autonomous and fully manifest in the space left open by the supportive unobtrusiveness of graphical space), the GUI consists in an overall desktop metaphor, with icons representing units of work (software or apps), all organized within a space one can navigate through the prosthesis of mouse and cursor, inside a landscape of icons, pull-down menus, and windows.⁵⁹

That is, the graphical interface did not and still does not offer much in the way of structure. But it was navigable haptically and visually. A field then. Always contained to a predefined rectilinear area, even if that area was forever expanding, it thereby, and from that precise containment, aspired to encompass more or less everything (chapter 5, on Julie Mehretu's work, elaborates on this idea of containment and expansion). It did so while achieving massive dissemination into almost every office, school, and home, transgressing various containers of life: public and private, professional and personal, institutional and informal, personal and computational. The spatial idiom is convenient (sometimes unavoidable) because this space, graphical space, hosted life—that is its most essential definition. Life needs spaces of existence, even if those spaces are just the vocabularies and technologies that exist for the impoverishment, appropriation, and destruction of certain lives. To speak of the graphical then is to speak of an almost blank field, of the work that nothingness can do when its inhabitants are induced to read it as openness, a space for their own self-elaboration. Whiteness, in such a field, could understand itself not as a racial formation but as an opening, a praxis, an open field that was in theory available to anyone—precisely postracial. That was the modality of its whiteness. More than just unmarked then, whiteness in its new graphical home implied openness, availability, possibility. 60

This research was gathering from the fifties to the eighties, on both coasts of the United States, at Stanford with Douglas Engelbart, at MIT with J. C. R. Licklider, as well as in the middle of the country at the University of Utah with Ivan Sutherland and Alan Kay (who would go on to work at Xerox PARC). It amounted to a revolution in a long history of thought about what the computer could be and do, with the revolutionaries advocating for a computer that, in feeling manageable and knowable, in feeling natural and even bodily, in feeling human, would encompass and transform the human, becoming a place for the human's augmentation. As such, it would propagate itself far beyond any redlining of race. In the postwar decades that saw the development of the graphical interface, questions of nationalism, knowledge, and personhood were at the center of a massive multidisciplinary effort, spanning public and private realms, to imagine, bring into being, and then parade globally a form of distinctively American subjectivity that would be resistant to authoritarianism of the sort that so concerned governments, corporations, and critical theorists alike.⁶¹ There is a line that can be drawn within this scattered field, not a straight one for sure, between Licklider's dreams of "man-machine symbiosis," Douglas Engelbart's research at the Stanford Research Institute on the "augmented human," and Apple Computers' eventual codification, mass marketing, and attempted patenting of the graphic user interface, at which point graphical space becomes both entirely ubiquitous and entirely backgrounded, merely a field for other activities. No one person's research was isolated or singular, but Engelbart and Licklider play a central role here because they, of all the others working on computer displays across the country, perhaps most clearly articulated the stakes of this research, which Engelbart called, tellingly, the Augmented Human Intellect project. Their vision was also, it is widely acknowledged among the actors in this progress narrative, massively influential on the way that computers and computation would develop in labs and universities and eventually private corporations all over America.⁶²

Engelbart believed that digital computers would eventually circulate scientific information through a global network that would repair the postwar world by converting war machines into new and powerful human-machine hybrids designed to produce not death but knowledge. ⁶³ His was an idealist project in the extreme. The labor performed by these new human-computer dyads, joined in and by the graphical interface, Engelbart called "knowledge work." ⁶⁴ As first demonstrated to a scientific public in 1968, the graphic interface was an open expanse whose finite di-

mensions could be infinitely expanded with windows, each containing discrete but connectable types of work. In his words, Engelbart aimed to grant the user "considerable freedom as to the positions and circumstances under which he can operate." We want to develop new communication means that allow a human to control or make use of machines (especially information-handling machines) with minimal interference in other physical activities associated with his primary tasks." A particular organization of the computer screen, an open field accessed proxemically, would become the means to this end. "Considerable freedom" was to be a primary objective of that screen form. Although for Engelbart, freedom was as much a mode of work and productivity as it was something felt by the user *as* freedom. With Apple, the story becomes more about feeling, about how it feels to use the graphical screen.

