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PARTIAL LIBERATIONS: THE MACHINE, GENDER, AND HIGH-TECH CULTURE[1]

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INTRODUCTION

A public burning occurred in Hamburg, Germany on February 19, in the year 1685. By order of the Senate, the victim was displayed early in the public square, leaving ample time for the requisite shaming. People had flocked in from outlying areas; an angry mob hurled rotting vegetables and equally foul words. Vendors hawked the victuals customary on such occasions.

When the crowd had been roused to the desired pitch of frenzy, the sticks of kindling were lit by the executioner. The flames leapt steadily higher around the unfortunate victim. We will leave aside the spectacle of the first few minutes. In a matter of some hours, all that remained was a smoldering, still crackling pile of unrecognizable matter.

The evil force that the townspeople and their government had tried to exorcise by submitting it to elemental dissolution was not, in this case, the lower-class female body of a witch. The burning of such bodies, a practice which by the time of the incident was already two centuries old and beginning to fall out of fashion, certainly furnished the precedent for the ritual. And perhaps the burning of witches sprang from social, economic, and demographic pressures similar to those that had given rise to the burning in question.

But it was not a witch who had been burned, though the victim had been accused of possessing equally occult powers. No, the townspeople and their government had burned a ribbon-loom, a machine, at the stake in the public square. This machine was a predecessor of the weaving machines—mule and power looms—on which the female workers of the coming Industrial Revolution would slave for countless hours.

This is my imaginative extrapolation of a passage from Chapter XV of Karl Marx's *Capital*.[2] In the passage, Marx describes an actual event that occurred in Hamburg. With nearly four hundred years hindsight, one is struck by the futility of burning a machine in a public square on the eve of the Industrial Revolution. But there is both a deeper absurdity and a deeper meaning to this execution. Here we see two historical eras of production, each with a different material substrate and mode of life, in violent confrontation. We see illustrated the contradiction of a single people with itself. The machine, emblematic of the age of Modern Industry, may have lost the battle, but it ultimately wins the war. The burning is inadequate because through it the people, summoning their most powerful forces, attempt materially to destroy a radically nonmaterial and radically new sort of object: an object that is solidified knowledge and skill. The irony of the burning is that this knowledge and skill is this people's own, albeit objectified. The people present at the burning thus perform their misunderstanding both of themselves and of their relationship to the means of production.

Doubtless this inadequacy was not entirely lost on the people, for the passage also tells us that the inventor of the ribbon loom was himself subjected to the elemental dissolution of the waters—that is, drowned at the secret initiative of the Mayor. The citizens of Hamburg thus managed to destroy both the machine and its creator as objects. But the power of such an invention was located neither in the physicality of its creator, nor in his individual innovation, nor in the resultant instantiation of the object. Rather, this invention displayed the powerful synthesis of a skill-infused object: the synthesis of previously separate powers in a single thing, the idea of this, and the significance of it for Capitalist development, along with the appearance therein of a certain degree of social labor's development. Neither drowning nor burning were effective measures against such a demon.

By the time it is forced to burn a machine in a public square, the historical era of Manufacture has been forever lost, and is questing

about for something to blame for the changes it perceives in itself. It seizes upon a machine. Why?[3]

According to Marx's passage, the ribbon loom had been accused of the following crimes: weaving four to six pieces at once, the machine made five workers superfluous. Worse still, "it enabled a totally inexperienced boy to set the whole loom with all its shuttles in motion, by simply moving a rod backwards and forwards" (403; I. IV. XV.5). In sum, the possibilities realized by the loom were sufficient utterly to undo the structures that informed the era of Manufacture and that relied on skill in the wielding of tools. An entire form of social and political life had resulted from the organization characteristic of Manufacture: guilds, early towns in which serfs newly escaped from the manor gathered, and a system of apprenticeship. It was this form of social and political life that saw itself threatened by the machine, and it was in fact threatened. It was not aware that it itself had contributed to and enabled this development.

