THE HERASAGA

BOOK ONE: HERA, OR EMPATHY

BOOK TWO: THE PRIESTHOOD OF SCIENCE

BOOK THREE: HERA THE BUDDHA

NOTE TO THE READER:

This PDF file contains Chapter 2, "Sublime Machine," in the book entitled *Hera The Buddha*; the entire volume is available as an E-book on Amazon, as follows:

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Figure 1 Yucca brevifolia in bloom, Joshua Tree National Park, California (Photo: W. Leiss)

HERA THE BUDDHA

A WORK OF UTOPIAN FICTION

WILLIAM LEISS



Figure 2 Euler's Identity

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COVER ARTWORK: ALEX COLVILLE (CANADIAN 1920-2013), MOON AND COW (1963), OIL AND SYNTHETIC RESIN ON HARDBOARD PRIVATE COLLECTION, USA

COVER DESIGN BY HYDESMITH COMMUNICATIONS, WINNIPEG

for HEIDEMARIE and THE DAUGHTER

EPIGRAPHS

What happens when machines become more intelligent than humans? One view is that this event will be followed by an explosion to ever-greater levels of intelligence, as each generation of machines creates more intelligent machines in turn. This intelligence explosion is now often known as the "singularity." If there is a singularity, it will be one of the most important events in the history of the planet. An intelligence explosion has enormous potential benefits: a cure for all known diseases, an end to poverty, extraordinary scientific advances, and much more. It also has enormous potential dangers: an end to the human race, an arms race of warring machines, the power to destroy the planet.

David Chalmers (2010)

As if somehow intelligence was the thing that mattered and not the quality of human experience. I think if we replaced ourselves with machines that as far as we know would have no conscious existence, no matter how many amazing things they invented, I think that would be the biggest possible tragedy. There are people who believe that if the machines are more intelligent than we are, then they should just have the planet and we should go away. Then there are people who say, 'Well, we'll upload ourselves into the machines, so we'll still have consciousness but we'll be machines.' Which I would find, well, completely implausible.

Stuart Russell (2017)

We are the first species capable of self-annihilation. Elon Musk (2017)

If you want a picture of A.I. gone wrong, don't imagine marching humanoid robots with glowing red eyes. Imagine tiny invisible synthetic bacteria made of diamond, with tiny onboard computers, hiding inside your bloodstream and everyone else's. And then, simultaneously, they release one microgram of botulinum toxin. Everyone just falls over dead. Only it won't actually happen like that. It's impossible for me to predict exactly how we'd lose, because the A.I. will be smarter than I am. When you're building something smarter than you, you have to get it right on the first try. Eliezer Yudkowsky (2017)

[W]e need not worry about the forecast that, in the near future, a "really smart" digital computer/machine will supplant human nature or intelligence. In all likelihood, this day will never come because, in a more-than-convenient

arrangement, our most intimate neural riddles seem to have been properly copyright-protected by the very evolutionary history that generated our brains, as well as the very complex emergent properties that make it tick. As such, neither evolution nor neurobiological complexity can be effectively simulated by digital computers and their limited logic.

Miguel Nicolelis (2014)

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Chapter 2: Sublime Machine



Figure 4 President Grant & Emperor of Brazil, at the Corliss Steam Engine, Philadelphia Exposition, 1876

THE SHOW-STEALING EXHIBIT at the Philadelphia Centennial Exposition in 1876 was a Corliss steam engine, weighing 680 tons and standing thirty-nine feet high, which provided all of the power for the entries in Machinery Hall. According to contemporary accounts, its presence overwhelmed all who entered the hall, whether they were ordinary fair-goers, such high and mighty as President Ulysses S. Grant and the Emperor of Brazil, or well-known writers like William Dean Howells. It excited the popular imagination, as had other such events beginning with the Great Exhibition in 1851, and so outstripped the capacity of ordinary descriptive reporting that only ecstatic metaphorical construction could register reactions to it. John F. Kasson notes that the fair-goers' descriptions of their experience "frequently became incipient narratives in which, like some mythological creature, the Corliss engine was endowed with life and all its movements construed as gestures. The machine emerged as a kind of fabulous automaton – part animal, part machine, part god."

One guidebook for the Philadelphia exposition offered its readers a lesson in aesthetic judgment. Whereas traditionally poets located the experience of the sublime in our reactions to wild nature or powerful human passions, the guidebook claimed that the modern age recognized the sublime in the design and operation of its great machines. And a newspaper reported that in the presence of the Corliss engine "strong men were moved to tears of joy."

Almost exactly one hundred years later the French "neo-Dadaist" artist Jean Tinguely persuaded the director of New York's Museum of Modern Art to offer the museum's sculpture garden as the site for a spectacular auto-da-fé by Tinguely's self-destroying machine. (The performance was named *Homage to New York*.) When finished, the machine was twenty-three feet long and twenty-seven feet high; its main distinguishable components were a piano, an old Addressograph machine, eighty bicycle wheels, steel tubing, a meteorological balloon, a huge klaxon on wheels, a wide assortment of small mechanized devices, and various chemicals – smoke, flash powders, and foul-smelling substances.