The graphical screen—for Engelbart, a minor implementation of his larger and more ambitious research efforts—was to be the answer to this question of how to retrain the human worker for the coming age of computers. "The system we want to improve can thus be visualized as a trained human being together with his artifacts, language, and methodology." That ensemble is what Engelbart called the "system." Labor, newly organized in the graphical field of the computer screen that Engelbart prototyped and there reimagined as knowledge work, was to be the crucible of this new subject's formation, its proving ground. The graphical screen itself made this labor and this form of subjectivity possible.

Although Engelbart had bigger dreams, his work on the graphical screen formed the acknowledged basis of Xerox PARC's creation of the graphic user interface. And Xerox PARC's work made Apple Computers' own work possible, even if the exact details of inheritance and debt might never be known definitively. But however unclear the details of propriety and ownership, these histories are well documented. For my purposes, the most significant contribution that Xerox and later Apple would make to this history was to inflect Engelbart's somewhat ambivalent conceptualization of the individual—free, yes, but also highly malleable, trainable—toward the kind of idealized creative type that Apple dreamed into being with slogans like "Think Different," and "The Power to Be Your Best." At the most obvious level, Engelbart and later Apple Computers proffer freedom from the command-line interface, from having to interact with a computer on a computer's own terms. Beyond this, and especially in Apple's later technical and marketing schemes, freedom would come to mean creative freedom generated by a graphical field that wasn't just an interface

to a computer, but was, in effect, the computer tout court. And the computer, in a closely related sense, was nothing more and nothing less than the user itself. The graphical operationalized this syllogism: computer/human. The graphical field aimed to dissolve any copulas remaining to separate human from computer, dissolve them in the acid bath of a progressivist humanism that would reuniversalize humans—so recently revealed in their violently racialized differences in World War II—as something better, something augmented, something more suited to the coming era where work would become synonymous with information exchange. An era, as well, in which whiteness needed new dematerializing enclaves, away from the bright lights of racial warfare (at home and abroad) and a coordinated set of decolonizing global movements (evident in theaters of war as well as in an anxious, violent relationship with movements closer to home such as the Black Panthers, Black Power, and civil rights).

Subsuming the computer, and in this sense erasing it, the contemporary graphical screen allows a user a far more "considerable freedom," although never more than an extension and amplification of the kinds of freedoms dreamed into being by Engelbart and his team: freedom to manipulate everything, to place oneself anywhere in the field of the screen, to physically move objects rather than issue commands in language not one's own, to be afforded random access to whatever one might dream up as a form of self-elaboration through information space. This was to be a "natural" language, intuitive, user-friendly, creative. 69

The Human in Bits

In Dawn L. Martin's account of black poetics, creativity starts not from freedom but from the space of impossibility that is black selfhood. Martin's thinking here illuminates, by way of contrast, how utterly reliant the graphical field was on a model where creativity is predicated on and made possible by a human conceived of, from the start, as limitless. Engelbart, Licklider, and others could aim to accommodate and amplify this human as though it were a blank slate, without history, without identity, immanently trainable and amenable to what the graphical space was making of the computer (this interplay between possible and impossible selfhood, the self in and outside of history, elaborated in its relationship to creativity, is where chapter 2, on Alma Thomas, begins).⁷⁰

The graphical field didn't emerge on its own to single-handedly launch an entire industry of personal computers and computing—though it did

make the computer personal even as it dissolved itself into a million design improvements and new haptic interfaces (from mouse to track pad to touch screen). The ubiquity of the graphical today saps perspicuity. What *is* the object of such a study? It can't be the graphic user interface as such, neither as Engelbart at Stanford imagined it nor as Apple marketed and refined it.

But the object also can't be whatever it is that is screened on or in the graphical field—as implied by studies like David Joselit's on image populations or Pasi Väliaho's on biopolitical screens. Design and computer discourses rarely theorize the human they are designing for; or rather, they do, but tendentiously. Their universalism, of course, hides this tendentiousness, which is precisely what made the graphical field so amenable to a postracial discourse.