The passage from *Capital* documents a number of other machines that "succumbed to the excesses of the populace" (404; I.IV.VX.5) in the early years of the transition from the era of Manufacture to the era of Modern Industry. The passage explains that revolts against the ribbon loom in particular were common among working people all over Europe. These revolts did not cease with the demise of Manufacture but continued well into the nineteenth century as isolated workers' rebellions vented righteous anger on the fixed capital of the factories. The Luddites are perhaps the most famous example of a group undertaking such rebellions; Marx mentions them shortly after. The passage from *Capital* ends thus: "It took both time and experience before the workpeople learned to distinguish between machinery and its employment by capital, and to direct their attacks, not against the material instruments of production, but against the mode in which they are used" (404; I.IV.VX.5). The burning of the machine is one example of the difficulty that those who operate within a given mode of production have in forming an adequate criticism of this mode, as opposed to the means by which the mode expresses itself. But time and experience have not helped us correct this mistake. We still demonize machines and locate them as sources of our oppression, discursively as well as practically.

In the following paper, I offer three theses: First, the machine is a key trope for us to use in decoding the texts of Karl Marx, including

the question of the status of these "monsters" of Modern Industry under a different—that is, Communist—mode of production (*Grundrisse* 1973, 690–712 and *Capital* 1887, 351–475; I.IV.XV). Second, the fates of women and the machine are linked on symbolic as well as material registers—for better or for worse. This is a part of the general phenomenon of the dissolution of the "natural" bourgeois family (*Capital* 1887, 372–380; I.IV.XV.3a). The link between machine labor and women is not yet made in the *Grundrisse,* but reaches its fully developed form in *Capital.* Third, few things obsess us as much as technology, in both high and low culture. However, we still fail to distinguish adequately between machinery itself and its employment towards exploitive ends. This failure continues to echo throughout contemporary theoretical disputes, especially in feminism and certain strands of anti-technological humanism. Nonetheless, the demand Marx makes of us not to confuse the means of production with their exploitative appropriation is a particularly difficult one to satisfy, for the reason that, even according to his own materialist criteria, the meaning of a thing is established in our practical experiences of it. And if our experience of machines has been outside of our experiences of exploitation, this has occurred only on the margins of the vastness of this exploitation, and is therefore conditioned by it. Nonetheless, this is exactly where a space must be carved out for the creative reappropriation of machines and technology, a particularization of our discussion of the effects of certain machines—a particularization that comes down from the level of abstraction at which technology is discussed as a mythological and abstract unity.

PART I: THE MACHINE AS A KEY TROPE FOR DECODING THE TEXTS OF KARL MARX

In Marx's history, the machine is emblematic of the era of Modern Industry. Marx writes, "It is not the articles made, but how they are made, *and by what instruments,* that enables us to distinguish different economic epochs" (*Capital* 1887, 175; I.III.VII.1, my emphasis). The technical term Marx uses for the general category that would encompass both machine and tool is "means of production" or sometimes "instrument of production" (*Grundrisse* 1973, 690; *Capital* 1887, 351–475; I.IV.XV). Just as the tool was the instrument of production emblematic of the era of Manufacture and the hand the instrument of

production emblematic of earlier epochs of (pre)history,[4] the machine is the means of production emblematic of Modern Industry—and the material instantiation of its contradictions.

Very briefly, these contradictions proceed as follows. Machines greatly increase productivity. However, the Capitalist's profit comes not from the increased productivity of fixed capital but from the increased productivity of living labor. Insofar as the latter conditions the former by speed and duration of work, the Capitalist profits. But at the same time, machines make superfluous the living labor from which the Capitalist profits, replacing it with more fixed capital. Thus the machines work both for and against the Capitalist. The only hope for continued profit is in the escalation of the intensity of labor of the remaining living labor concomitant with increased appropriation of scientific innovation free of charge in new and better machines. This escalation increases the individual value of the article produced—tied to its novelty—over the social value at which it is generally sold. But over time, old machines act against the Capitalist. In Capitalism, machines are ultimately inimical to the interests of *both* Capitalist and Worker. One begins to see why Marx sensed the imminent apocalypse of such a self-contradictory system. This problem is known as the fall of the rate of profit.[5] The fall of the rate of profit is the crux of Chapter XV and underpins Marx's explanation of machines. It also explains why the Factory Acts try to put a legislative brake on unlimited Capitalist expansion. Everyone ultimately loses in such a system.[6]

