In *The Fragment on Machines*, Karl Marx laid out a series of logical propositions about machine-enabled labor that appears to suggest the elimination of the living labor (human agency) required by these machines; however, this interpretation is obviously incorrect when the assumptions and context that produced his theorization are taken into consideration. Automated labor is a fundamental shift in the nature of value production, one that is potentially destabilizing to the entire capitalist productive system, revealing the inherent incompatibility between digital capitalism and social reproduction, not simply a matter of economic or class structure, but of *machinic* relations orchestrated by the different degrees of human agency required—greater and lesser control produced, maintained, and reified by *how* digital capitalism and the ideology of the digital reinforce each other through technology.

§2.1

James Bridle’s ‘new aesthetic,’ presented as an online research
project in 2011 and 2012, suggests a physicalization of what was/is more commonly purely digital—a realization of immateriality as physicality. It (re)traces similar aesthetic developments as earlier exhibitions such as Post-Digital Painting did in 2002. Bridle’s ‘new aesthetic’ collects examples where automated production becomes a tangible dimension of human society, ranging from the autonomous action of Google Street View’s face-blurring algorithm to the translation of bitmaps into decorative textile patterns. The particular sense this collection documents is a concerted effort at realizing and acknowledging the digital nature not only of the immaterial ‘space’ produced by computers and algorithmic systems (the results of digital automation), but the transfer of these autonomously produced artifacts into the physical realm. The automated machine labor revealed by this project is a symptom of the emergent autonomous production it documents, revealing the paradox of automation, labor, and value production: the cultural, historical, and aesthetic ruptures between automation and the (traditional) conceptual mappings of human society.

Within Bridle’s archive there are several overlapping categories of material: (1) autonomously generated images that contain markers of the digital such as glitches of various types (encoding errors, algorithmic misidentifications of faces, pixilation/scan lines/digital noise, etc.); (2) physical constructions employing signifiers of digital forms (blocky pixel-imitating construction, scanlines, etc.); (3) translations of digital forms into a visual style (QR codes, low resolution bitmaps, etc.); (4) dynamic, interactive data visualizations (art installations such as Pixels Per Person by Carina Ow that visualizes wifi usage, biometric scanners, and augmented

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1 “The New Aesthetic” was the title of the blog James Bridle used to collect his materials: new-aesthetic.tumblr.com; he started posting on May 6, 2011 and noted on May 12, 2012 that “The New Aesthetic” tumblr was closed at that time. Bridle then resumed posting new materials on August 20, 2012.

2 Joe Houston, Post-Digital Painting (Bloomfield Hills: Cranbrook, 2002).
THE EMERGENCE OF IMMATERIAL PHYSICALITY

reality—the Google Glass project is another prime example). These groupings are neither exhaustive nor mutually exclusive. While there are points of contact and degrees of overlap between them, they articulate general tendencies in the formal appearance of digital technology, and document an apparent paradox: immaterial physicality.

Bridle’s ‘new aesthetic’ also contains examples of camouflage used to ‘hide’ from digital military systems. These images demonstrate a reorientation of physical structures towards their engagement with digital technology, specifically designed to resemble the artifacts and forms of digital imaging. Unlike earlier approaches that addressed specifically human recognition and capabilities, contemporary camouflage mimics the pixilation of digital imagery—it is addressing not human sight, but the automated recognition systems of machines and the digital cameras that accompany them. This shift from a primary concern with human recognition to the disruption of machine vision is a transformation of degree and locus of address, mirroring the shifts posed by the ‘new aesthetic’ generally.

The importance of primitive accumulation to capitalist expansion—the annexing of domains without required payments commonly given to labor—assumes a consumptive dimension in the latter half of the twentieth century as the technologies employed in war become increasingly expensive and (self)destructive; thus, war as a productive stimulus for capitalist expansion both through productive demand and through primitive accumulation (which the Iraq War under President George W. Bush so clearly demonstrated).³

All these works appear to render the aura of information tangible, physically present, but at the same time withdrawn from immediate engagement: the ‘new aesthetic’ offers itself as proof that the digital aspiration to the state of information is immanent—the translation of information to pure instrumentality—emanating directly from how the digital reifies

the capitalist ideology of accumulation in autonomous production. The technical aspects of digital technology become style—thus new aesthetic—a transfer instantiating the immaterial in a physical form, a “print-out” whose tangibility then becomes the operative dimension in asserting the presence of an immaterial, digital ‘information space.’ This physicality proffers the realization of information as instrumentality. Objects collected by Bridle reflect digitally-derived features displaying the existing capacities (both current and historical) of digital technology: the illusion they produce is one where what was immaterial, penumbral, crystalizes from the air into solid, tangible form: reification becomes realization—immaterial physicality.