When the main motor was switched on, the piano keys were struck, wheels turned, klaxons sounded, a radio blared, clouds of smoke billowed forth; a number of small constructions broke free and wheeled about; and small objects were hurled through the air. Then the piano caught fire, the steel tubing supports began to give way, and the terrified museum authorities ordered in firemen with axes and extinguishers to finish off the machine. Once set in motion, the machine's self-destructive orgy had followed pretty much its own course, rather than the artist's specific sequence of events, and this spontaneity was precisely what Tinguely had hoped most to achieve. To him this machine "was the opposite of the skyscrapers, the opposite of the Pyramids, the opposite of the fixed, petrified work of art, and thus the best solution he had yet found to the problem of making something that would be as free, as ephemeral, and as vulnerable as life itself." The late machine was described as both a beautiful and a terrible thing, and it was reported that at the end some spectators had wept.

All in all, the concept of the sublime – the ineffable union of awe and dread, terror and attraction – is a good a guide as any to unravelling the modern reaction to industrial society and the machine. The iconography of the machine supports the case. Kasson remarks that many nineteenth-century popular illustrated magazines chose a graphic style and accompanying text for their drawings of large machinery that heightened the sense of "mystery and majesty." One of the most famous illustrations was J. O. Davidson's *Interior of a Southern Cotton Press at Night* (1883). Davidson himself supplied the following explanatory note: "Beneath the converging rays of electronic

lamps and reflectors a most weird effect is produced, for the machine assumes the aspect of a grand and solemn demon face, strangely human, recalling the famed genii of the Arabian Nights." In the great scene in Fritz Lang's film *Metropolis* (1926), where tier upon tier of identical machines, deep underground, are attended by workers whose rhythmic movements follow those of the levers and dials, the machine's face closely resembles the one engraved by Davidson.



Figure 5 J. O. Davidson, "Interior of a Southern Cotton Press," Harper's Weekly, 24 March 1883

The iconic representation of the machine, in eliciting the feeling of the sublime, testified to the darker side of the human experience with large-scale machinery that qualified the popular enthusiasms expressed at the great exhibitions. This popular ambivalence was mirrored in the struggles by imaginative writers and social thinkers to come to terms with the industrial age.

The majority of nineteenth-century political economists, and virtually all the marginalist economists who created a formalized discipline after them, typified the "happy consciousness" of industrial society: they were satisfied that the abundant and manifest benefits supplied by industrialism and the division of labor overawed whatever negative aspects inevitably accompanied them. They never entirely silenced the dissenting voices, however, who worried about the moral degeneration and degradation of skills in the labor force. Originating in a striking passage in Adam Smith's *Wealth of Nations* (1776), this dissenting strain was kept alive mainly in the nineteenth-century socialist movement, notably by Robert Owen, Karl Marx, and William Morris. It remains alive in the twentieth-century tradition that runs from Thorstein Veblen to Ivan Illich.

Many dissenting social thinkers believed, however, that the degeneration characteristic of industrial society was remediable, in most cases by more or less drastic reordering of economic and political circumstances. It was much different with those who represented the predominant aesthetic sensibility of their time, for among them the prevalent mood ranged from dismay to horror. Beginning about 1830, when the impact of industrialism began to register, major writers entered the lists against the machine and the industrial age. Thoreau, the later Emerson, Melville, and Henry Adams in the United States; Zola, Balzac, and Flaubert in France; Heine, Hesse, and Thomas Mann in Germany; in nineteenth-century England, Carlyle, Dickens, Ruskin, and Morris, and in the early twentieth century Forster, Lawrence, and Huxley. For some of these it is (at least overtly) a minor theme, but for others the machine becomes the symbol of degeneracy itself. This mood's culminating expression is the great anti-utopian novel of the early twentieth century, Yevgeny Zamyatin's *We*.

The anti-industrial sentiment also predominated in major English and European developments in the plastic and decorative arts, in part as a reaction against the influence of industrial design on public works and consumer goods. The Aesthetic Movement and Art Nouveau set their faces resolutely against mechanical reproduction and industrial design. Only in the 1920s did architecture and design begin to reconcile themselves to the industrial age.

One can date the aesthetic reaction to the machine from 1829, when Thomas Carlyle's great essay "Signs of the Times" baptized his period the "Age of Machinery." This reaction is completed almost exactly a century later, with the publication of the two greatest anti-utopian novels, *We* (written in Russian in 1920, but published first in English translation in 1923); and *Brave New World* (1932). George Orwell was the first to identify Zamyatin's theme: "What Zamyatin seems to be aiming at is not any particular country but the implied aims of industrial civilization.... It is in effect a study of the Machine, the genie that man has thoughtlessly let out of its bottle and cannot put back again." An allusion to the genie, which we have already encountered in J. O. Davidson's commentary on his illustration of the cotton press, is itself one of the most common textual threads in the literary response to the machine age.

The aesthetic response to industrialism after 1830 argued the shallowness of other reactions, especially in political economy and social thought. The latter were, as

suggested above, divided into a predominant "happy consciousness," which welcomed industrialization with open arms, and a dissenting minority, which wanted urgent institutional changes to counteract its deleterious impact on labor and social relations. Most of those in the latter category, however, contended that these negative aspects could be overcome and that the machine age could be turned unambiguously to mankind's benefit.

The dominant literary metaphors appeared to rule out this eventuality. For at its deepest level the matter appeared to be one of life and death, considered in terms of the essential determinants of what it means to be human, and the machine seemed to represent the ultimate degeneration, the death of humanity. In the following pages this theme will be tracked through a series of metaphorical constructions that lead inexorably to the opposition of life and death.