Three features distinguish the machine as Marx analyses it in Chapter XV of *Capital:* a motor mechanism, a transmitting mechanism, and a working machine. The motor mechanism is the centralized power source that replaces the human body wielding the tool. Different motor mechanisms of escalating amounts of power culminate in the factories of the Industrial Revolution, driven by steam or coal, whose various machines turn around this vast output of energy.[7] The transmitting mechanism is the part of the machine that co-opts the skill previously possessed by the worker, the template or schema that guides the energy from the motor mechanism into a specific action. The working machine is the sheer multiplication of the tool that actually forms or shapes the product. Instead of a knife, wielded by a workman, cutting out a single shoe, a thousand knives are

dispatched by the power of the motor mechanism and directed by the skill of the transmitting mechanism.

In this account of machinery, we are faced with two quantitative shifts: those of the motor mechanism and the working machine, which are sheer numerical increases of power and tools. The employment of the transmitting machine is a qualitative shift. But this classification is explanatory rather than definitive. The Hegelian point that quantitative shifts of a great intensity result in qualitative change is particularly applicable to the transition between the machine and the tool.[8] The context of Hegel's point is the distinction between animate and inanimate things. For Marx, a qualitative shift of this type, between tool and machine, underpins his historical classification of the eras of production. He plays on Hegel's point in his insistence that in Modern Industry, the machine is animate and its human operator "reduced" to the role of "watchman and regulator" (*Grundrisse* 1973, 705).

The development of these three aspects of the machine allows Marx to give the following description of the changed scene of production once the factory has replaced the workshop. He writes:

> As soon as a machine executes, without man's help, all the movements requisite to elaborate the raw material, needing only attendance from him, we have an automatic system of machinery, and one that is susceptible of constant improvement in its details. . . . Here we have, in the place of the isolated machine, a mechanical monster *[Ungeheur]* whose body fills whole factories, and whose demon power, at first veiled under the slow and measured motions of his giant limbs *[versteckt durch die fast feierlich gemessene bewegung seiner Riesenglieder]*, at length breaks into the fast and furious whirl of his countless *[zahllosen]* organs. (*Capital* 1887, 360; I. IV. XV.1; German from the Marx-Engels Internet archive at www.mlwerke.de/me/me23/me23_391.htm#Kap_13_1)

The infinity of hands, hands beyond all measure, the gigantism of an automated system of machinery: these are demonic. For Marx they represent forces of past human labor solidified and standing over against living labor.

Marx often uses the vocabulary of monstrosity to describe machines within the factory scene, in his early as in his later work.[9] We see Marx's residual humanism in the natural norms by which concepts like monstrosity are necessarily regulated.[10] The monstrous

machine, like the witch or the cyborg, has access, albeit an unnatural access, to excessive energies and powers. Monster figures also appear at the shifting boundaries between human/machine and human/animal. The factory scene is one place where such boundaries are called into question, as are the animate and the inanimate at stake in Hegel's quantity/quality distinction.

Fascinating in Marx's above description of the monstrous factory scene is the way in which machinery itself is described as a body with a central power source (or heart) in the motor mechanism, a brain in the transmitting mechanism, and an infinity of hands in the working machines. In the face of such a system, the "natural" limits of human power no longer have any meaning:[11] the machine can work around the clock at a breakneck pace; the worker is no longer limited by night or day nor by a pace set by the human capabilities of wielding a tool. The body of the worker thus becomes obscured, not a body at all itself but only a part of this larger body, and her role in the production of the object is increasingly minute as the machinery is "improved." But we shall see in the next section that the way in which natural powers and categories come to be obscured in mechanical production is also a liberation, or could condition a liberation, albeit a liberation won at the expense of suffering and dying human bodies.