§2.2

Capitalism is the transformation of labor into a commodity—the worker’s externalization of their productive capacity as a thing to be exchanged. The historical machine is the crystallization of this externalized labor-commodity as a physical productive force, itself valuable, but at the same time dependent upon the very human labor it encapsulates. The categorical divisions Marx proposed—material of labor: those physical commodities transformed by the labor process, including but not limited to raw material; means of labor: the tools, machinery, and buildings utilized by labor; and finally what he terms living labor: the workers who run the machines and enable the production to proceed—reveal how the automated system can be recognized as the logical extension of the means of labor, an ultimate rendering of human living labor unnecessary to the completion of production.

This trajectory is inherent in the machine itself as an apparatus magnifying and supplanting human action. The evolution of the technical requirements to print a single sheet on a printing press is an example of this process: the earliest European printing press with moveable type built by Johannes Guttenberg around 1439 required human labor to set the type, wipe ink on the plates, situate the paper, and remove
each sheet; a modern computer printer does all these actions autonomously, faster, and with much greater precision—in the process transforming the earlier printing press into a machine that only requires limited human involvement in its actual functioning (a human needs to load its paper reservoir). All the productive functions that required several people and both extended time and labor in 1439 are now entirely autonomous.

However, when Marx wrote The Fragment on Machines, the role of human agency in industrial production was not in doubt; his series of propositions concerned the relationships between capital, fixed capital (the investments made in machinery and buildings to house them) and labor (necessary to operate the machines). The trajectory of mechanization had not passed beyond being an enhancement to human productive capacity: first the development of hand tools, which enabled an absolute distinction between labor requiring manual capacities and that requiring intellectual labor, visible in the distinction between the stylus used in cuneiform writing and the plow used in cultivating crops. The emergence of mechanical and machine tools prior to and including the industrial revolution all serve to magnify human action and improve productive capabilities, but remain limited by the abilities of the machine operators. Production in the nineteenth century, even when employing mechanization, remained dependent on the agency of human labor both to keep the machines running and to guide their use in facture itself—for these machines, however much they streamlined the manufacturing process, human labor was essential. This assumption that machines require human participation for their productive action, still true with physical manufacturing, is entirely false within the realm of immaterial production. Marx’s minimal discussion of the role of machines in production makes the observation that mechanization (and automation) requires labor for its action:

Transposition of powers of labor into powers of capital both in fixed and in circulating capital.—To what extent
fixed capital (machine) creates value.—Lauderdale. Machine presupposes a mass of workers. [...] As such a means of production, its use value can be that it is merely the technological condition for the occurrence of the process (the site where the production process proceeds), as with buildings etc., or that it is a direct condition of the action of the means of production proper, like all matières instrumentales. Both are in turn only the material presuppositions for the production process generally, or for the employment and maintenance of the means of labor.4

The role of industrial machinery within this theoretical framework is marginal because the transformation of labor into commodity retains an implicit understanding that production requires human action, a “mass of workers,” and even the term ‘manufacture’ literally references this handwork aspect of production. Thus machinery appears as an addendum to the costs of production as an expense—the purchase of “tools” employed in manufacturing—but is not a substitute for labor, nor its replacement. Within this construction, the machine functions as a crystallization of capital expenditure in a form that is simultaneously a commodity—the machinery—and a generator of value as it is put in motion by human labor, itself alienated by the protocols of mechanization:

As long as the means of labor remains a means of labor in the proper sense of the term, such as it is directly, historically, adopted by capital and included in its realization process, it undergoes a merely formal modification, by appearing now as a means of labor not only in regard to its material side, but also at the same time as a particular mode of the presence of capital, determined by its total process—as fixed capital. But, once adopted into the pro-

duction process of capital, the means of labor passes through different metamorphoses, whose culmination is the machine, or rather, an automatic system of machinery (system of machinery: the automatic one is merely its most complete, most adequate form, and alone transforms machinery into a system), set in motion by an automaton, a moving power that moves itself; this automaton consisting of numerous mechanical and intellectual organs, so that the workers themselves are cast merely as its conscious linkages.\(^5\)