The object, then, will have to be the graphical field as such, but where, inside the syllogism human/computer, "as such" refers to nothing other than the spidering out of the graphical field through rhythms of habituation, training, individuation, and informatization—where the graphical field refers precisely, in other words, to the human reborn along with and within that field. In this way, the GUI's minor status in the larger scope of computing history might turn out to be a way to combat what many more materialist histories of computing disdain as the fetishization of "the vibrant colors and sleek displays of the interface."

Which is to say, computer historians might see my focus as too narrowly trained on a particular form of the computer screen—the GUI. And while I don't dispute that characterization, it belies the fact that the history of that particular set of technologies is itself far more expansive than has been acknowledged, and will take us sometimes far away from a consideration of any aspect of the screen in itself, given that the express goal of that space was to inaugurate a renewed form of the human. My intention is less to illuminate these histories each in themselves (and so to work across something like analogy or even comparison) than to illuminate the space where they blur, way out at their edges, into indistinction, a space that belongs to no particular history, hinting at the limits of seeing any history as organized and isolated inside a discipline, medium, racial categorization, or technology.

In Fred Turner's periodizing terms, the particular modality of freedom touted by Engelbart and later Apple partook of the larger postwar interest in a form of democratic personhood that was free to make choices within a gently constrained field of options, to feel as though the choices are

one's own so that those very choices come to define one's individuality, even or especially in interactions with new technologies. In this version of modernity, crowd, mass, and audience are thereby defused as threats to individual autonomy because they come, in the period of graphicalization, to exist most strongly within the ambit of this individuality, in service to it, setting it off, marking its distinction. In the period influenced by Gilbreth and Schoener and Engelbart, masses no longer subsume the individual, they highlight everything that stands out about the individual. This is what is so suggestive about Wendy Hui Kyong Chun's argument that this history of computing operates inside a toggle between freedom and control. The individual, so reconceived, operated as a form of control on collective forms of life.⁷⁴

But if collectivity was a choice for the white population (something that could be considered optional, and so defended against by technologies like the graphical interface), for a black population it was always also a yoke, a lifelong sentence, while also being, precisely as such, the source of its reinventions of life. Claudia Rankine says, "We suffer from the condition of being addressable," meaning that every address to black life (including this one) enforces a mode of collective life that is imposed from without and so becomes part of both the enabling and disabling conditions of black collective life as lived impossibly from within.⁷⁵

Related problems being worked out in other fields of activity, ones that were indelibly marked by racialization, asked their questions about the graphical in other idioms and with other urgencies, so much so that they can seem to be entirely distinct fields—what, after all, does the computer screen have to do with abstract art by black artists? But this is just an effect of the way that whiteness sequesters all conversations that are burdened by the necessity of taking race, and specifically blackness, into account. The graphical field was not an artwork to be sure, nor was it primarily visual, and certainly did not feel it had anything to learn from experiments in the field of art practice. But the graphical interface was a field that became the stage for the performance of new forms of the self as that self became entangled with information and computing. Howardena Pindell, Alma Thomas, Jack Whitten, Charles Gaines, and Julie Mehretu were all, in their ways, concerned with this very problem—the problem of the human in bits.

Human/computer, or, personhood/technology: this was the interface that early experiments in computing and, as we'll see, certain practices of black abstraction were all working at so manically. Sometimes

these two histories, of personal computing and black abstraction, evince conscious awareness of one another, although mostly they did not. More often, that awareness is partial or part-conscious or oblique. But the commerce between these histories is real nevertheless. Both sides experimented with forms of the human and human labor that were nonrepresentational and—in that strict sense rather than in relation to figuration—abstract. One can see this commerce, for instance, in the context of civil rights debates that revolved around ideals of freedom. Often these ideals were focalized around the person-form of the individual as a potential site of freedom, of dignity, of respect—be that in the form of the exemplary individual, the talented tenth, or those who, precisely in failing at the politics of respectability, have been punished for failing to uphold those values. These debates become even more resonant when we notice that, during these same decades, the various technologies of the digital computer were beginning to actively transform the sites and valences of personal freedom, of individuality as a mode of subjectivization.