Root Metaphors

Sander L. Gilman has used the idea of root-metaphor as a way of understanding both continuities and variations over time in literary expressions that reflect common experience. It seems that we often require a means of synthesizing our perceptions of complex events, especially when we are faced with startling new circumstances that fall outside the realm of our ordinary experience. Metaphors – "it was like a thunderclap" – allow us to capture a novel or extraordinary event in forms of thought that are well known to us, thus "domesticating" it; furthermore, they encourage us to believe that we may communicate our experience to others. There is a concomitant risk, of course:

metaphorical constructs limit our ability to assimilate new information, because we try to squeeze the unusual into familiar and comfortable form.

That established ways of life are challenged by unremitting technological novelty is something of a cliché by now. Yet we who have become so jaded should not forget how profoundly unsettling was the sprouting of large-scale machinery and the factory system for both society and culture in the nineteenth century. For most people, common folk and artists alike, it was as the world itself had come unhinged. Many found that they could comprehend its significance only by resorting to metaphorical expressions rooted in thoroughly familiar structures of experience. When one recalls the enormity of the changes wreaked in the social and physical landscape in such a relatively short time, it is unsurprising that the search for adequate expressive modes should terminate in the fundament itself: life against death.

No simple scheme can hope to capture all of the varieties of expression for such a universally felt experience. The one to be explored here seems to catch a sample of reasonable size and quality, although undoubtedly much that is equally important slips through its mesh. The scheme is composed of three levels of metaphorical construction, internally related to one another, which proceed from the "surface" realm of familiar social experience to the ultimate duality of life and death.

The root metaphor for the surface level of representation of the relationship between humanity and the machine is *master and servant*. This had two quite obvious advantages. First, it was a relation that was thoroughly familiar in social experience everywhere. Second, and perhaps more important, it is a relation that is readily reversible in imagination. The affirmative response to industrialism trumpeted the machine as the perfect servant of human objectives, as the long-sought deliverance from necessity and want. The rejoinder quickly made itself heard: the servant will be master. The imagery of the "sorcerer's apprentice," together with that of the Arabian Nights and its genii, have been favored to make the point.

The root metaphor for the second level is further development of the master-andservant theme. Domination and servitude are external relations in which each side is necessarily the opposite of the other. On the second level, we pass beyond the purely external relation, and the two participants in the human-machine relation begin to switch roles: human agents adopt more passive roles in step with the growing virtuosity of machinery. Machinery based on advanced designs is capable of self-regulation and self-adjustment; at the same time, the human agents who tend the machines have less and less to do. There arises the twin prospect of the autonomy of the machine and people as automatons. The second level of representation is therefore *autonomy/ automaton*.

The "autonomous technology" theme is an old and persistent one in Western thought. Conceiving the machine as autonomous is an extension of the master-and-servant metaphor. Here the machine's role in the relation is reversed – servant is now master – in the sense that we have allowed ourselves to become utterly dependent on its productive power in providing desired goods; strictly speaking, then, this is a case of voluntary servitude. In other words, we set in motion a course of events that resulted at some point in our losing control over what we have created: we can no longer "freely" choose to have it or not. Since we cannot even conceive of doing without its benefits anymore, we are beholden to our apparatus, and we begin to adjust our behavior to its modus operandi. In Carlyle's words: "Men are grown mechanical in head and in heart, as well as in hand."

What began as an external relation is now an internalized process, whereby the dependent member (the human being) surrenders its own authentic being to its erstwhile instrument. The relation itself and the tension between its originally opposed sides dissolve as society begins to mimic the way machines operate. In *We* Zamyatin gave the most striking representation to the process of internalization and the root metaphor of autonomy/automaton: society is ordered on the model of the machine, and men and women are its subordinate parts, whose "functions" are determined strictly in relation to their role in the apparatus as a whole.

The third level of root metaphor was a direct outcome of what preceded it: the concept of automaton led directly to the imagery of the opposition between life and death. This metaphor works on the identification of the machine with inorganic matter, necessity, repetition and identity, and thus death – and the concomitant association of life with organic processes, and with contingency, variation, or freedom. The machine as automaton, however, possesses characteristics both animate and inorganic: in crossing over the two realms it appears to draw what is living inexorably into the province of the inanimate. Powerful representations of this theme appear in the case studies to be presented later: Melville's "The Paradise of Bachelors and the Tartarus of Maids," E. M. Forster's "The Machine Stops," and Zamyatin's *We*.

Machinery

For industrialism's defenders, machinery had lifted a double yoke from humanity's shoulders, namely, subjection to nature's capriciousness as well as to the corrupting influence spread by relations of dependence among people. Technology would overturn humanity's age-old subordination to physical forces and deliver he realm of nature holus-bolus into its hands, to do with as it would. At the same time, material abundance and mechanical aids would do away with the employment of people in

personal service – an especially prominent theme in the United States, where industrialism had been linked to republicanism. Two years after Carlyle's 1829 essay appeared, its message was thoroughly rejected by a writer for the *North American Review*, Timothy Walker, in "Defence of Mechanical Philosophy." Of the blessings of technology, he wrote: "From a ministering servant to matter, mind has become the powerful lord of matter."

This Baconian theme, both widely sown and deeply rooted by mid-century, was so successful in its propagation because it represented the relation between human beings and large-scale machine technology as analogous with the completely familiar routine of masters and servants. Machines would take the place of servants, who are out of place in a democratic regime; not only could it assume many of the burdensome tasks usually imposed on dependent people, and in many cases perform them more efficiently, but it could also be seen to be more fitting in this role. John Ruskin gave a nice explanation for this point. What a master ordinarily requires of his servants, he remarked, is the maximum output for the least pay (that is, the market value of the servant's labor); and, according to the prevailing economic wisdom, this situation will yield the greatest benefits for society as a whole and all its individual members, including the class of servants.