While Marx’s description seems to invoke a contemporary, cybernetic understanding where human labor merges with mechanical procedures, this “automation” is not the automation of the digital system. While the agency of these human workers is severely constrained by machine technology, it is human labor’s conscious action (what he calls “intellectual organs”) that enables production. Labor was the fundamental ‘component’ of these technological innovations that gave rise to industrial production. It took an alienated form because of the demands production placed on labor as an intelligent, highly complex “cog” within an otherwise regimented activity—Marx’s “intellectual organs” (agency)—the allowed actions within the mechanized factory are limited to and contained by the requirements of the device.

The assumption that machines require human agency only emerges as the complexity of those machines reaches a transition point, and parts of their operation requiring human action (but not agency) are replaced by automatic functions. This necessary labor, in which the machine’s role is to magnify and aid human production, was a factual part of the available machinery during the nineteenth century when Marx was alive; the emergence of the factory robot and computer-driven autonomous production line was more than a century away. Factories were adopting the ‘labor-saving’ efficiency of mechanizing repetitive processes—those proce-

dures that do not require intelligent guidance (agency), and are instead functions of fragmented and compartmentalized procedures such as those performed by a clockwork mechanism, much like the Rathaus-Glockenspiel clock in Munich, where the device follows an elaborate series of automated actions through careful gearing and organization of the mechanism itself. Human agency remains an essential, guiding part of the machine, but at the same time, there is an absolute distinction between the mechanical and the human, a division mandated by the nature of the technical apparatus itself, even, and especially when, the orchestration of these devices is designed to create the appearance of self-awareness. It is these increasingly complex machines of the industrial revolution powered by steam or electricity that perform calculations and other precise, highly specialized kinds of intellectual activity that place the role of human agency in doubt.

The nature of mechanized production in the nineteenth century is fundamentally different than autonomous, immaterial production: digital systems have enabled machines where human labor has been minimized or entirely eliminated, and production proceeds without human control, guidance, or interaction; High Frequency Trading (HFT) is a typical example of this automation of the decision process through algorithmic rules. The shifts apparent in the printing press are common features of how automated production replaces necessarily dehumanized labor. Autonomous production that began as a ‘labor-saving’ procedure now saves all human labor in/as the productive machine: it is this specific dimension of automated (immaterial) labor using digital technology that reflects an ideology of production-without-consumption.

Digitally-enabled automation makes the human labor previously rendered subservient within the productive system itself uncertain, posing a fundamental challenge to capitalism as historically defined through the transformation of human labor into a commodity—the use of human intelligence, skill, and labor time as a specific form of productive
value. The potential for *full automation* emerges with the development of digital automation, one where human labor—human agency—becomes a wasted value, and which the ‘new aesthetic’ documents.

§2.3

The industrial revolution’s innate challenges to traditional social structures apparent in the de-skilling of those trades replaced by industrial production resulted in the emergence of design reform movements throughout industrial Europe at the end of the nineteenth century under the influence of John Ruskin via William Morris (*Arts and Crafts* in the UK, *Art Nouveau* in France and Belgium, and both the *Secession* and *Jugendstil* movements in Germany and Austria). These movements created classic examples of *ressentiment*—an anti-industrial aesthetic of hand-working. The *Fragment on Machines* was written in the same period and addressed these same issues of industrial production as Ruskin; however, Marx’s analysis emerged from economics rather than considering industrialization as an aesthetic problem.

In contrast to mechanized production’s impact on the skilled trades, automation initially impacted intellectual (immaterial) labor rather than physical (manual) labor—from the *Antikythera Mechanism* produced around 100 BCE, to the *Prague Orloj* clock from 1410, to the *Rathaus-Glockenspiel* in 1907—automation and automated systems have principally been concerned not with manual production, but with the elimination of intelligent labor. This separation of the intellectual potential of labor from its actions quickly became apparent during the nineteenth century in the regimentation of intelligent tasks limited by machinery. But while the role of human agency is reduced by early calculating machines, they remained within the realm of labor-saving devices, replicating complex computations with only

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limited use value, and whose production required specialized intellectual labor: these are devices outside the realm of material production. Yet, following the same set of concerns with mechanical production as Ruskin, Marx is not addressing these devices.