To follow the decades of this long-form development, this book focuses on art practices that span the sixties to the present. Each artist has spent their career insistently, iteratively, repetitively working out the possibilities and constraints of what we can, for now, call gridded space—although we can already glimpse how this conventional artistic idiom will give way to a language of bit and field, raster and screen, all the implements of the graphical. While the literature on the modernist grid is vast and influential, none of it reckons with blackness or black personhood, despite black artists' frequent use of the grid. And none of it deals with the graphical computer screen. Both of these forces have fundamentally transformed the history of the grid. This project asks why each of these artists turned to gridded or, as I'll want to say, graphical space as a way to transform the labor of art and to thereby experiment with possibilities for black life.

Together, their work offers persistent, incisive, restlessly exploratory accounts of this history of the graphical—a history that is, precisely in its ordinariness, now more or less coextensive with life. Put the other way, my thought is that the work of Thomas, Whitten, Gaines, and Mehretu operates in adjacency to, if not inside, the larger field of this history of the graphical and graphical personhood—that something important about their aesthetic experiments finds purchase in and offers a kind of explanatory framework to this larger history. The whiteness of the long graphical project shows up, fluoresces, in and through their projects not because all the artists are black and so naturally or essentially oppose that logic, but

because the particular blackness of their practice reveals the racializing ambitions of the graphical project.

Which is to say, this is not a book about black resistance, opposition, or subversion. The aesthetic experiments this book describes are attuned to other modes of aesthetic and social labor. More than just "quiet" in Kevin Everod Quashie's sense or "reparative" in Eve Kosofsky Sedgwick's, the artistic practices and procedures I study in what follows simply don't inherit, and so refuse to propagate, the presumption that something in the human is fundamentally at odds with the computer. Their history, as they knew—and as Katherine McKittrick and Louis Onuorah Chude-Sokei (and W. E. B. Du Bois; see chapter 3) give us ways to understand cautioned them against simply choosing the "right" side of the human/ technology or human/mathematics divide. Thomas, Whitten, Gaines, and Mehretu are, in their works and working procedures, wary of the computational, the mathematical. But their practices and the restlessness of those practices are better explained when we see that their wariness didn't gather around a single pole of this antinomy—human-number; personmachine—but around that antinomy as a whole. And so they all experimented with various combinations of human and computer, working with the graphical as a scene whose volatility might point to ways out of that defining American antimony altogether. Or not. They wanted to find out. The point, for them and for this book, isn't that they found answers although they did, provisionally—but that their experiments, in their capaciousness, their willingness to play with all the variables mobilized in the graphical embrace of human and computer, show this history in a far more expansive and lively light.

The problem their art inhabited wasn't, in other words, the vortex of exclusion/inclusion. It didn't lie within the possibilities offered by representational politics. Theirs were practices keyed to the wider ambit of dysselection, that longer and larger problem. The graphical, whose icon and theater of operation was the personal computer, was a site where all the artists whose work I discuss, in their different ways, saw that problem playing out in the latter half of the twentieth century. The procedures they invented to experiment in that space were sometimes quiet, oblique, orthogonal, ambivalent, and all the more elusive when assessed in terms of visual likeness (to the computer, the computer screen, or to the GUI). Unfortunately, but necessarily, there will be very little visual likeness in what follows—of the sort that might say, for example, that mark looks like a pixel, that painting is organized like a computer screen. Again, the

visual, insofar as it is a logic of representation (and that, of course, is not all that it is), gets subsumed as so much content *for* the nonrepresentational. Thomas, Whitten, Gaines, and Mehretu were always restless with how resistance and subversion tied their projects to logics they might want to reject more entirely.⁷⁷ It was from this footing, then, that their work addressed questions of personhood as it transitions into and comes to inhabit the computational circuits of the graphical screen.