This would be the case, Ruskin objected, "if the servant were an engine of which the motive power was steam, magnetism, gravitation, or any other agent of calculable force." On the contrary, the servant is a human agent whose "motive power is the Soul," and this fact marks an essential difference: "The largest quantity of work will not

be done by this curious engine for pay, or under pressure, or by the help of any kind of fuel which may be supplied by the cauldron. It will be done only when the motive force ... is brought to its greatest strength by its own proper fuel, namely by the affections."

Ruskin's distinction reinforces the metaphor of the master-servant relation as a way of understanding the machine's significance for human life, for always lurking in this relation is the potential reversibility of its terms. Thus the machine can be seen as replacing the human agent and as doing the bidding of human masters. But much folklore also tells of the "reversal of fortune" that catapults erstwhile servants into their master's place to lord it over those who formerly had abused them. Just so the machine.

Melville used the notion of a reversal of roles between humanity and machinery in his portrayal of a New England paper mill in his short story, "The Paradise of Bachelors and the Tartarus of Maids" (1855): "Machinery – that vaunted slave of humanity ... here stood menially served by human beings, who served mutely and cringingly as the slave serves the Sultan. The girls did not seem so much accessory wheels to the general machinery as mere cogs to the wheels." This was to become a favorite image in the critique of industrial society, especially in utopian literature that argued for a "second reversal," to be achieved by a radical reordering of social relations to re-establish humanity's hegemony over the instruments to which it had become enslaved. In his utopian sketch *A Traveler from Altruria* (1894), William Dean Howells suggested this in a way that reinforced the root metaphor; in his imaginary future society, "the machines that were once the workman's enemies and masters are now their friends and servants."

The resolution proposed in "re-reversal" confines the relation between humanity and machinery to the first level of root metaphors. It finds adequate the representation given by the metaphor: machines should be regarded as our servants. And it identified

our problem solely as one of re-establishing our right to occupy the dominant side in this relation. As we shall see, this seemed a rather superficial resolution to those who wished to consider the matter in terms of deeper levels of significance and more profound root metaphors. For the reversal slips too readily over the circumstances that had given rise to the original reversal, that is, the one whereby human agents had become the machine's servants.

The change in Ralph Waldo Emerson's attitude over a period of twenty years offers a clue about these circumstances. He began with robust confidence in the industrial age and its possibilities for improving the human condition: the enormously influential essay "Nature" (1836) trumpets that nature "is made to serve." Illustrating what Leo Marx calls Emerson's "rhetoric of the technological sublime" is the following 1843 entry from his journal: "Machinery and Transcendentalism agree well." *English Traits* (1856) records a different sentiment, however: "But a man must keep an eye on his servants, if he would not have them rule him ... It is found that the machine unmans the user. What he gains in making cloth, he loses in general power ... The incessant repetition of the same hand-work dwarfs the man, robs him of his strength, will and versatility, to make a pin-polisher, a buckle-maker, or any other specialty ... Then society is admonished of the mischief of the division of labor, and that the best political economy is care and culture of men."

Industrialization

Emerson's mention of pin-polishing stands in ironic contrast to the famous opening chapter of Adam Smith's *Wealth of Nations*, which had heaped praise on the division of

labor and had made Smith's own pin-making illustration a legend in the subsequent political economy literature.

Seventeenth-century Europeans were unable to decide whether the barbarous ways of the New World inhabitants were a degenerate form of earlier civilized conditions or simply a case of arrested development. Their successors may not have resolved this point, but they were confident at least that they knew the proximate cause of their misery. According to Adam Smith, the "savage nations of hunters and fishers ... are so miserably poor" because their labor productivity is so low, and this in turn results from their ignorance of the benefits bestowed by the division of labor.

Smith also knew how to reckon the price paid for economic progress, however. The mental faculties of everyone in "barbarous societies" reman "acute and comprehensive" and are not "suffered to fall into that drowsy stupidity, which, in a civilized society, seems to benumb the understanding of almost all the inferior ranks of people." The division of labor confines the worker's activities to routine tasks: "The man whose life is spent performing a few simple operations ... has no occasion to exert his understanding ... He naturally loses, therefore, the habit of such exertion, and generally becomes as stupid and ignorant as it is possible for a human being to become ... His dexterity at his own particular trade seems, in this manner, to be acquired at the expense of his intellectual, social, and martial virtues." Material progress is won at the expense of widespread degeneration in mental faculties and the capacity for exercising good judgment in public and private affairs.

The Tory critique of industrial society inspired by Carlyle made much of this theme, claiming that the proponents of industrialism and economic development regarded the working population as nothing but "animated machines." Their opposition lent voice in the political arena to the widespread anti-machinery sentiment among the working classes in the early phases of the factory system and to the tremendous social

disruptions that accompanied it. The Tory critique's force diminished as it became increasingly apparent that the necessary concomitant to its attack on industrialism was preservation of the traditional agrarian economy and social hierarchy. This left sustained opposition effectively in the hands of the radical critics, who also objected to the degradation of labor and skills under industrialism, but who steadfastly maintained that under radically different social arrangements the highest possible degree of application of machinery to production was in the workers' interests.