PART II: THE SOCIOLOGICAL EFFECTS UNLEASHED BY THE WIDESPREAD USE OF MACHINES IN PRODUCTION

It is no accident that Marx's discussion of women's entry into the industrial reserve army comes under the rubric of machines. Modern Industry has sociological effects, just like any other system of production. First, by lessening the actual physical strength required by previous production, labor can employ workers who, according to natural categories, are classified as weak. It can also employ these workers more cheaply. Factory work is spread throughout the entire family rather than devolving exclusively upon the adult male members of a household.[12] In this mode of production, "strength" and "weakness" become strictly social categories. In terms of employability, brawny shoulder muscles suddenly become a weakness and the nimble fingers of a child, a strength. The invention of the machine makes what would have previously been regarded as strength into

weakness and various weaknesses, such as the tedium and minuteness of traditional women's work, into strengths. This shift shows the essential malleability of the categories "strength and weakness."

The widespread entrance of women into the labor force[13] also occasioned various backlashes. Among the bourgeoisie it caused an oppositional reinforcement of notions of women's natural weakness: as the women of the nineteenth century's working class headed into the factories, bourgeois women became increasingly circumscribed in what they were allowed to do. Among the working class, men resented the unbeatable (because cheaper) competition that swelled the ranks of available labor. We should also not lose sight of the fact that women were desirable as industrial workers because they could be paid less, ordered about more effectively, and were generally of less social value. However, even with all of these negative consequences, the entry of women into labor marks one site where the machine caused the concepts of sex and family—along with strength and weakness—to become self-consciously cultural rather than natural.[14]

I am not suggesting that the entry of women into the labor force was an unproblematic triumph for women or for feminists. I wish to leave intact all of the ambiguity of this moment. It should be borne in mind that working class women were allowed into the formal labor market only as a way of further exploiting the working class, of spreading a living wage out to maximize surplus value, and of dividing this class against itself. The difference between a career in the professions and factory work should also not go unnoticed. But I do wish to suggest that the machine lessened the significance of natural categories as meaningful in the workplace and that ultimately this was a liberation, albeit one of dastardly origins. Moreover this is a change that could condition still more substantial liberations. In particular, alienation and the resultant changes in the scenes of production can actually be desirable if one happens to belong to a disenfranchised natural category.

Now, the alienation of human skill into a mechanical apparatus is not necessarily bad. There is nothing undesirable about a worker's skill/knowledge being located outside her body if she in turn owns the objects that embody the skill—if she owns the machines, or has ready use of them, or can siphon off a use of them different from the one for which they were specifically designed. Her body expands to include these machines, and from this expansion she can reappropri-

ate their powers for positive ends. Machines do not cause the net obsolescence of skills, as is often claimed, but the development of a different set of skills, and a set of skills less closely tied to so-called "natural" capacities.

In this way the myth of the end of skilled labor is really a false problem. This is not to rehearse the justifications of the bourgeois economists whom Marx ridicules. The fact is that under the bourgeois system, finding a job somewhere else takes time, and in the meantime one suffers, even if ultimately one is better off in the end. But the development of women's technical skill is a version of the exception Marx recognizes to the law of the fall in value of labor-power when he writes that "[a]n exception to this law holds good whenever the decomposition of the labour-process begets new and comprehensive functions, that either had no place at all, or only a very modest one, in the earlier system" (*Capital* 1887, 331; I. IV. XIV.3). A place for the value of women's labor is made in the wake of the transformations of modernity.