But who needs to hear that the contemporary world of information, data management, and the associated modes of labor and subjectivity—all of which would come to find a home in the graphical screen—were made for and by whiteness? This seems obvious enough . . . maybe. But such is the status of claims about whiteness in the United States, which, for white people, might sound like news when in fact their aim, here as elsewhere, is not to make the bearers of whiteness more self-aware but to make the sensorium of whiteness less habitable. 78 By and large, the graphic user interface of the personal computer, that graphical field, that space made to harbor life and labor, that place where human and bit mingle in an unmarked, open field, has made whiteness more habitable, if also more expansively and fugitively destructive. The four artists whose practices I try to learn from saw another set of possibilities in the graphical—if nothing else, the possibility for a confrontation with the human-computer interface that wasn't internally geared to provide sanctuary to whiteness. And so, together, they track the promises of the graphical, but also its elasticities. To follow their work, to see it for all of its dense enmeshment with the graphical, the raster, the computer, and with spaces where information and the human would come to re-form one another, is to follow the silverfish movements of an elusive hope. That hope flickered in a graphical environment that scrambled older technologies of self-possession, and in which it might have been possible, therefore, to reimagine the relationship between the human and their work, between the encryptions of personhood and the decryptions of racialization. For me, this story begins in Alma Thomas's stripe paintings, with a first stirring of interest in a kind of technological imaginary, moves through Whitten's and Gaines's wary uptake of digital systems — Whitten's ever restless, Gaines's steely and resolved—and ends in aporia with Mehretu's almost furious attempts to force the graphical to live up to its promise of including everyone and everything, even, impossibly, the studio assistant. From wary potential to conflagrational hypertrophy. Seen together, these chapters tell the story of the graphical as a space where black artists experimented with an abstractionist politics of personhood and collectivity while—and because—an incipient politics of white informational personhood was prototyped and eventually consolidated in the graphical field of the personal computer.

The art historian Leo Steinberg, in his famous 1972 essay "Other Criteria," started to feel out the terms of this proximity, the points of extension between technological research and art practices that were each interested in the implications of the graphical field for racialization and the engineering project of the human. So Steinberg's "Other Criteria" is the subject of the next chapter. It forms a bridge to subsequent chapters that describe various logics and implementations of the graphical as they took shape through artistic practices that took the human in bits to be their subject and their problem.



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- 1 Howardena Pindell, *Untitled*, 1973. Ink on paper collage, $17\frac{1}{2} \times 90\%$ in. Signed and dated, lower right (Inv# PINPP088).
- 2 Howardena Pindell, Video Drawings: Swimming, 1975, 14 \times 161/8 in. Collection Museum of Contemporary Art Chicago, Anixter Art Acquisition Fund 2016.6. Courtesy of the artist and Garth Greenan Gallery, New York.

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Introduction

- Beckwith and Cassel Oliver, *Howardena Pindell*, 156–57.
- 2 Beckwith and Cassel Oliver, 147.
- The idea of the genre flail comes from Berlant, "Genre Flailing."
- 4 Robinson, Black Marxism.
- See also Ed Clark, Romare Bearden, Tom Lloyd, William T. Williams, 5 Melvin Edwards, Louis Cameron, Jacolby Satterwhite, Aria Dean, Martine Syms, Caitlin Cherry, Sondra Perry, Adrienne Gaither. This list, and the ellipses it implies, doesn't name a trend or movement or style, a categorical grouping that would gather historical meaning around a pattern found inside the art world. It names, rather, an ongoing and iterative yet disparate set of experiments at the interface of personhood, technology, and labor. And insofar as these experiments exist, they exist in resonance and tension with the concomitant history of computing. The spirit in which I offer this list, partial as it is, is a desire to provide resources, other places to look and study. But I regret any sense in which the list form, however open-ended, implies that certain artists don't offer substantial commentary on the historical relationship between personhood and technology. I've long been committed to a view that, in wanting to deliteralize our studies of technology, would see almost any

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aesthetic practice as a potential place to learn about technology and the forms of life that are bound up with it. One place to look for a source of this thought is Haraway, "Cyborg Manifesto." See also Cohen, *Never Alone, Except for Now.*