The ‘new aesthetic’ emerges as the antipode to the Ruskin/Morris hand-worked aesthetic, as a parallel to the early twentieth century’s “machine style”: the Modernist, Art Deco style where human handiwork was systematically elided in favor of the glittering chrome and smooth surfaces now synonymous with industrial production on a mass scale. However, these Modernist designs remained unquestionably a product of human action—both intellectual and physical; it is the role of human agency that comes into question with the ‘new aesthetic’: the necessity not only for human labor in the production of the work, but the requirement of human agency (following the aura of the digital) as a productive and organizational principle. The immaterial physicality of the ‘new aesthetic’ presents a convergence of these machinic, semiotic, and biologic productions, revealing a fundamental contradiction posed by human agency in relation to autonomous production.

Autonomy from human production and the elision of human agency emerges as the intermediary between designer-engineer and final result becomes simply the action of the tool which exactly executes the planned work. The various artifacts brought together as the ‘new aesthetic’ are united by their orientation not towards human observation or functional utility, but rather by their invocation of productive values without human action—the aura of the digital’s separation of product from all that is required to produce it: labor, capital, resources. This transition point marks a shift from the fragmentation of the assembly-line where tasks are organized around the repetitive action of masses of human labor (itself an organization that implies semiotic disassembly and standardization) to an automated fabrication where the design is generated on digital machines and then implemented by other digital machines without human labor in the facture
process; the necessity of human-as-designer thus comes into question as it is the only aspect of non-machine agency remaining, an element whose necessity is challenged by evolutionary algorithms and automated design.

What the ‘new aesthetic’ documents is the shift from earlier considerations of machine labor as an amplifier and extension of human action—as an augmentation of human labor—to its replacement by models where the machine does not augment but supplant, in the process apparently removing the human intermediary that is the labor which historically lies between the work of human designer-engineers and fabrication following their plans. The ‘new aesthetic’ figures in this cycle as a symptom of a reorientation already underway, rather than its outcome, as human agency becomes insignificant to these modes of production, and automation usurps its position (agency) in the system as a whole.

The shift from immaterial values generated by automation (semiosis) to material values generated by automation (facture) signals a fundamental shift in the nature of capitalist production, one where human labor is of lesser significance to that of automation. It is through this convergence that problems posed by autonomous production are elided following the aura of the digital’s stripping of physical considerations and limitations from consciousness: the emergence of production without human labor, of commodity and exchange values (both physical and immaterial) generated without the action of human agency. The fundamental condition of Marx’s capitalism (labor-as-commodity) returns to a central position through the transformation of labor to automation and the inherent commodity nature of machines: the definitional condition of capitalism becomes the literal condition of production under automation. In the autofactory, there is no role for humans; unlike human labor which is entangled with the minimum dimensions of society (Agamben’s “bare life”), the autonomous machine is pure commodity, non-life. Large bodies of the “human resource” fall idle as their manual functions in production are now automated, their own commoditization of their human labor becomes
superfluous to the productive capitalism of automation—this is the ideology of automation that follows one fundamental law:

Anything that can be automated, will be.

The autonomous labor performed by machines—whether through automated processes algorithmically driven (as with High Frequency Trading software), through generative systems, or physically in the robot assembly line—is a crystallization of labor-as-commodity without requiring living labor’s social reproduction costs: automation does not require a wage, does not impose social demands on its owners, and when it is expended, it can be discarded to be replaced by newer technology.

§2.4

The paradox of automated labor and capitalism arises directly from the limiting role that scarcity of capital poses to this productive system: the automated production of values can only continue if it is possible to exchange those values for other values. The aura of the digital, when instantiated through automated production, necessarily creates a paradox where instead of an exponential escalation in value production, it generates surplus values for which there is exponentially decreasing opportunity for exchange: the immaterial physicality that automation brings into existence (and which is documented by the ‘new aesthetic’) is one where the elimination of human labor also serves to undermine the concept of ‘exchange value’ itself, as Marx noted:

Exchange-value appears first of all as the quantitative relation, the proportion, in which use-values of one kind exchange for use-values of another kind. This relation changes constantly with time and place. Hence exchange-value appears to be something accidental and purely relative, and consequently an intrinsic value, i.e., an exchange-value that is inseparably connected with the com-
modity, inherent in it, seems a contradiction in terms.\(^7\)