To resist a technophobia that would regard all alienation—and thus all scientific innovation—as bad is also to realize that, under current conditions of production, liberations for women in particular are often possible through the seizure of a scientific education, for starters. The demand for unalienated labor is not only an impossible standard for liberation; it is also a dangerous ideology that can prevent those who most need it from obtaining a scientific education. It is therefore a way of keeping women in their place for their own good.

Machines generate a network of secondary effects that are in principle appropriable by anyone (*Capital* 1887, 362; I. IV. XV.1). The means of communication spawned by Modern Industry can be appropriated by the workers to further their organization as well as by the capitalist industry that produced them; Marx is thinking of the role the railways play in workers' organizations when he suggests this in *The Communist Manifesto* (Tucker, 1978, 481). Alienation causes the worker to become disenfranchised, but capital alienates its power in turn, and the worker can seize this power. Alienation is both the problem and the solution in an age of mechanical production. The problem of exploitation arises not from the machines themselves, but from how they are used. You will perhaps notice that we have thus rejoined the question with which we began. We continue not to know

what partial liberations are available until we undertake a less general inventory of our actual machines.

In the third section of this paper I argue that we feminists had best develop better relations with machines so that we can contest for their appropriation, rather than burning them in discursive squares in a futile gesture that would seek to return us to a bygone era of production. In this I follow the work of historian of science and self-identified Marxist feminist Donna Haraway.

PART III: PARTIAL LIBERATIONS, TWO FEMINIST CONCLUSIONS OF THE ANALYSIS OF MACHINES

Marx's analysis of the machine has led feminist thinkers to divergent conclusions, depending on whether they focus on the exploitative or potentially liberating effects of machines as Marx describes them. Drawing on insights from Haraway, I will argue that focusing on potential liberations is a more powerful strategy and that focusing on exploitation risks mistaking the machine itself for the enemy. Let us first get a sense of the types of claims that typically result from a focus on the negative consequences of mechanism.

In her 1980 book *The Death of Nature*, Carolyn Merchant offers an historical narrative of the European Scientific Revolution. She considers the inventions, machines, and the scientific consciousness that accompanies them as marking a definitive transition from an earlier organic worldview, in which, she argues, both woman and nature were more highly valued. She sees environmental destruction as proceeding hand in hand with a devaluation of women, who are identified conceptually with the nature under siege. She sees the language of the Scientific Revolution as irreducibly sexual in describing an increasing manipulation of a passive female earth. For Merchant, machines are emblematic expressions of a world driven by order and power. They are portrayed as alienating completely any connection with organic wholes, such as the earth, which previously had been regarded as vital. After the transition to mechanical production, the earth is regarded as inert matter, a thing to be formed and inquired into, mined, exploited, and dissected.

Merchant's account includes a history of a number of actual machines, including the clock and the watermill. It also identifies the rise of commercial capitalism as instrumental to the development and

application of machinery. As a history, the book is excellent. It is when Merchant begins to draw up a schema for action in "our time" that her thesis becomes utopian and revisionist, about machines and about "women," as well as less than optimally engaging the extremely lively matter of contemporary physics. In her concluding chapter, Merchant calls for a return to "the values and constraints historically associated with the organic world view [as] essential for a viable future" (1980, 289).

In fact, such a worldview is not one to which we can return. We do not choose our consciousnesses; we produce them. To pay adequate attention to the material constituents of our reality today is to understand how the cultural undercurrent of organicism itself is increasingly predicated on machines, their use, and the kind of thinking and practice they generate. It may be only through high-tech intervention that we can begin to solve or reverse the very environmental problems created by mechanical production in the nineteenth and twentieth centuries. In any case, the boundary between organicism and mechanism is, in the words of Haraway, "thoroughly breached" (1991, 151).

Indeed, the persistence of organicism in the various cultural and intellectual traditions to which Merchant gestures is an argument not for its viability as a perspective to which we could return, but rather an argument against this very viability. Organicism, like unalienated labor and other mythical origin stories, can openly appear as ideal only in a world in which they have been definitively eclipsed.