- 6 Krauss, "Grids."
- 7 Higgins, Grid Book.
- 8 Coleman, "Race as Technology"; Benjamin, "Innovating Inequity"; Chun, "Introduction."
- 9 Nooney, "How the Personal Computer."
- Bardini, Bootstrapping; Waldrop, Dream Machine; Smith, Fumbling the Future; Laurel and Mountford, Art of Human-Computer Interface Design; Laurel, Computers as Theatre.
- 11 Mondloch, Screens; Friedberg, Virtual Window.
- 12 Franklin, Control.
- Sheets, "Black Abstraction"; Bowling et al., *Energy/Experimentation*; Mercer, *Discrepant Abstraction*.
- Louis Onuorah Chude-Sokei puts it this way: "How we have come to know and understand technology has been long intertwined in how we have deployed and made sense of race." Chude-Sokei, *Sound of Culture*, 1.
- 15 McKittrick, "Mathematics Black Life," 17.
- 16 Franklin, Digitally Disposed.
- Louis Onuorah Chude-Sokei's book importantly rehistoricizes technology as that which has been driven by a fear of blackness. Chude-Sokei, *Sound of Culture*.
- This is part of the story Fred Turner tells. See Turner, *From Counterculture to Cyberculture*; Turner, *Democratic Surround*.
- Galloway and Thacker, "Protocol, Control, and Networks"; Browne, "Digital Epidermalization."
- Here, I'm talking about Saidiya Hartman's discussion of the relationship between empathy and fungibility. See Hartman, *Scenes of Subjection*.
- 21 Césaire, Discourse on Colonialism.
- 22 Berlant, "Slow Death."
- Ramon Amaro has written a series of essays about this temporality of computation and racialization, all of which have been important resources for what follows: Amaro, Black Technical Object; Amaro, "As If."
 - Hong, Death Beyond Disavowal; Melamed, Represent and Destroy; Hu and Goding-Doty, "Race After Representation"; McKittrick, "Mathematics Black Life"; Du Bois, "Sociology Hesitant."

- Melamed, Represent and Destroy; Hong, Death Beyond Disavowal; see also Ahmed, On Being Included.
- This paragraph thinks with the work of Hartman, *Scenes of Subjection*; McKittrick, *Dear Science and Other Stories*.
- 27 Wynter, "Unsettling the Coloniality of Being."
- 28 Wynter, "Unsettling the Coloniality of Being." But see also Krista Thompson's *Shine*, which pays so much gorgeous attention to a category of the dysselected that she refers to as "African diasporic aesthetic practice"; Thompson, *Shine*.
- 29 Ford, Think Black.
- Crawford, Black Post-Blackness; Collins and Crawford, New Thoughts on the Black Arts Movement; McKittrick, Dear Science and Other Stories; English, How to See a Work of Art.
- 31 Stiegler, "Discrete Image"; Galloway and Thacker, "Protocol, Control, and Networks."
- Wynter, "Unsettling the Coloniality of Being."
- 33 Liu, Laws of Cool, 159.
- 34 Liu, Laws of Cool, 159.
- 35 Liu, Laws of Cool, 160.
- 36 Liu, Laws of Cool, 161.
- 37 Galloway, Protocol.
- Gregg, Counterproductive; Gregg and Andersson, "Lillian Gilbreth's Management Desk."
- 39 Taylorization is the study, quantification, and scientific management of labor such that the labor process corresponds less to human bodies and more to the process itself, thereby rendering bodies as fragments in service to that process. See Braverman, Labor and Monopoly Capital.
- 40 Gregg and Andersson, "Lillian Gilbreth's Management Desk," 123.
- The iconic example being Sandberg, *Lean In*.
- For a different account of the gender politics of so-called flexible or creative labor, see Sianne Ngai's chapter on the zany, in Ngai, *Our Aesthetic Categories*.
- Culminating, perhaps, in Asia Kate Dillon's nonbinary character Taylor Mason in the TV series *Billions*, whose power in the series comes directly from usurping what is, in the world and in the show, an otherwise entirely white-male prerogative to manipulate technology in the service of financial gain. Mason is better than all the other males in the show at this form of productivity.
- 44 Turner, Democratic Surround.