Among all those who were willing to commit themselves to this course, Marx grasped best its profoundest implications: "In no way does the machine appear as the individual worker's means of labor ... Not as with the instrument, which the worker animates and makes into his organ with his skill and strength, and whose handling therefore depends on his virtuosity. Rather, it is the machine which possesses skill and strength in place of the worker, is itself the virtuoso, with a soul of its own in the mechanical laws acting through it ... The science which compels the inanimate links of the machinery, by their construction, to act purposefully, as an automaton, does not exist in the worker's consciousness, but rather acts upon him through the machine as an alien power, as the power of the machine itself ... The production process has ceased to be a labor process in the sense of a process dominated by labor as its governing unity." The laborer ceases to be the "chief actor" in the production process and becomes instead only the "watchman and regulator" over it.

The radical tradition split into two quite different currents in response to the growing presence of machinery in production and the consequent deskilling of labor. The most

influential current, in which Marx and most modern socialists are found, accepted the declining role of labor and its traditional skills in producing life's necessities and relegated the cultivation of skill and virtuosity to the realm of free time or leisure. A much smaller branch, for which William Morris's utopian tract *News from Nowhere* (1890) is the chief source, drew the opposite conclusion: re-establish skilled craft labor as the cornerstone of social life and limit wants and satisfactions to what such effort can provide with the smallest possible reliance on mechanical assistance.

The factory system methodically undermined labor's autonomy, its very "substance" as an agent in social life, by eliminating society's dependence on the rich panoply of craft skills heretofore distributed among the working classes. The historical residue of those skills is absorbed by the system of machinery, "whose unity" – in Marx's striking formulation – "exists not in the living workers, but rather in the living (active) machinery, which confronts their individual, insignificant doings as a mighty organism." Regarded in this light, it is easy to see why the master-and-servant metaphor, so readily applied to the relation between humanity and machinery, was also so readily reversible. Having appropriated the essential substance of its putative master, the machine was heir to humanity's accumulated, alienated mastery of its environment; what remained for the "stupid and ignorant" mass of deskilled laborers was only numbing exhaustion in the service of the machine's imperious rhythm.

The radical critique maintained that the machine could be remastered and compelled once again to service mankind's purposes. The system of machinery confronts the worker as an automaton or as a "living, mighty organism" at the level of immediate experience; labor is cowed into submission because it appears as if all skill, initiative, and "virtuosity" have passed irrevocably from it to another kind of being. Its apparent otherness and autonomy, however, upon analysis turn out to be just that, mere appearance. In truth, it is the same substance: Machinery is "objectified labor," the material legacy of past human skill and exertion, misappropriated in the form of privately owned capital. What seemed to be service to the machine was in fact subjection to another human group that had discovered in large-scale machinery a wondrous device for extracting vast wealth from the labor of others. The realization that labor's enemy was not the machine but the capitalist was for the radical critique the "beginning of wisdom" and the first step toward re-establishing labor's autonomy.

An implicit rejoinder to this program was made in the period under review, governed at the second level by the root metaphor of autonomy/automaton: specifically, internalization of the machine principle in humanity's own mode of being. From this perspective, labor's wresting control of the industrial system away from the capitalists would be Pyrrhic, for this would seal the fate of society as a whole, committed irrevocably to mechanistic modes of action. The very moment of its triumph simultaneously would signal labor's final defeat, and its ostensible autonomy would be a sham. Labor and its skills would be no longer the heart of the production process, since it had surrendered that role to machinery; labor – or what was left of it, namely superintendence – would become just a routine social obligation to earn income for consumption.

In accepting machine production as the dominant means for supplying life's necessities, modern society would be forced as well to adopt a mechanistically oriented routine for life in general:

The relation in which the consumer, the common man, stands to the mechanical routine of life at large is of much the same nature as that in which the modern skilled workman stands to that detail machine process into which he is dovetailed in the industrial system. To take effectual advantage of what is offered as the wheels of routine go round, in the

way of work and play, livelihood and recreation, he must know by facile habituation what is going on and how and in what quantities and at what price and where and when, and for the best effect he must adapt his movements with skilled exactitude and a cool mechanical insight to the nicely balanced moving equilibrium of the mechanical processes engaged. To live – not to say at ease – under the exigencies of this machine-made routine requires a measure of consistent training in the mechanical apprehension of things.

These comments by Veblen in his *The Instinct of Workmanship* (1914) were not meant to encourage any hope that this "machine-like process of living" could be overturned. The best that one could do was to take it to its logical conclusion by placing engineers instead of businessmen in charge.

When this concern was first raised, almost a century earlier, it was possible to surmise that the swelling tide of mechanization might yet recede again. The great manifesto for those who so believed was Thomas Carlyle's "Signs of the Times" (1829). For Carlyle, the physical instruments rapidly overtaking traditional productive processes were only the visible expressions of a deeper malaise, namely a habit of mind and action he described in precisely the same terms as Veblen would use much later: a pervasive "matter of factness." The machine itself served as a metaphor for "the great art of adapting means to ends ... by rule and calculated contrivance."

Carlyle begins his animadversions by referring to the transformations in the physical environment wrought by the application of machinery to production and transportation. Besides its obvious effects in undermining the craftsman's position, mechanization is faulted for being unable to distinguish between appropriate and trivial applications. By these means people seek to rule nature and in so doing pay a heavy price: "Not the external and physical alone is now managed by machinery, but the internal and spiritual also." Here the machine stands for the disappearance of spontaneity and for the rise of a mode of action that first appraises each situation in strategic terms, then breaks down ultimate objectives into a manageable series of discrete steps, and then assigns means from whatever quarter to the separate tasks: "Has any man, or any society of men, a truth to speak, a piece of spiritual work to do, they can nowise proceed at once and with the mere natural organs, but first call a public meeting, appoint committees, issue prospectives, eat a public dinner; in a word, construct or borrow machinery, wherewith to speak it and do it."