Haraway calls organicism an "oppositional ideology"—that is, an ideology that can appear in its fullest form only when it mythically opposes itself to the given reality. She writes: "[The] symbolic systems and the related positions of ecofeminism and feminist paganism, replete with organicisms, can only be understood in Sandoval's terms as oppositional ideologies fitting the late twentieth century. They would simply bewilder anyone not preoccupied with the machines and consciousness of late capitalism. In that sense they are part of the cyborg world" (1991, 174). Oppositional ideologies are the machine burnings of our own age: the recognition or anticipation through denial of an already-accomplished change. Nature itself at its root must be such an ideology: for no concept of nature could come forth as self-consciously natural on undifferentiated ground. The idea of the "natural" must from its beginnings be a product of the technical.

The language of "oppositional ideology" might indeed be a provocative means of describing interpretations of the Marxist Revolution that retain an implicit salvation history. This idea of revolution is a means of keeping us humanists busy in isolation from the sciences, a means of channeling our intellectual and social energy along safe utopian paths that stand under and ultimately support present regimes of power by failing to engage them. Focusing too narrowly on revolutions that would return us to unalienated labor distracts us from the more pressing question of how we can live with, in, and among machines that are here to stay. How can machines be appreciated as holding out the possibility for liberation and not only for strife and exploitation?

Donna Haraway takes up this question in her essay "A Cyborg Manifesto." She levels the following criticism at Merchant's book:

> One of my premises is that most American socialists and feminists see deepened dualisms of mind and body, animal and machine, idealism and materialism in the social practices, symbolic formulations, and physical artifacts associated with high technology and scientific culture. From *One Dimensional Man* (Marcuse 1964) to *The Death of Nature* (Merchant 1980), the analytic resources developed by progressives have insisted on the necessary domination of technics and recalled us to an imagined organic body to integrate our resistance. Another of my premises is that the need for the unity of people trying to resist worldwide intensification of domination has never been more acute. But a slightly perverse shift of perspective might better enable us to contest for meanings, as well as for other forms of power and pleasure in technologically mediated societies. (1991, 154)

Not only is Merchant's proposed strategy unlikely—the organic body to which she suggests we return is not flesh but "imagined"—her strategy also purports that dualisms persist in the culture of high technology. In fact, these dualisms are fatally undermined by high-tech culture. More importantly, the strategy of return to oppositional ideologies such as organicism might well be ineffective practically, given the overwhelming presence of technological means of communications. The railways along which workers communicated are now phone lines and computers through which amounts of information undreamed of by Marx move in a fashion that is notoriously difficult to control. More chillingly, the self-identification of women with organic nature can be interpreted as a gesture at the very least of self-

loathing, if not of outright suicide, in a world in which organic nature is as imperiled as it is in our own.

Haraway takes up the positive aspects of machines in Marx's analysis. She does not shy away from such a partial liberation, even of dastardly origins, and from the positive effects such liberations can have. Specifically she refigures the scientific image of a machine-human hybrid, the Cyborg, as a liberatory schema for women, one which is itself subject to transformation and alienation. The Cyborg is "completely without innocence" (1991, 151) and without longing for a return to imaginary organic wholeness. In a later book Haraway will describe two particular cyborgian subject configurations as "no strangers to the property form of existence" (1997, 120). Haraway writes: "Cyborgs are not reverent.... They are wary of holism but needy of connection—they seem to have a natural feel for united front politics, but without the vanguard party. The main trouble with cyborgs, of course, is that they are the illegitimate offspring of militarism and patriarchal capitalism, not to mention state socialism. But illegitimate offspring are often exceedingly unfaithful to their origins" (1991, 151). Capitalism, as Marx argues, spawns secondary effects that have the potential to undercut its worst features. Haraway argues for the reform brought about by such secondary effects as partial liberations and not for an apocalyptic or revisionary revolution. She argues for choosing effective political strategies even if the methods are subtended by horrifying histories. This is what she means by an innocence best lost: we feminists must choose partial provisional action rather than seek refuge in mythologizing narratives.