The paradox appears precisely because exchange value emerges from the relationship between one commodity and another—from the exchange of a commodity for the acquisition of another; in capitalism this exchange devolves fundamentally to transfers of labor between different social strata where higher level values derive from the action of labor at lower levels in that same society. Thus the elimination of the lowest levels of human labor from the production process destabilizes the upper levels in a cascading fashion. This proposition is not an “end of capitalism” fantasy where automation ends the scarcity of both capital and physical limitations, but a structural contradiction in the nature of value itself when decoupled from human labor. By replacing the lowest levels of human labor with automation, greater efficiencies in production emerge, but at the same time that human labor is displaced; some of it occupies (is absorbed by its society into) higher-skilled (greater degree of intelligent agency) positions supported by those automated procedures; however, as that higher-skilled labor is also automated, society’s ability to absorb this displaced labor necessarily creates a new problematic not specifically recognizable as the issue of class struggle described by Marx—a shift from conflict between those who labor and those who do not, to conflict between those controlling the production of exchange values and those excluded from exchange entirely: the human labor whose labor-as-commodity no longer possesses any utility, hence is not an exchange value.

The disappearance of the historical Luddites from contemporary digital production reflects the aura of the digital encroaching and conditioning consciousness. The view that machines, including computers, are not a challenge to human labor has become an axiomatic belief about machinery (The Luddite Fallacy). Instead, it is the cybernetic under-

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standing implicit in misreading the *Fragment on Machines*—a worry that machines will colonize the living, human body—that had a currency at the end of the twentieth century, both in popular entertainment (the “Borg” of *Star Trek*) and in the Critical Art Ensemble’s comments from *Electronic Civil Disobedience* published in 1996:

Although technological development causes many people fear and anxiety, fewer and fewer believe that technology will replace them. In fact, the fear is really quite the opposite. As technology attaches itself to the body, the relationship between the body and technology becomes increasingly symbiotic.⁸

In the general failure to acknowledge the potential of digital computers to automate cognitive tasks, (a fact evident from the earliest surviving calculation device, the *Antikythera Mechanism* to the most contemporary digital computer: any intellectual activity that can be reduced to particular rules can be rendered autonomous)—the threat posed by automation to *human exceptionalism* is sublimated as fears about digital technology colonizing the organic, human realm: the idea that humanity must merge with computers to enable them to *begin* thinking. If computers do not need to merge with humanity in such a fashion, then humanity is not exceptional—opening the possibility for (at least some portions of) human intellectual labor to be rendered obsolete, as HFT does with the decision making process for stock and commodity trades in the financial markets.

A herald of the ideology of automation’s expanding force is apparent in the intersection of automated immaterial labor with the formerly intellectual labor of human agents, and is a literal realization of the bifurcation between design and facture, one where the devaluation of human labor reaches its apogee: rendered obsolete by the machine, there is no longer

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any need for human agency once the autonomous factory has been built except to switch it on. This situation is the implicit horror/terror common to computer technology (and its earlier realization as the golem or homunculus) as an actor in society. The ideology of automation reveals its close relationship to the earlier ideology of the self-made man whose success is not a product of family, investment, or privileged position in society—shorn of the requirement for a network of human actors working in concert to produce wealth (material or immaterial), the automated system enables an ideology where the productive human population appears obsolete, parasitic, on the “designers” whose plans they formerly executed—this is the ideology of automation embraced by the middle classes.

Ironically, by working to create computer systems that emulate or replace both human labor and human agency, the United States’ middle class belief in the self-made man, in “autonomous achievement,” becomes the reality of “automated achievement” for the upper classes, leaving the remainder of society to ‘work’ as consumers/debt generators, automation effectively eliminating them from the production process. HFT is one sign of this ideology of automation coming into action—a procedure that removes human agency from its historical role in immaterial production: the response time of the computer system is such that only machines can compete in a market where price fluctuations determined in microseconds make the difference between profit and loss. It is reified in the digital, reflecting a denial of the physical realm and the necessary role of human agency in creating and sustaining the social structures which enable the ideology of automation’s fantasy of “freedom” from social (re)production and the constraints required by human society. This complex of relationships reflects the underlying bias of digital capitalism against the social.