By the time he came to write *English Traits* (1856), Emerson had lost his youthful enthusiasm for the industrial age and was ready to echo Carlyle's sentiments: "Mines, forges, mills, breweries, railroads, steam-pump, steam-plough, drill of regiments, drill of police, rule of court and shop-rule have operated to give a mechanical regularity to all the habit and action of man. A terrible machine has possessed itself of the ground, the air, the men and women, and hardly even thought is free." Taken as a metaphorical allusion, the last sentence could do nicely as an epigraph for E. M. Forster's story "The Machine Stops."

Neither Carlyle nor Emerson, however, was yet prepared to concede that all was lost. There was still time to reverse this disastrous course and reassert the pre-eminence of the natural and the spontaneous over the mechanical mode of action. Despite its deepening penetration of public and private life, mechanization was not yet triumphant over the old ways. Carlyle advertised this hope in an especially revealing way, namely, by suggesting at the end of his essay that the fundamental root metaphor governing the first level of representation was still operative: "Indications we do see in other countries and in our own, signs infinitely cheering to us, that Mechanism is not always to be our hard task-master, but one day to be our pliant, all-ministering servant."

This curious conclusion by Carlyle seriously undermines the force of the argument that preceded it. For it suggests that, however widely it had spread, mechanism had not contaminated the original sources of human action and still could be subordinated to individual and collective ends governed by non-mechanical principles. Or perhaps the opposite is nearer the mark: the force of his own earlier argument undermines Carlyle's conclusion.

Automatons

Matching the uninterrupted march of machine technology in the second half of the nineteenth century was a growing fear that it was indeed out of control. In the relation between humanity and machines, increasingly the former seemed to be the passive partner and the latter the active agent. The more the system of machinery as a whole assumed labor's erstwhile attributes – skill and indeed virtuosity (Marx) – the more the worker appeared "like a machine" in the derogatory sense, fit only for the dull repetitiveness of routine operations. Emile Zola, who on other occasions rhapsodized about modern technology, filled his Rougon-Macquart novels with allusions to the machine-like and thing-like character of human action and, correspondingly, with the appearance of animate force and autonomous power residing in machinery.

As early as his writings of 1857-8 Marx had referred to an "automatic system of machinery" as the "most complete" and "most adequate" form of the machine itself, "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." The root metaphor of autonomy/automaton, which was to be fleshed out as a favorite device in fiction, alluded not so much to a reversal of roles, as in the case of the master/servant

metaphor, as to a complete collapsing of the two sides of a relation into a synthetic entity that transcended both. Its most effective representation was the man-like automaton.

Herman Melville's story "The Bell-Tower" (1855) is thought to be the first fullydeveloped portrayal of such a creature. The story is headed by Melville with an anonymous epigraph, the third paragraph of which reads, "Seeking to conquer a larger liberty, man but extends the empire of necessity." In the story itself, a "great mechanician," Bannadonna, is commissioned to construct a huge bell-tower; after the tower is completed, he insists on working in secrecy on the belfry, eventually having a large object, concealed in wrapping, hauled up. Bannadonna alone remained in the belfry when the day came to inaugurate the ringing: the entire population remained below, but at the appointed hour, instead of the anticipated booming of the great bell, only a single muffled sound was heard, followed by silence.

Upon entering the belfry, the town magistrates found the dead Bannadonna and standing over him an enormous mechanical figure, cast by its creator to run upon a track at each appointed hour and strike the bell with its arms. Bannadonna, intent on some finishing touches to the bell, had forgotten the hour and had been struck dead by the mechanical figure.

Yet, according to the story's narrator, this was to have been only the prototype for Bannadonna's ultimate creation, an "elephantine helot" to be produced in great numbers and incorporating all the characteristics of all the animals that mankind had heretofore yoked to its will: "All excellences of all God-made creatures, which served man, were to here receive advancement, and then to be combined in one." And the figure itself was to epitomize the aesthetics of the sublime: Bannadonna's design principle for it was "the more terrible to behold, the better."

Bannadonna had intended to give his "metallic agent" not only the power of locomotion but also "the appearance, at least, of intelligence and will." The terror inspired by the physical appearance of the automaton has its source in a deeper dread, originating in its violation of the border between life and death: inorganic matter, becoming animate by a process of purely mechanical or chemical operations, inevitably produces a reverse effect and draws the living into the realm of the dead. This is the third and final level of root metaphors about the machine.

In "The Paradise of Bachelors and the Tartarus of Maids" (also 1855), Melville casts the relation between humanity and machinery in these terms. The story's unusual structure is especially interesting, for Melville portrays the degeneracy or sterility of machine-based civilization not by contrasting it to a healthier, unmechanized condition but rather by juxtaposing it to another kind of sterility represented by traditional culture. The result, while wholly negative in tone, seems to make the point forcefully that there is no succor there.