To do this we must embrace and redeploy rather than smash machines, in our discursive and our practical lives. In fact, in a world in which academic along with practical feminist action is thoroughly conditioned by high-tech means of communication—web-based support and information networks, notebook computers, electronic texts, and online submission of journal articles—we have already chosen. Now we have only to reckon, and reckon well, with these choices. To demonize and repudiate our machines is to behave like the lovers from the *Symposium* who "are even willing to cut off their own arms and legs if they think they are diseased" (Nehamas and Woodruff 1989, Diotima's Speech, 205E). We might at least wish to call into question such a debilitating move.

It is also important not to be overly optimistic about machines, lest we crash on the other, equally perilous shoal of an unmitigated technophilia. The question of whether and how machines can be so easily reappropriated from their original conditions of production is worth exploring more carefully than Harway does or than I do here. More particular accounts of different types of machines and other high-technological objects, accounts that look at the characteristics and the contexts in which particular machines operate, would go some distance toward redressing this problem.[15] I do not wish to suggest that Haraway herself does not call for this particularization of accounts of technology; she does in numerous passages throughout her texts. I myself present the machine as a generality here in order to oppose the generality with which anti-technological discourses treat the machine. Sometimes it is best to meet a giant with a giant on the meta-discursive level. That said, there is something false about such a presentation, which is sensitive neither to particular contexts as liberating or oppressive nor to the complicated history of machinery itself. By treating the machine as a monolith, I also risk replicating the very problem I wish to undermine. So to the machines themselves!

NOTES

1 Like most philosophical essays, this one has a genealogy of debts, occlusions, and silent and imaginary interlocutors along with very vocal ones. Among the latter are Dan Conway and Sara Brill of the Pennsylvania State University, those who attended the *Philosophy, Interpretation, and Culture* conference session at which the paper was first presented at SUNY Binghamton in the Spring of 2001, and Andy Moore.

2 The passage in question is to be found at *Capital* 1887, 403–4; I.IV. XV.5. I have preferred to use a notation in addition to page numbering in my citations from *Capital*. The first number is the page from the 1887 English edition of *Capital* out of Progress Publishers in Moscow on which the given text is found. The second notation reflects the following content: "Volume of Capital. Part. Chapter. Section."

3 Marx's late writings document the fits and starts of the changes between the two historical periods he calls Manufacture and Modern Industry. The former period lays the social and technical foundation for the subsequent one. The transition between the two periods spans roughly

the seventeenth through the nineteenth centuries, with earlier harbingers and later residues. This paper seeks to bring out the significance of machines for this transition and then to hear our own cultural discourses about technology as echos of the same features.

4 These earlier modes of production have a shifting system of classification in Marx's history and prehistory. At any rate, it is the era of Capital with which he is concerned, and the periods leading up to it serve mostly to explain this period and show how it came into being.

5 In Volume One of *Capital*, Marx tells the reader repeatedly that a full analysis of the problem of the fall of the rate of profit will be put off until Volume Three.

6 For the most concise description of this problem, see *Capital* 1887, 382; I.IV.XV.3b. See also Negri 1991, 127–50.

7 The locution in the English translation of *Capital* for the motor mechanism is "prime mover" (1887, 358, 360, 362, 363; I.IV.XV.1), "*erste Motor*" in the German (Marx-Engels Internet Archive). The "prime mover" of the English text evokes the force of a God who sets things into motion from nothing. This is fitting, especially given Marx's insistence that with Machinery, the human being "for the first time succeeds in making the product of his past labour work on a large scale gratuitously, like the forces of Nature" (366; I.IV.XV.2). That in machinery these forces should appear to come from nothing, that this past labor is obscured, is a bourgeois trick that only a class-based analysis will help to reveal. That the human being should mimic the scale of natural forces in an unnatural way is sheer hubris, which is revealed in the vocabulary of monstrosity Marx uses to characterize machines. I will further address this vocabulary later in this essay.