- 45 Maxwell, New Negro, Old Left; Haywood, Black Communist in the Freedom Struggle.
- 46 Cahan, Mounting Frustration.
- 47 Cahan, Mounting Frustration.
- 48 Turner, Democratic Surround, 201.
- 49 Turner, Democratic Surround, 210.
- 50 Bush, "As We May Think."
- Bush, "As We May Think," 108.
- Bush, "As We May Think," 109.
- Turner, Democratic Surround, 202.
- 54 Gunning, "Cinema of Attraction."
- As discussed in chapter 3, Stephanie Boluk and Patrick LeMieux have a terrific section of their book on the role that the hand has come to play in videogames, tracing the figure from the first gloved-hand cursor icon of an early Apple operating system to Mario back to Mickey, where they discover the ways that Mickey, and thus the whole trajectory of the cartoon hand, partook of minstrelsy and blackface. Boluk and LeMieux, *Metagaming*, 69–70.
- On the relationship of whiteness (and its long history of violence) to the Holocaust, see Césaire, *Discourse on Colonialism*.
- Two books tell this history, from inside the computer industry, through the biographies of two key figures: Bardini, *Bootstrapping*; Waldrop, *Dream Machine*.
- Hafner and Lyon, Where Wizards Stay Up Late.
- For more design-oriented approaches that are far more attentive to the particularities and metaphorics of the graphical user interface, see Laurel and Mountford, *Art of Human-Computer Interface Design*; Armstrong, *Digital Design Theory*.
- 60 Dyer, White.
- Turner, From Counterculture to Cyberculture; Turner, Democratic Surround.
- 62 Waldrop, Dream Machine.
- 63 Engelbart, "Special Considerations of the Individual."
- 64 Engelbart, "Toward High-Performance Knowledge Workers."
- 65 Engelbart, "Introducing Our Thinkpiece."
- 66 Engelbart, "Introducing Our Thinkpiece," 1.
- 67 Chun, Control and Freedom.



- 68 Engelbart, "Augmenting Human Intellect."
- Of course, Apple's marrying of the computer to a putatively intuitive, easy interface has stoked the usual kinds of fears, most common among computer literati, about the mollycoddling of the user, about making people into consumers rather than computer users: a Frankfurt School critique but with optimism for the computer as a utopia, if only it is used correctly. See, for instance, Stephenson, *In the Beginning*.
- 70 Martin, "Black Poetics."
- Joselit, After Art; Väliaho, Biopolitical Screens.
- See, for example, Turner, From Counterculture to Cyberculture; Turner, Democratic Surround; Bardini, Bootstrapping.
- 73 Cited from the abstract of Stine, "Critical Hardware."
- 74 Chun, Control and Freedom.
- 75 Rankine, Citizen, 49.
- Such practices are given one kind of vocabulary by Quashie, *Sovereignty of Quiet*; Sedgwick, "Paranoid Reading, Reparative Reading."
- 77 The thought about ambivalence is inspired by Jagoda, *Network Aesthetics*.
- Ahmed argues that in studying whiteness, problematizing whiteness, one must refuse the desire of one's auditors to offer solutions, better habits of being, ways of giving up whiteness, both because those solutions act as if the problem of whiteness could be solved, as if it doesn't need to continually be encountered precisely *as* a problem, but also because that very desire allows white people to position themselves as outside of the problem. Critique is not an escape from complicity; see Ahmed, "Phenomenology of Whiteness."

Chapter 1. Operational Processes: Leo Steinberg

- 1 Steinberg, Other Criteria.
- 2 Wynter and Scott, "Re-Enchantment of Humanism"; Wynter, "Unsettling the Coloniality of Being"; McKittrick, *Sylvia Wynter*.
- 3 Later collected as Steinberg, *Other Criteria*.
- 4 Steinberg, *Other Criteria*, 84.
- 5 Steinberg, Other Criteria, 84.
- 6 Steinberg, Other Criteria, 81.
- It is well known, for instance, that George Kubler's book *The Shape of Time*, published in 1962, a book that many artists, art historians, and art critics read at the time, was influenced by cybernetics and information theory; Kubler, *Shape of Time*. See also Lee, "'Ultramoderne.'"