The "Paradise of Bachelors" section recounts a long and very alcoholic dinner enjoyed by an old group of bachelors in an elegant private club in London; the story then shifts without transition to the "Tartarus of Maids" section, which describes a paper-mill factory in New England that employs a work-force made up only of young women. Both are based on visits by Melville, the first at Elm Court in Lincoln's Inn in 1849 and the second at Pittsfield, Massachusetts, in 1851. The "Paradise of Bachelors" is a scene of sedate, well-tempered pleasure. The meal itself, although consisting of many courses, is curiously undistinguished fare; the dominant imagery is of the bachelors' carefully modulated consumption style: not a one sneezes when the snuff is passed around. The meal itself is, as Dillingham remarks, "a metaphor for their orderly existence." The impression of sterility and lifelessness is transmitted both by their dispassionate overindulgence in food and drink and by the state of lifelong bachelorhood to which all are committed.

The whole story's structure – the abrupt succession of the two sections – employs the first as backdrop for the second. The intrinsically powerful imagery of sterility and death in the second section is heightened further by being presented against what had preceded it. The latter section is saturated with such imagery: the narrator-traveler's close brush with death, the pallor in the female workers' faces, the blankness of the paper, the factory ("like some great whited sepulchre"), the setting: "The mountains stood pinned in shrouds – a pass of Alpine corpses." The traveler sees the apparatus inside the factory: "Something of awe now stole over me, as I gazed upon this inflexible iron animal. Always, more or less, machinery of this ponderous, elaborate sort strikes, in some moods, strange dread into the human heart, as some living, panting Behemoth might. But what made the thing I saw so specially terrible to me was the metallic necessity, the unbudging fatality which governed it."

It is not just that the machine is the living entity; procreative allusions indicate that it has assumed the generative capacities of life as well. The machine is housed in a room that is "stifling with a strange, blood-like abdominal heat": and the elapsed time

between the introduction of the pulp and the emergence of the finished paper is "nine minutes to a second." The female workers are all unmarried virgins whose very substance drains away. The traveler sees, imprinted on the finished paper, "glued to the pallid incipience of the pulp, the yet more pallid faces of all the pallid girls I had eyed that heavy day."

The references to the "necessity" and "fatality" of the machine reinforces the epigraph to "The Bell-Tower": There is no escape from necessity through machine technology; on the contrary, that way leads to greater bondage.

One can assume that for Melville the world outside the machine's orbit was still vibrant and that no irreversible commitment to it had been made. By the end of the nineteenth century it seemed to many that such a commitment indeed had been extracted from a society seemingly enthralled by the system of machinery, especially in North America. The dominant opinion seemed to be that whatever unease the machine might evoke paled into insignificance beside the more immediate dangers against which man and machine warred side by side: the power of untamed nature, wilderness, and the surviving remnants of savage cultures. There is a marvelous representation of this attitude in the Currier and lves lithograph *Across the Continent* (1868). A train is drawn up before a rough frontier settlement, on the other side of which two mounted native warriors stand; the train itself is the protective hedge for civilization against the as-yetuntamed wilderness.

Early twentieth-century imaginative fiction recognized this complete commitment (or capitulation) to the machine. The external form of representation that characterizes the first and second levels of root metaphor – the machine confronting mankind as master/servant or as automaton – gave way to imagery of full internalization. Portrayed in its most striking terms, the man/machine symbiosis emerged fully developed, with the inevitable result: degeneration of the physiological and psychological autonomy of

the human agent. The machine appeared as metaphor for a human society organized as a single, machine-like organism.

E. M. Forster described his short story "The Machine Stops" as "a counterblast to one of the heavens by H. G. Wells." The human population resides underground, living singly in compartments where, at the pressing of buttons, mechanical devices supply water, food, air, beds, medicine, music, and communicating devices. Travel outside the compartments, although provided for, becomes rare, with a resultant deterioration in skin and musculature. Vashti, the central character, is described as a "swaddled lump of flesh" with "a face as white as fungus." Originally the interlocking, supportive mechanism that sustains life in the compartments had been directly superintended by its designers; as the dependence became habitual, however, the human agents seemed to lose control over the functioning of the apparatus, which also had been supplied by its inventors with self-repairing mechanical aids. Soon they began to pray to it. That was the beginning of the end: "But humanity, in its desire for comfort, had overreached itself. It had exploited the riches of nature too far. Quietly and complacently, it was sinking into decadence, and progress had come to mean the progress of the Machine."

Eventually the mechanism collapses, taking with it the compartmentalized inhabitants. But they were already dead in all but name, the living dead. Kuno, Vashti's son, had tried to explain this to her before the end: "Cannot you see … that it is we who are dying, and that down here the only thing that really lives is the Machine? We created the Machine to do our will, but we cannot make it do our will now. It has robbed us of the sense of touch, it has blurred every human relation and narrowed down love to a carnal act, it has paralyzed our bodies and our wills, and now it compels us to worship it. The Machine develops – but not on our lines. The Machine proceeds – but not to our goal. We only exist as the blood corpuscles that course through its arteries, and if it could work without us it would let us die."

Hope for regeneration lies only in the rude bands of escapees or natives who exist completely outside the orbit of mechanical society. This theme recurs in *We* and *Brave New World*.

In *We*, the individuals – who carry such designations as D-503 and I-330 – are described as the "cells" of the "single mighty organism" that is the One State. All live in identical rooms and are nourished by a single, industrially produced substance. The Table of Hours regulates all movements, setting prescribed times for eating, work, exercise, and sleep, except for the two Personal Hours each day – which, it is expected, will soon become part of the "general formula" like the others. Zamyatin's imagery is dominated throughout by mathematical allusions. According to the sexual law, for example, each "number" (individual) is entitled to have sexual relations with any other: "You declared that on your sexual days you wish to use number so-and-so, and you receive your book of coupons (pink). And that is all. Clearly, this leaves no possible reasons for envy; the denominator of the happiness fraction is reduced to zero, and the fraction is transformed into a magnificent infinity."