8 Marx rehearses this point of Hegel's over and again in Volume I of *Capital*. Three very clear examples of this are to be found in the chapter on the Rate and Mass of Surplus-Value (1887, 292; I.III.XI), in the chapter on Cooperation (1887, 308 and 315; I.IV.XIII), and in the chapter on The General Law of Capitalist Accumulation (1887, 589; I.IV.XXV.3). In the latter passage, Marx uses Hegel's point to show the way in which the quantitative accumulation of capital has qualitative effects on its composition, and specifically on the proportion between its constant and variable—or objective and subjective, or mechanized and human—portions.

9 Further, both Marx and following him Engels use the vocabulary of monstrosity to describe the general process of Capital's extraction of wealth, and not just in relation to machines. Indeed, few figures are so

common in *Capital* as the vampire, the werewolf, and the Cyclops as descriptors of this process (See especially 1887, 224, 228, 233, 242, 245, 249, 252 from the Chapter on the Working Day; I.III.X.1–5). I prefer the positive spin on gigantism and monstrosity in general and will have more to say about it in connection with women, machines, and liberation.

10 Cf. Negri 1991. Despite this difference over the humanism point, Negri and I share the thesis that machines are a particularly illuminating site in which to examine Capital's self-contradictions, and we also share the project of extending Marxian analyses forward in history (as the title of his book *Marx Beyond Marx* suggests). In this book, Negri observes that in the *Grundrisse*, the texts on machines are not collected into a chapter as they will be in *Capital*, but rather span two sections at the "peak of Marx's theoretical tension" (1991, 139) in the work. Negri uses this textual observation as a part of the much larger argument that he builds as the thesis of his book: that there are paths left open in the *Grundrisse*—in particular, paths of subjectivity for the Proletariat—that are shut down by the objectifying analysis of *Capital*. This objectifying analysis leads to interpretations of Marx which see the force of history in its form as Capital as deterministic. In such interpretations, proletarian agency / subjectivity is utterly foreclosed. Negri argues this while insisting that this account of subjectivity still intact in the *Grundrisse* does not rest on any humanist or naturalist presuppositions (1991, pp. 15, 32–33, 43, 68, 109, 111, 154, 156, 163). I find this strand of argument in Negri convoluted. It is unclear with whom he is in dialogue, and, in addition, the frequency of his assertion of this point is downright suspect. Negri's focus on recuperating the young Marx's insistence on subjectivity without this subjectivity maintaining its humanist overtones is a particularly daunting theoretical twist. I am sympathetic to such a project as a part of the general attempt of the extension and revision of Marx, though not as an obliteration of Marx's naturalistic humanism when it appears. I find the question of why such appeals occur far more interesting than the attempt to deny them when they do.

11 And conversely, at least for Marx, the monstrosity of machines has no meaning without the contrast with natural human power—a contrast he draws several times in this section.

12 Here I rehearse Marx's argument. For reasons that will become apparent, I want to stay focused on it and avoid any meaningless squabbles over the differential "natural" strength of the sexes.

13 Many third-wave feminists have challenged various versions of the account of "women's entry into the labor force" as myths, asserting that all but a particularly privileged sphere of women have worked outside of

the home since time immemorial. Leaving this aside, I wish to stress the particular historical status of the widespread entrance of women into *factory* labor, to look at women who work with machines.

14 Marx says as much near the end of Chapter XV of *Capital* (1887, 459; I.IV.XV.9).

15 Merchant's history of actual machines is an example of such an inquiry, especially before she works this history into her more general technophobic meta-narrative. Another example is historian of science Donald Cardwell's *History of Technology*, reissued in 2001 under the telling title *Wheels, Clocks, and Rockets: A History of Technology*. For something a little more fun, see Rachel P. Maines's history of the electric vibrator in *The Technology of Orgasm* (1999).

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