Society itself is a machine, an organism of differentiated and smoothly integrated component parts. A mechanism in the usual sense, the physical object, appears in *We* only as a symbol: first, as the Integral, a spaceship designed to bring the message of "mathematically infallible happiness," achieved by the One State, to other planets; and second, as the Benefactor's Machine, a device to cauterize the area of the brain that houses the faculty of imagination. The *One State Gazette* announces to the citizenry: "Until this day, your own creations – machines – were more perfect than you … The

beauty of mechanism is its rhythm – as steady and precise as that of a pendulum. But you, nurtured from earliest infancy on the Taylor system – have you not become pendulum-precise? Except for one thing: Machines have no imagination ... The latest discovery of State science is the location of the center of the imagination: a miserable little nodule in the brain of the pons Varolii. Triple x-ray-cautery of this nodule – and you are cured of imagination – forever. You are perfect. You are machinelike."

As the novel ends, D-503, chief mathematician for the Integral project, submits voluntarily to the operation: "It is the same as killing myself – but perhaps this is the only way to resurrection. For only what is killed can be resurrected." Once the operation is universally performed, and the imaginative faculty is genetically blocked in future generations, the mechanism itself will be needed no longer: society-as-machine will have removed all remaining impediments to its smooth functioning and will be able to reproduce itself identically for all time to come. But, at the city's edge, there is chaos, as the remnants of older humanity assault the surrounding Wall.

The matter-of-factness that Veblen identified as the behavioral orientation of the machine age has today become the expected routine of everyday life. We are accustomed to quantitative measure in every aspect of social life. The calculation of benefits and costs in numerical terms pervades our lives – in negotiations between prospective marriage partners as well as between unions and corporations, in setting minimum levels of welfare payments as well as maximum "throw-weights" for nuclear missiles. Domestic life is unimaginable anymore without mechanical devices, and more

and more people carry around inside their bodies some testimony to the wizardry of medical technology.

As well, an abundance of automatons in all sorts of horror films and science-fiction literature during the last fifty years has inured us to them; the ubiquitous video games should dissolve whatever remains of the machine's threatening visage. A few scattered souls may still quake at the prospect of self-programming computers becoming obstreperous, or of chess grandmasters being humiliated by an unanswerable gambit from a machine opponent, but for most the terror and dread, as well as the sublimity, that fired the nineteenth-century mind are gone. The relation between mind and machine is now grist for esoteric philosophical debate in the academic mills; the combat in this zone, however fierce it may become, is unlikely to revive that older mood.

The master of the new style is the Polish writer Stanislaw Lem, and the mode of representation is whimsy. *Mortal Engines* introduces us to "electroknights" and to "ultradragons" and to a computer that calls itself "Digital Grand Vizier" and insists on being addressed as "Your Ferromagneticity." *The Cyberiad* opens with a story about a machine that suffers with good grace the ridiculous commands of its inventor, although it cannot resist a touch of spite. The stories are infinitely comforting, because Lem's machines have all the pathetic emotions and foibles so readily recognizable as our own. And, after all, Jean Tinguely's self-destructive machine was designed to show precisely that the machine shares with us life's essential attribute, namely mortality, and is thus an affirmation of life rather than its negation.

Sources and References

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Figure 1, *Euler's Identity*: <u>https://en.wikipedia.org/wiki/Euler%27s_identity</u>

Leonhard Euler (1707-1783) was a Swiss mathematician and physicist, and this has been described as "the world's most beautiful equation." It was one of the formulae shown to fifteen mathematicians in a neuroscience study using MRI scanning of the brain. The study found that in the subjects' brains the medial orbitofrontal cortex was stimulated; this is part of the 'emotional brain' in which we experience aesthetic pleasure such as music: S. Zeki *et al.*, "The experience of mathematical beauty and its neural correlates," *Frontiers in Human Neuroscience*, vol. 8 (February 2014), pp. 1-12. The quotation from Dirac in Chapter 8 will be found towards the end of this article:

http://journal.frontiersin.org/article/10.3389/fnhum.2014.00068/full

Results of voting: BBC survey asking what was the most beautiful equation ever written:

- The Dirac equation, 22,913 votes, 34%
- Euler's identity, 11,383 votes, 17%
- Pi, 9,060 votes, 13%
- Riemann's formula, 3,615 votes, 5%

- The [Schrödinger] wave equation, 3,318 votes, 5%
- The Euler-Lagrange equation, 2,663 votes, 4%
- Bayes' theorem, 2,590 votes, 4%
- The Yang-Baxter equation, 1,382 votes, 2%

The Dirac equation (in natural units): <u>https://en.wikipedia.org/wiki/Dirac_equation</u>

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PART ONE: THE MIND UNHINGED

CHAPTER 2.

This is the complete text of Chapter 4 from the book, *Under Technology's Thumb*, by William Leiss, published by McGill-Queen's University Press in 1990. Notes and references for the citations will be found in the text of that book. Originally published as "Technology and Degeneration: The Sublime Machine," in *Degeneration*, eds. J. E. Chamberlin and S. L. Gilman (New York: Columbia University Press, 1985), pp. 145-164.

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